Eugenides Foundation / Planetarium

Athens, Greece 8-11 October 2007

Communicating Astronomy with the Public 2007

EDITORS

Lars Lindberg Christensen **(ESA/Hubble)**

Manolis Zoulias **(Academy of Athens)**

Ian Robson **(UK ATC)**

LAYOUT

Nuno Marques **(ESA/Hubble)**

Martin Kornmesser **(ESA/Hubble)**

Communicating Astronomy with the Public 2007

Communicating Astronomy to a Global Audience

http://www.communicatingastronomy.org/cap2007/

EDITORS

Lars Lindberg Christensen **(ESA/Hubble)**
Manolis Zoulias **(Academy of Athens)**
Ian Robson **(UK ATC)**

TALKS

Session 12: Media

Session 13: Closing Remarks

POSTERS

Credit: Spitzer Data — NASA/JPL–Caltech/T. Megeath (University of Toledo); Other Data — NASA–ESO/M. Robberto (STScI)

This image from the Spitzer Space Telescope and the Hubble Space Telescopes shows the Orion Nebula in an explosion of infrared, ultraviolet, and visible light colours. It was “painted” by hundreds of baby stars on a canvas of gas and dust, with intense ultraviolet light and strong stellar winds as brushes.

Session 1
Opening Remarks

At the heart of the artwork is a set of four monstrously massive stars, collectively called the Trapezium. These behemoths are approximately 100,000 times brighter than our sun. Their community can be identified as the yellow smudge near the centre of the composite.

Welcome from Commission 55

Ian Robson
President Commission 55 (eir@roe.ac.uk)

On behalf of Dennis Crabtree and myself from IAU Commission 55 I would like to welcome you all to what I know will be a splendid, enjoyable and rewarding conference. This will be a very brief introduction so we can get on with the real topic of discussion, preparations for IYA2009.

Commission 55 has been very active in supporting IYA2009: Dennis, Lars and I are members of the IAU Executive Working Group overseeing the international events and it is clear that this activity has diverted us from the C55 larger goals. However, let me take this opportunity to remind you about the Washington Charter[1]; having as many organisations as possible sign up to and then follow the themes of the Washington Charter is one of our key tasks. Let us set a key goal of enlarging the signatories by 50% by the end of the meeting — please checkout the web and then contact me if you intend taking this to one of your organisations so I can follow up with you.

Of course organising this meeting has been one of the key tasks of C55 since CAP2007, and I would like to take this opportunity to thank our hosts and the Local Organising Committee, especially Manolis. Key members of C55 have been far from inactive, however, and at this meeting we will see the launch of the new Communicating Astronomy with the Public journal, spearheaded by Pedro Russo. This promises an exciting future and a refereed medium for you to publish your work and ideas. Excellent work has also been going on behind the scenes on the Astronomy Metadata Visualization Standards project, now part of the Virtual Astronomy Multimedia Project (VAMP) and you will see examples of this at this meeting.

So, without further ado, let us move on to hear from the President of the International Astronomical Union, Catherine Cesarsky, about IYA2009.

[1] http://www.communicatingastronomy.org/washington_charter

Credit: Sze-leung Cheung

Welcome to the International Year of Astronomy 2009

Catherine Cesarsky
ESO, the European Organisation for Astronomical Research in the Southern Hemisphere, IAU President
(ccesarsk@eso.org)

Abstract

The International Year of Astronomy 2009 will be a global celebration of astronomy and its contributions to society and culture, highlighting the on-going explosion of knowledge about the Universe.

Introduction

Following a suggestion from Franco Pacini, IAU President from 2000 to 2003, the International Year of Astronomy (IYA2009) was launched by an IAU resolution at the end of the General Assembly in Sydney, just as Franco was passing the presidency to Ron Ekers. The date was chosen to commemorate 400 years since the first use of a telescope by Galileo. Following a presentation by the Italian delegation, backed by several other delegations from all over the world, IYA2009 was endorsed by the United Nations Educational, Scientific and Cultural Organization (UNESCO), which is now a coordinator with IAU. At this meeting, Minella Alarcon will present the UNESCO vision for IYA2009. The Italian delegation at the United Nations (UN) is about to submit a resolution, in conjunction with thirty other countries, for the UN to declare 2009 the International Year of Astronomy. The decision will be taken by the UN General Assembly early in December 2007.

Goals and implementation

IYA2009 will be a global celebration of astronomy, with the motto: “The Universe: Yours to Discover”, and will be in accord with the UN millennium development goals.

It will encompass activities all over the world, aimed at people of all ages, but particularly young people from all continents and all walks of life. It will mobilise professional astronomers and physicists, historians, science writers, journalists, planetariums, science museums, amateur astronomers and school teachers.

In 2009 we would like everybody on Earth to think, at least once, about the wonders of the sky; to share the human wish to reach to the stars and to comprehend them; to feel part of the Universe; to give as many people as possible the chance to gaze through a telescope, be it only a cheap Galileoscope aimed at the Moon; and hear or read about astronomy’s contribution to culture, the history of astronomy, its recent successes and its future prospects.

CAP2007

At this meeting, Pedro Russo (IYA2009 coordinator) and Lars Lindberg Christensen (IAU Press Officer) will introduce the main planned activities, called the Cornerstones, and their coordination, while the various SPoCs (Single Points of Contact) will detail the activities in preparation in their countries. A glance at the titles of presentations in the programme shows that most of them are relevant to many of the IYA2009 themes, including humanising astronomy, bringing the Universe back to Earth, inspiring a community and visualising the invisible. This meeting is also an opportunity for all of us to comment on the existing plans, and also to express new ideas.

We, the IYA2009 Working Group, hope that after this meeting the national activities will rapidly take shape and that our global organisation will be set on a stronger basis:

MAKE IT HAPPEN!

Communicating Astronomy with the Public 2007: A speech of welcome

C. Goudis
National Observatory of Athens (cgoudis@astro.noa.gr)

Communicating astronomy with the public is equivalent to communicating the quintessence of modern science with the man in the street, the man who walks the streets as he earns his daily crust, the anxious, fragmented man of our techno-civilisation who masters fragments of science in his imposed role as user: a user of machines, a user of computers, a user of prefabricated ideas, a user accustomed – or sometimes forced – to use useless things, produced en masse by our technological culture of abundance, just for the sake of using them.

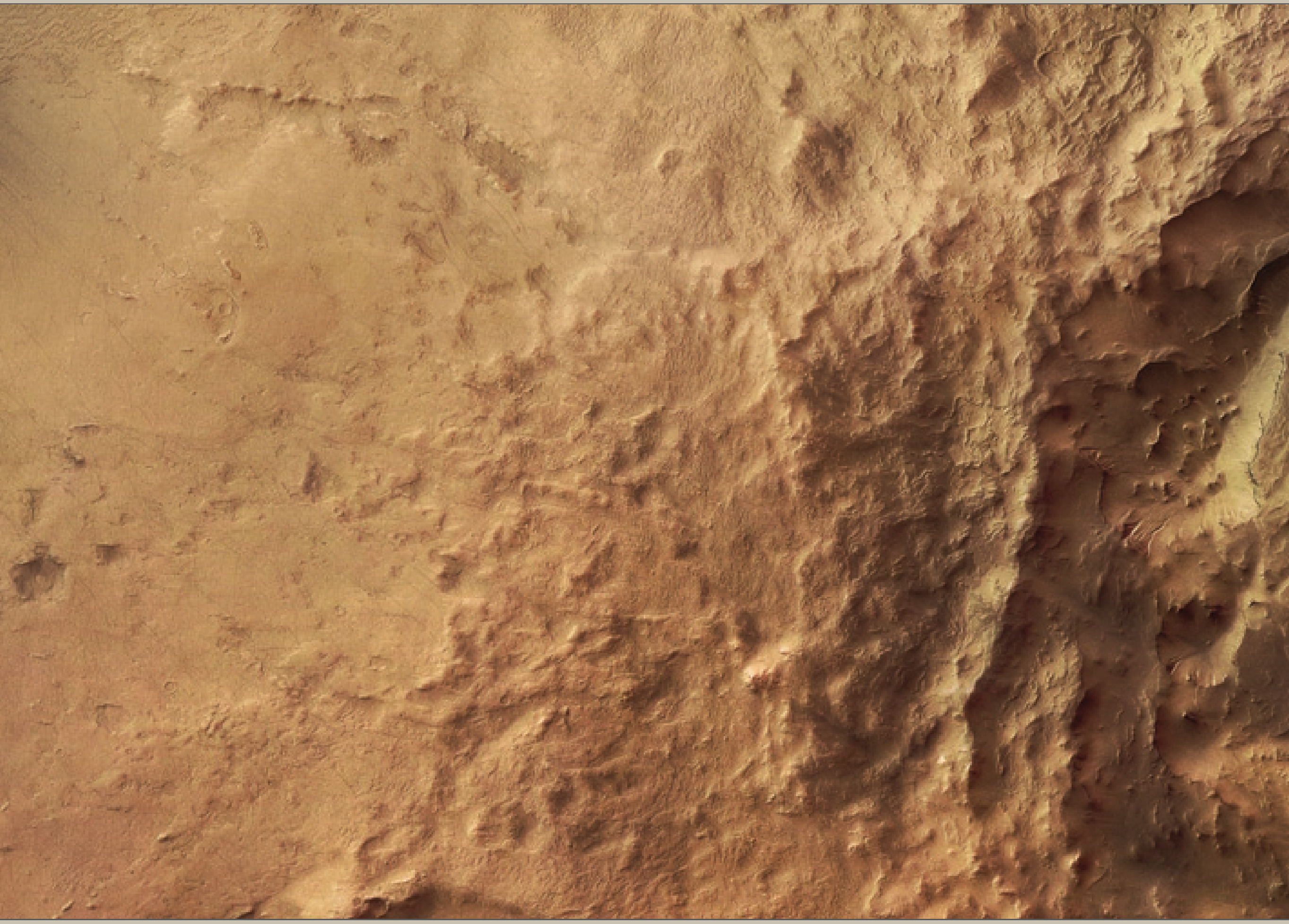
These days, the only thing man finds he cannot use freely is his mental power to conceive and appreciate the broader large scale structure, and the deeper evolving pattern of the cosmos we are immersed in. To do this means to become human again, as defined by the Greek word *anthropos*, as a man who is prone to look up towards the heavens, to escape from the constraints of the never-ending, strict, narrow, miserable and repetitive orbit of his everyday life, forcibly oriented towards the society of the spectacle, which offers him refuge in a cosmos of virtual reality.

Nevertheless, as the history of science has proved again and again, the real reality is more fantastic than any virtual approach towards our existential search on Earth. I always keep in mind the Copernican paradigm or, being a Greek, I would rather say the Copernican re-invention of the blasphemous Aristarchean concept of placing the Sun at the centre of our parochial planetary universe. Copernicus's catalytic work *De Revolutionibus Orbium Coelestium* has transcended the initial kinetic meaning of the word *revolutio*, implying the periodic motion of the planets around the Sun, and, because of the vast impact this sudden and unexpected dethronement of planet Earth has made on the mind of man, has provided us with the concept of revolution, both in science and society, serving as a paradigm for the new paths of enlightenment astronomy opened in the world by shattering the established views propped up by an old regime desperate to retain its stability.

In a sense communicating astronomy with the public means revolutionising the public, fracturing its lethargic view on the things, actions and machinations that permeate and drive our society, and offering instead the opportunity to construct a more humane framework of communication based on a broader understanding of our deeper ignorance of the mysterious Unknown we pretend we understand just by naming it the Universe. Astronomy means a critical approach to reality, in view of our ever-expanding accelerating knowledge, naturally circumscribed by our ever-expanding and equally accelerating ignorance. Communicating astronomy with the public also means communicating the principle of tolerance rooted in our small presence in the vastness of the Universe, a principle of tolerance badly needed for our everyday behaviour towards our fellow travellers in our short trip of life on planet Earth.

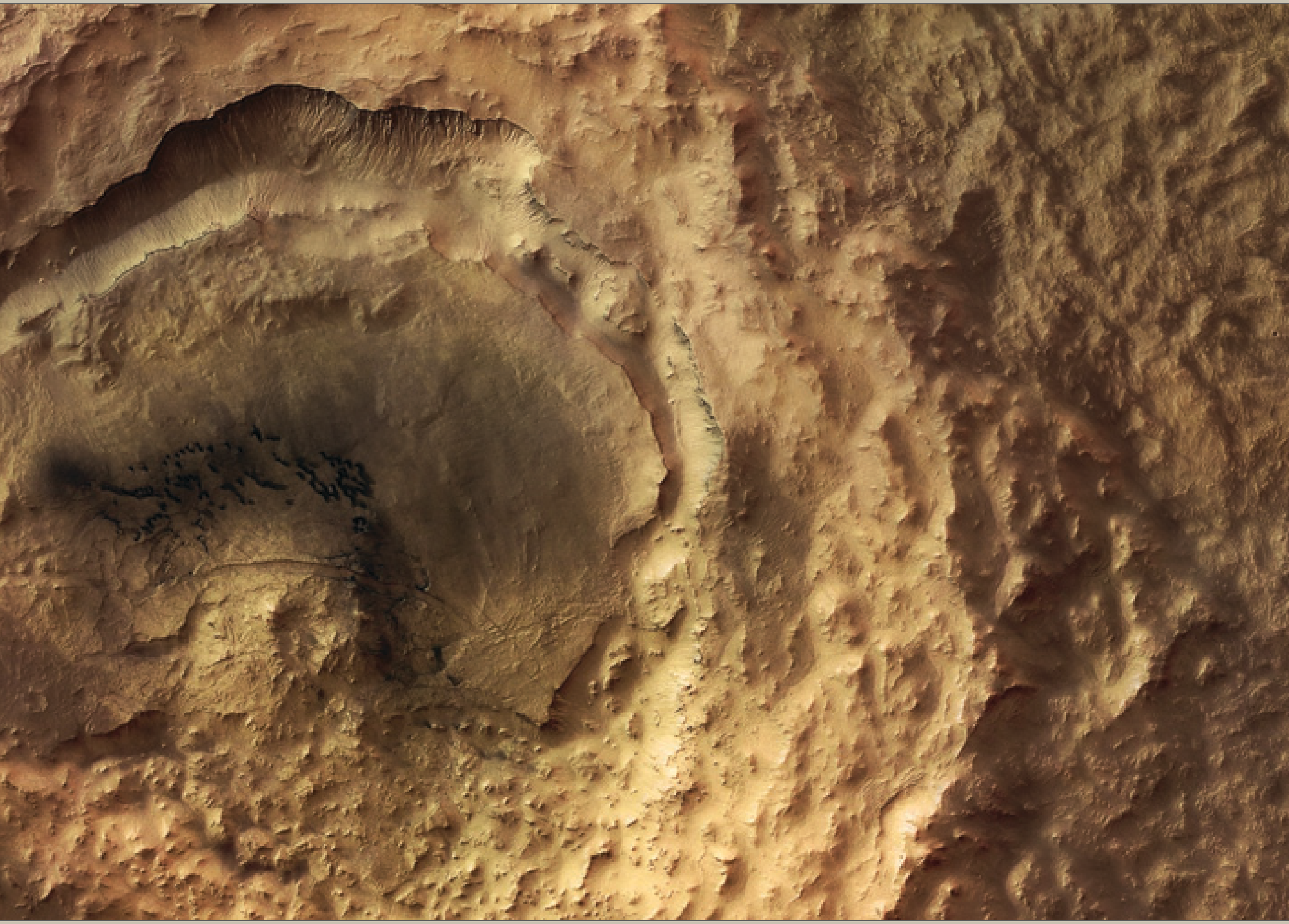
In a sense devising better ways of communicating astronomy means to contribute to a better world. And this is a gallant and noble effort that you have to be congratulated upon. Welcome to Athens, the evergreen city of spiritual light, and may the spirit of the place make you ease the way of communication between the world above and the world below, by taking into account our old Heraclitean view that the way between them is one, singular and identical for both levels of existence, the cosmic and the human, the macrocosmos and the microcosmos.

Thank you for coming and enjoy your stay in Athens.



Credit: ESA/DLR/FU Berlin (G. Neukum)

Session 2
IYA2009 General



The Maunder crater, named after the British astronomer Edward W. Maunder, is located halfway between Argyre Planitia and Hellas Planitia on the southern highlands of Mars. With a diameter of 90 kilometres and a depth of barely 900 metres, the crater is not one of the largest impact craters on Mars at present, but it used to be much deeper. It has since been filled partially with large amounts of material. The High Resolution Stereo Camera (HRSC) on ESA's Mars Express orbiter took the picture.

G-HOU in the IYA2009

Rosa Doran[1], **Roger Ferlet**[2] **& Carl Pennypacker**[3]
[1] NUCLIO — Núclio Interactivo de Astronomia / Global Hands-on Universe (rosa.doran@nuclio.pt)
[2] Institut d'Astrophysique de Paris, CNRS/UPMC (ferlet@iap.fr)
[3] University of California at Berkeley, Lawrence Hall of Sciences (crpennypacker@lbl.gov)

Abstract

The Global Hands-On Universe[1] started a few years ago with the main purpose of renewing the teaching and learning of science. It gathers teachers, educators, scientists and students in more than 20 countries around the world. Its most successful international effort is EU-HOU, the European Hands-On Universe, which was partly funded by the European Commission in a collaboration of eight European nations. More than 1500 teachers worldwide have already been trained in preliminary programmes. We plan to expand our network to at least 100 nations in seven years. Students regularly undertake science studies after being exposed to our multidisciplinary resources, heavily based on real astronomical data and new technologies. For the IYA2009, we want to begin a global programme fostering the interaction of schools around the globe. Our programme is called "Today I am Galileo — Tomorrow I am Darwin" and involves several activities: historical research, reproduction of Galileo's observations and extrasolar planetary studies. Our main objective is to promote a deeper, evidence-based understanding of our place in the cosmos.

Introduction

The Global Hands-On Universe (Global HOU) is an international, non-profit association, devoted to Astronomy Education. Its main goal is to reawaken students' interest for science while building a global community of educators, teachers, scientists and students.

Astronomy is the best tool to promote science culture. Students enrolled in our projects do not only discover the wonders of the Universe through hands-on activities, but also develop many important skills. Skills that will be important in any area of expertise they might follow: critical thinking, global citizenship awareness, multicultural interchange, creativity and leadership, etc. While engaging in Global HOU activities students are exposed to a broad scientific structure and build a sense of belonging to a planetary community.

[1] www.globalhou.net

Alexis Janvier

Figure 1 – Global HOU – Global Hands-on Universe is a worldwide effort of more than 20 countries and intends to be a formal association of 100 nations in 7 years.

Armella Leung / Alexis Janvier

Figure 2 – The European network started with 8 countries. Several tools and resources were made available at the www.euhou.net website.

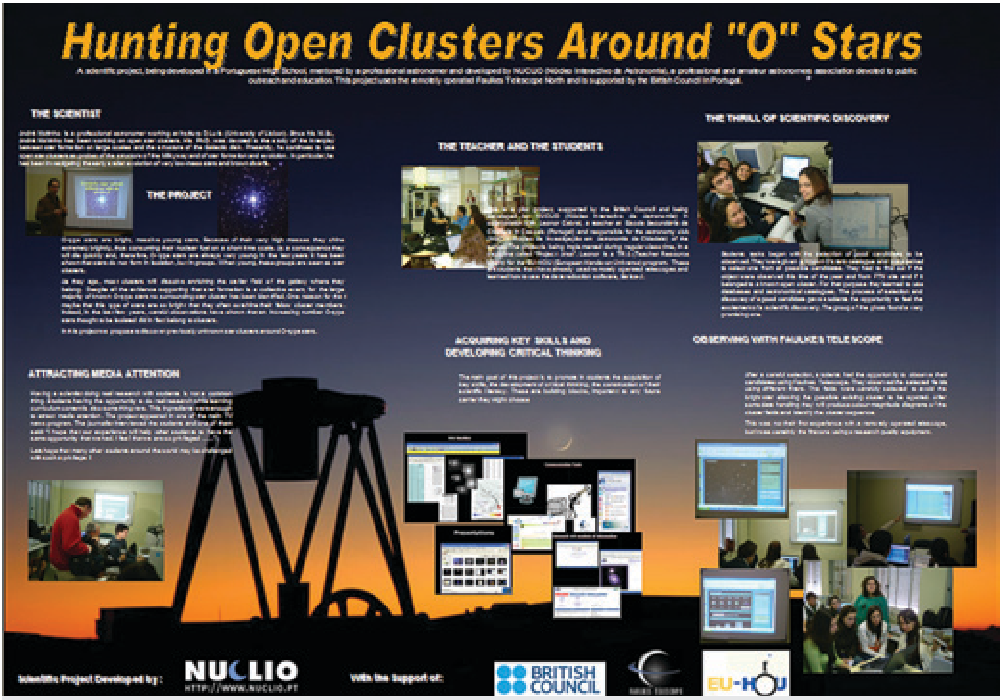
European Hands-On Universe

The Global Hands-On Universe found its first roots at the University of California at Berkeley and now is being implemented in more than 20 countries. The first subsystem of the Hands-On Universe was created in Europe in a collaboration of eight countries in a project partially funded by the European Commission. Through this project, several resources, using astronomy as a basis to teach science content, were created. Hundreds of teachers have already been trained in using the multiple tools developed within the scope of this programme. The training of teachers and the creation of a network of schools, nationally and internationally are at the heart of what we do.

Among the tools that have been created there is some powerful, image processing software: "SALSA J", open source software based on "Image J", which is becoming increasingly user-friendly. Other tools that are accessible to teachers enrolling in HOU activities are webcams and optical and radio robotically operated telescopes. This allows students to have a taste of scientific research during regular class hours, while learning regular curriculum content.

Science@Schools

One extra step is to engage students in actual research; with the support of scientists we promote a project we call Science@Schools, where real research is promoted in the classroom. Scientists from different areas of expertise are being invited to adopt one or more schools (at a national or international level) and help engender real scientific research with the students. This initiative is in its early stages, but has already given fruitful results and helps spread key skills acquisition. By engaging students in real scientific quests it also helps to improve their proficiency in handling information and communication tools.



EU-HOU

Figure 3 – The world of new technologies opened the possibility of a new approach in science teaching. With the help of scientists students can have a taste of real research in the classroom.

Today I am Galileo…Tomorrow I am Darwin

For IYA2009, when we celebrate 400 years of Galilei's observations and 150 years since the publication of Darwin's revolutionary book on evolution, Global HOU is developing a programme that will tackle the important role and impact that these two historical moments had on our lives. The programme is called: "Today I am Galileo…Tomorrow I am Darwin" (TGTD).

The idea is to build a collaboration between schools at a global level, creating a network of at least 50 schools per country, each working with schools in three different countries. We are expecting to have at least 20 countries involved. The main objectives of this programme are in line with IYA2009 guidelines as it will create: collaboration between schools in different countries; support scientific awareness; use of observing tools in real research activities; give participants an idea of how modern science is done, while favouring the use of ICT; reawaken the students' interest in science, but, most important of all, promote a sense of planetary citizenship and help all participants achieve a sense of how fragile life is on this planet.

These activities were designed to tackle issues such as: the stories behind science and scientists; how science is done; the importance of language and arts in science. The main goal being: to increase scientific knowledge and creativity, instigate a multicultural dialogue, give participants a sense of a planetary neighbourhood, and promote discussions on our role in planetary climate change.

Several different challenges will be proposed. Schools can engage in all of them or choose only part of it. The project was also built to be a multidisciplinary quest. Teachers of all disciplines are invited to enrol. Students can engage in different activities and assume the role of scientists, journalists or artists. The tasks for the three roles are given bellow.

Scientists

- Reproduce Galileo's observations and understand their implications for our current model of the Universe.
- Build a world map with satellite images of each participant partner school.
- Build a world map of moon images, at the same moon phase, taken around the globe.
- Build a world map with pictures of a shadow produced by a stick at noon at the equinox.
- Measure solar activity and average temperature in school.
- Monitor extrasolar planets by exploring:
    - extrasolar planet climatology;
    - habitable zones in the Universe;
    - constellations from the skies of an extrasolar planet;
    - Alien Galileo — how to find that the extrasolar planet is not at the centre of the Universe;
    - Alien Darwin — does the extrasolar planet have the necessary conditions to host life?

All science disciplines are invited to participate in this task. Amateur astronomers will be invited to assist with the observations where needed.

Journalists

Handle national and international enquiries on:

- How and when Galileo appeared.
- How and when Darwin appeared.
- How Galileo and Darwin are being celebrated in each country.
- How cosmology evolved in each culture.
- How ideas on life on Earth/in the Solar System/Universe evolved in each nation.
- The future of space exploration and the participation in each country.
- What people in your culture think about life in the Universe.
- What people in your nation think about the future of space exploration.
- What people know about our current model of the Universe:
    - Is the Earth or the Sun at the centre of the Universe?

For this task we suggest the participation of the following disciplines: history, geography, science and languages.

Artists

- Build colour images using image processing software and real astronomical images either acquired by themselves or from a database.
- Drawings of the scientists' observations.
- Alien Van Goghs — how would a starry night look like from an extrasolar planet?

ICT and arts teachers could adopt this task.

To ensure the quality and success of these tasks it is important to have as many members of the community as possible participating. Different areas of expertise are needed to guarantee the desired scope of TGTD: arts, languages, history, geography, physics, chemistry, biology, geology, mathematics, ICT, engineering, journalism etc.

Anyone interested in participating or to giving his or her opinion is welcome.

Credit: Dennis Crabtree

A comet's tale: How much of the world came to miss the most spectacular sky spectacle in decades

Daniel Fischer
Fachgruppe Kometen der Vereinigung der Sternfreunde
(Comet Section of the Association of Amateur Astronomers of Germany) (dfischer@astro.uni-bonn.de)

Abstract

In January 2007 comet C/2006 P1, named McNaught, became brighter than Venus, was visible in the daytime sky and developed the most dramatic dust tail in recent memory. For those with clear skies during the crucial days and in the right geographical latitudes it was a sight to remember, a subject of everyday conversation, gaining local presence in the general media as well. But the world's media at large practically ignored what was literally the greatest astronomical story in decades, except in regional markets. This paper traces the surprising failure of the early 21st century media machinery to several interrelated factors and concludes that there was simply "no one in charge" at the crucial moments. Finally, the case of comet 17P/Holmes – which increased its brightness a million times two weeks after CAP2007 – is treated as a complementary case study in progress.

An inconvenient orbit

Soon after McNaught's discovery on 7 August 2006, when enough astrometry was available to determine a reliable orbit, McNaught (2006) and other comet specialists (mainly in the amateur community) realised that C/2006 P1 could become very bright in the following January. However, since comets can display all kinds of behaviour when approaching the Sun and as this one had never been observed before, no one was willing to "go public". The absolute magnitude and thus size of the nucleus of McNaught was not large, and so it was even considered possible that it would disintegrate and simply disappear as it heated up. Despite half a dozen space missions to comets and ground-based observing records of hundreds of comet apparitions there is simply no way to predict a comet's behaviour based on its physical state at a particular time. The only hope lies in observations covering months and extrapolations of the brightness development.

The author first learned of the possibility of a great show at a conference of German comet observers in early November 2006 and decided to alert the German amateur community at least – not with any bold claims about great brilliance, but at least the geometrical circumstances for the world in the crucial weeks two months hence, Fischer (2006a). Other than that article, and a note in an English-language news service, Fischer (2006b), the impending approach of comet McNaught was, to my knowledge, totally ignored by the well-known astronomical media, let alone the general press, and this remained the case until the end of 2006. For an obvious reason: the comet was so close to the Sun that its behaviour simply could not be monitored reliably. Only when it was recovered at about the "right" brightness in late December, did enthusiasm among amateur astronomers specialising in comets begin to climb, as reported by Fischer (2007), although hardly anyone else knew about what might unfold in the coming weeks.

Waking up

By 4 January 2007 McNaught had reached magnitude +2 and only then did two major international news services for space enthusiasts run reports by Sinnott (2007) and Rao (2007). At this time the comet was best seen from high northern latitudes, such as Alaska and Scandinavia. This explains why the first news stories in the general media seem to have originated there; in the US the comet was even treated at first as an "Alaskan" phenomenon, as reported by Loomis (2007). For temperate northern latitudes it was very low on the horizon but already visible to the naked eye by the second week of January. This is rare enough that it should have warranted press coverage, especially since perihelion was still a week away and the comet was obviously not fizzling out, but, to the author's surprise, little happened (see the articles linked in the sidebar of Fischer (2006b)). The German public, for example, learned about the comet's existence largely from brief clips in TV weather reports that had been instigated by individual amateur astronomers contacting the weather desk (Horn 2007). The author knows of no press release issued before McNaught's perihelion or a major wire story describing its stunning development in the first two weeks of January when its brightness increased daily, beating even Venus in the end – there were even independent "discoveries" reported by lay people.

Around perihelion on 13 January McNaught was so bright that it could be spotted – in very clear skies at least – just 5° away from the Sun with little or no optical aid. This rare phenomenon, unseen since the apparition of the even brighter C/1965 S1 (Ikeya-Seki) in 1965, again did not make it into the general news, but this may actually have been a good thing. It would have been difficult to describe to the general public in the necessary detail how to try to make observations safely so close to the Sun, especially with binoculars. Then the comet swung south, and in Australia, at least, it was already expected. Encouraged by McNaught's great brilliance at perihelion and its obvious survival, papers such as the Sydney Morning Herald informed their readers about the visibility in the coming week. It helped, of course, that the McNaught himself was working in Australia, and, in the end, Bryant (2007) described it as: "*the best publicised comet since Halley*". While parts of Australia had to struggle with clouds, "*once the comet was bright and hanging over the Indian Ocean in a warm clear and still daylight sky, […] it became headline news in all West Australian papers and television newscasts and stayed there for a week or so. The beaches were crowded with onlookers every night*", recalls Gifford (2007). "*It was mentioned in just about every evening news service I heard around the time*", agrees a report by Jones (2007) from Adelaide. "*The coverage of great comet McNaught in the media in Australia was absolutely phenomenal and unprecedented.*"

The view from Down Under

Several Australian amateur astronomers have reported, that the real means of transporting the news about the great comet show were not the traditional media but internet forums[1] – which

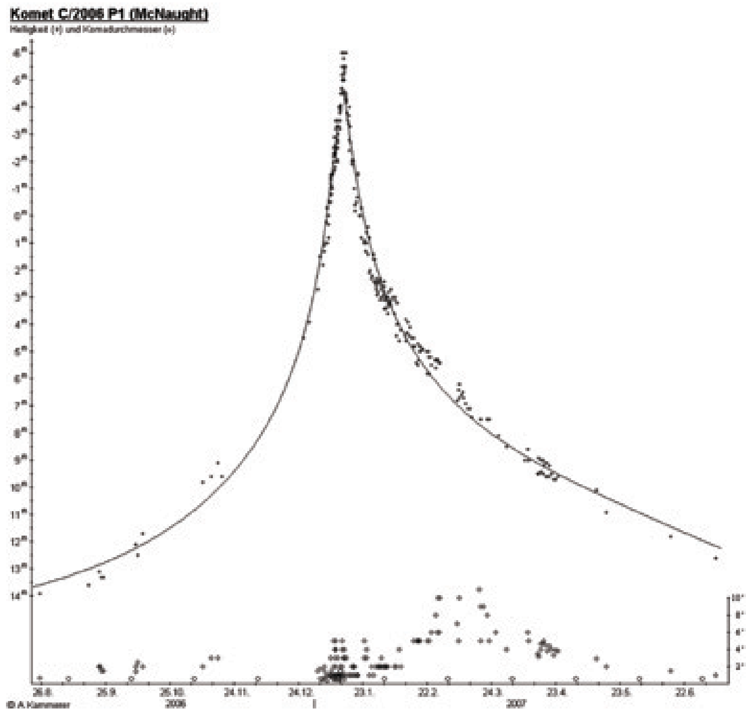
[1] such as www.iceinspace.com.au

became extremely popular – and by word of mouth! According to a report from Canberra by Herald (2007) (contrasting with the above-mentioned assessment of the Australian press), "*while the comet was not being mentioned much in the papers and the like, the public knew. For several nights, all the vantage points around Canberra were crowded (and I do mean crowded) with members of the public – many with cameras trying to take pictures. Also I have a daughter who lives in an outback town of 100 people, 100 km from the nearest town – and she tells me they were all looking at the comet.*" Even in Western Australia Gifford (2007) reported that "*much of the information came by word of mouth rather than from the media. Events happened so quickly that the media were always behind with their information*" – an interesting assessment of a billion-dollar business. Indeed: "*The difference from 20 years ago is probably the internet, so that knowledge of the event was not dependent upon the old media of print/radio/TV*", (Herald 2007) – but the "old" media are still useful to trigger interest in a rare phenomenon in the first place! Electronic social networks also "*played a big part in being conduits of information and generating interest and excitement*" about McNaught (Jones 2007).

In New Zealand, Austin (2007) reported that the situation was similar, with "*sufficient publicity for hordes of the public to take a good look. I've never seen such large crowds in NZ for any astronomical event before. […] The news media cooperated by giving it what they could, but like any of the news anywhere in the world, they are dependent on astronomers giving them the correct facts.*" In the absence of press releases from prestigious astronomical institutions – which to my knowledge did not appear before 19 January (ESO PAO (2007a), Gemini PAO (2007)) – initiatives by individual astronomers were the key by which news about McNaught percolated into local media around the world (Machholz 2007), though often only with difficulty, as editors were hard to convince to run the stories. And to tell the world about the comet, you first had to know about it yourself. Many, even in the popular astronomy world in the northern hemisphere, did not learn about the comet in time! "*So it wasn't just the public who were unaware, there were those within the local astronomical community who were unaware the comet was visible*", a report from the UK says – where, on the other hand, the comet was impressive enough pre-perihelion to awe the average pedestrian running into an astronomer by chance, as related by Overfield (2007).

Conclusions – and the next event

The final disappointment came in late January when comet McNaught had put on an outstanding performance for the southern hemisphere, documented in countless photographs – readily available on many websites, if one were just told to look. Yet I am unaware of any major news story in the northern hemisphere that would point this out to the public at large or of magazines running those pictures in all their glory. And the only press release after the "main show" (ESO PAO 2007b) only stressed an astrophysical detail, not the McNaught phenomenon as such. Not only was there "no one" with enough clout to announce to the world what might be coming – this reluctance can be forgiven, though the comet community should really try to improve comet forecasting techniques – but it is a missed opportunity for astronomy outreach that the world was not exposed to the sky show over Australia, South Africa and South America big time. Even when unable to view the comet's spectacle with their own eyes, modern means of image transportation



www.aerith.net/comet/catalog/2006P1/2006P1.html

Figure 1 – The brightness development of the comet.

Terry Cuttle

Figure 2 – The comet at its best, on 21 January 2007 as seen from the Glasshouse Mountains, Queensland, Australia.

could have turned the comet into a celebration for the whole "global village". McNaught was big news as such, yet it was not carried with a vigour even close to its worth.

Less than two weeks after CAP2007, comet 17P/Holmes suddenly increased its brightness by 15 magnitudes, or a factor of one million, making it easily visible to the naked eye in Perseus (though looking like a fuzzy star, without any tail) for weeks. This time the media machinery worked somewhat better than in the case of McNaught, again "lubricated" by individual astronomers (including the author who triggered a press release by the German Amateur Astronomical Society that led to widespread coverage in Germany) or the Center for Astrophysics in Cambridge, Mass., with a rather unusual press release featuring amateur photographs by staff members (CfA PAO 2007). Being an "explosive" event surely helps, as, for example, the supernova 1987A, another strictly southern sky event, had generated ample news coverage in the northern hemisphere. But the astronomical communications community at large should find better ways to transport slowly – and unpredictably – developing astronomy stories as well, so that epochal events like comet McNaught don't just drown in a flood of lesser news.

Acknowledgements

The author thanks all those who responded to a call for contributions on the Comets Mailing list which helped make this paper a somewhat more global effort.

References

- Austin R. (2007), Re: Comet McNaught and the public – input for conference talk sought, posted on the Comets Mailing List on 21 September 2007, tech.groups.yahoo.com/group/comets-ml/message/12714
- Bryant G. (2007), Coverage of McNaught, personal message on 21 September 2007
- CfA PAO (2007), Old Comet Still Kicks Up Its Heels!, CfA Press Release #27 of 26 October 2007, www.cfa.harvard.edu/press/2007/pr200727.html
- ESO PAO (2007a), The Great Cometary Show, ESO Press Release #5 of 19 January 2007, http://www.eso.org/public/outreach/press-rel/pr-2007/pr-05-07.html
- ESO PAO (2007b), The Celestial Whirligig, ESO Press Release #7 of 23 February 2007, www.eso.org/public/outreach/press-rel/pr-2007/pr-07-07.html
- Fischer D. (2006a), Kurzer Ausbruch von SWAN – und ein heller Komet in der Abenddämmerung im Januar?, interstellarum Astronomie-Newsletter #27 of 9 November 2006, http://www.oculum.de/newsletter/astro/000/20/7/27.uv5.htm#1
- Fischer D. (2006b), The Cosmic Mirror, Update #302, www.astro.uni-bonn.de/~dfischer/mirror/302.html
- Fischer D. (2007), Komet McNaught immer noch knapp »im Trend«, interstellarum Astronomie-Newsletter #29 of 1 January 2007, http://www.oculum.de/newsletter/astro/000/20/9/29.6gh.htm#1
- Gemini PAO (2007), Comet McNaught Captured from Cerro Pachon, Gemini Observatory Press Release of 19 January 2007, www.gemini.edu/index.php?option=content&task=view&id=223
- Herald D. (2007), Re: Comet McNaught and the public – input for conference talk sought, posted on the Comets Mailing List on 21 September 2007, tech.groups.yahoo.com/group/comets-ml/message/12712
- Horn K. (2007), Hinweis im Heute-Wetter, personal message on 21 September 2007
- Jones K. (2007), Re: McNaught as a case study for comet communication, posted on the Comets Mailing List on 20 October 2007, tech.groups.yahoo.com/group/comets-ml/message/12822
- Loomis B. (2007), Bright comet passes over Alaska, Anchorage Daily News of 10 January 2007, www.adn.com/front/story/8550960p-8444806c.html
- Machholz D. (2007), Comet McNaught, personal message on 20 September 2007
- McNaught R. (2006), C/2006 P1 photometric behaviour, Posting on the Comets Mailing List on 26 October 2006, tech.groups.yahoo.com/group/comets-ml/message/10827
- Overfield R. (2007), Comet McNaught and the public, personal message on 21 September 2007
- Rao J. (2007), New Comet is Brightest in 30 Years, www.space.com/spacewatch/070104_comet_mcnaught.html
- Sinnott R.W. (2007), January's Surprise Comet, www.skyandtelescope.com/observing/home/5089276.html

Credit: Sze-leung Cheung

Progress toward a low-cost “Galileoscope” for the IYA2009

Richard Tresch Fienberg[1] **& Stephen M. Pompea**[2]
[1] Sky & Telescope (rfienberg@SkyandTelescope.com)
[2] National Optical Astronomy Observatory (spompea@noao.edu)

Abstract

One of the IAU’s Global Cornerstone Projects for the International Year of Astronomy 2009 is to develop, produce, and distribute huge numbers of very inexpensive, yet good-quality, small telescopes. This will enable millions of people around the world, especially children and others who can’t afford a commercial telescope, to experience for themselves the thrill of scientific discovery that Galileo experienced when he turned his telescope skyward 400 years ago. We report progress toward realising the “Galileoscope” based on efforts by an IAU Task Group and an affiliated AAS working group as well as on discussions at the CAP2007 meeting in Athens.

The Galileoscope: An IAU IYA2009 Global Cornerstone Project

The IAU public brochure for IYA2009 asks: “*Who doesn’t remember the first time they looked at the Moon through a telescope and were amazed by the details of the mountains and craters? The same is true for Jupiter’s cloud belts and its fascinating Galilean moons, Saturn’s rings, and a sparkling star cluster.*” This question has a simple and obvious answer: “Anyone who has never had the opportunity to look through a telescope!” Especially for those who can’t afford to buy even a department-store telescope, a do-it-yourself Galileoscope could be the key to pursuing an interest in astronomy beyond IYA2009.

Accordingly, the IAU has made the development of an unprecedented inexpensive yet good-quality telescope one of its Global Cornerstone Projects for IYA2009. As the IYA2009 brochure goes on to say: “*Observing through a telescope for the first time is a unique experience that shapes our view of the sky and Universe.*” The IYA2009 programme wants to share this observational and personal experience with as many people as possible across the world and is collaborating with the US IYA2009 National Node to develop a simple, accessible, easy-to-assemble, and easy-to-use telescope that can be distributed by the millions. Ideally, every participant in an IYA2009 event should be able to take home one of these little telescopes. This simple telescope enables people to build and observe with a telescope that is similar to Galileo’s. Sharing these observations and making people think about their importance is one of the main goals of IYA2009: “*Promote widespread access to new knowledge and observing experiences.*”

Parallel, coordinated efforts

At its March 2007 meeting in Garching, Germany, the IAU Executive Committee for IYA2009 appointed a Telescope Kit Task Group chaired by Rick Fienberg (S&T). Soon thereafter, the American Astronomical Society's IYA2009 Program Committee appointed a Telescope Kits & Optics Challenges Working Group chaired by Steve Pompea (NOAO), who is also a member of the IAU Task Group. Fienberg and Pompea have been coordinating their efforts ever since. While both groups are considering the Galileoscope's potential for improving public outreach as well as informal and formal science education, Fienberg's group is tilting toward outreach and Pompea's toward education.

Pompea's programme is an outgrowth of previous work on the development of educational telescope kits to increase science literacy (Pompea and Hawkins, 2004). It builds on experiences in the NSF-funded, informally oriented Hands-On Optics (HOO) project (Walker et al., 2007), a collaboration between SPIE — the International Society for Optical Engineering, the Optical Society of America, and NOAO. Module 3 of the HOO project is devoted to image formation using lenses and mirrors. As a culminating activity, participants build a small refracting telescope using the Learning Technologies Inc. (LTI) telescope kit originally developed for Project STAR at the Harvard-Smithsonian Center for Astrophysics. LTI builds and distributes the HOO kits, which were designed at NOAO.

NOAO has also developed an abbreviated telescope-education kit for the NSF-funded project Astronomy from the Ground Up, in collaboration with the Astronomical Society of the Pacific and the Association of Science-Technology Centers. This "Terrific Telescopes" mini-kit has been used in a number of workshops for science centre educators with considerable success.

Galileoscope project goals

The IAU and AAS groups share the following project goals:

- Design low-cost telescope kits that aid understanding of optical systems. (Note: Pre-assembled scopes may be OK for public outreach, but they are not suitable for education.)
- Find means of manufacturing and distributing these kits.
- Provide basic enquiry-based educational material on image formation and telescopes for more extended education programmes.
- Optimise kits for tradeoffs between magnification, field of view, optical quality, and ease of assembly and use.
- Don't reinvent the wheel; build on and/or adapt from existing telescope kits.
- Use Hands-On Optics Module 3 and Astronomy from the Ground Up's "Terrific Telescopes" module.
- Rely on existing networks for distribution (e.g., clubs, planetariums, science centres, teaching networks).
- Seek partners/underwriters to help minimise costs for design, manufacturing, and distribution.

As a first step, we canvassed the marketplace for existing low-cost telescope kits and pre-assembled telescopes, many of which are marketed primarily as toys. We found about a dozen different models from various suppliers and obtained samples of each for evaluation.

We need to develop something new

Current telescope kits are easy and fun to assemble, and there are some very inexpensive toy telescopes available. Despite this, and despite 20 years of success with the LTI telescope kit, which has great educational value, we nevertheless conclude that for the Galileoscope project we need to develop something new. Existing models exhibit a range of problems:

- If they produce correct images, they’re of insufficient magnification for astronomical use (for example, 3x).
- If they offer enough magnification for astronomical use, the images are upside down, which makes aiming them difficult for novice users.
- They provide very narrow fields (< 1½°).
- They come without mounts to stabilise the view.
- Chromatic and other aberrations limit useful magnification.

From an educational perspective, the LTI kit remains the best of the bunch because of the way it enables students to experiment with image formation and telescope construction. But incorrect assembly by students can lead to degraded optical performance due to misplacement or tilting of the eyepiece lens, which is held in place by a soft foam insert. In general though, we want to build on the many positive aspects of these Project STAR telescopes while improving their optical performance as much as possible.

One size doesn’t fit all

For IYA2009 we envision that two telescope kits may be necessary! One kit, the Galileoscope described by the IAU, would be optimised for looking at the Moon and the Galilean satellites of Jupiter — it might not show much else to advantage. The requirement for lowest possible cost will likely drive the Galileoscope’s design.

Here are the draft specifications for the Galileoscope:

- Suitable for observing the Moon and Jupiter and its moons.
- Must be easy to build without supervision (since it may be distributed outside a formal or informal educational setting).
- Magnification can be moderate, e.g. 15x to 25x.
- Image quality can be modest; chromatism OK.
- Image should be right-side up.
- Field of view should be at least 2°.
- Stable mount is desirable; having a scheme for attaching the scope to something (e.g. a camera tripod) is essential.

A second kit, termed the Saturnscope, would be designed to reveal Saturn's rings; this would require higher magnification than that provided by the Galileoscope and would surely be more expensive too. If produced in bulk, though, we believe that both telescopes can be reasonably priced and give excellent value for money.

Here are the draft specifications for the Saturnscope:

- Suitable for observing the rings of Saturn. (Note, however, that during IYA2009 itself, Saturn's rings will be seen edge-on from Earth.)
- Needs magnification > 30x, ideally 50x to resolve the planet's disc and rings (20″ to 30″).
- Image quality must be very good; minimal false colour.
- Right-side up image is useful but not essential.
- Field may be narrow (but you need to be able to get Saturn into the eyepiece).
- A stable mount is absolutely essential.

New approaches and key collaborators

We are investigating a number of new approaches for these kits, including the use of aspheric surfaces, glass and plastic injection-moulded objectives, novel mounts, and simple methods of stray-light control (Pompea, 1995). We are also analysing a number of potential eyepiece designs. Our optical analysis partners include the Tucson companies Raytheon, Breault Research, and Photon Engineering, as well as Ceravolo Optics in Ottawa.

Key members of the AAS working group include a retired optical engineer from Lockheed Martin and a person with experience in telescope systems and manufacturability. We're also consulting with Dick Buchroeder, a legend among amateur astronomers for his optics expertise. Meade Instruments, the world's largest manufacturer of telescopes for backyard astronomers, has expressed serious interest in participating in the Galileoscope project; they offer deep capabilities in design, manufacturing, and distribution.

Additional progress made at CAP2007 in Athens

At the CAP2007 meeting in Athens, additional progress was made thanks to a presentation by Kaz Sekiguchi of the National Astronomical Observatory of Japan. He described two telescope kits used in classrooms and informal educational settings in Japan, and exhibited samples. Both use cemented doublet achromatic objectives and compound plastic eyepieces. These address one of the chief concerns raised at the CAP2007 meeting, namely, that we not distribute poor-quality optics that are more likely to turn kids off astronomy than to turn them on to it. The optical quality of the Japanese kits is as good as — or better than — that of many small commercial scopes.

The Spica kit employs nested cardboard tubes and is fairly complicated to assemble, requiring a little glue and a lot of patience. It provides a magnification of 35x with a standard eyepiece but can be supplied with 21x and/or 50x eyepieces too. The kit includes a tripod-mounting block and a "peep sight" finder and has a retail price of about $20, though it can be bought at somewhat lower cost in bulk quantities. When looking at the assembled Spica telescope and considering its performance, it's hard not to think of it as satisfying the requirements of our Saturnscope.

The Starbook kit uses similar lenses but a much simpler tube design involving plastic parts that simply snap together. The assembled scope provides 15x and a field of view of about 2½°. It also has a tripod socket; it's aimed using "gun sight" tabs on the top of the plastic tube. If this telescope could be produced at lower cost, it could potentially serve as the IYA2009 Galileoscope.

Both of the Japanese kit telescopes provide an upside-down image, but because of their pointing aids and/or wide fields, this may not be a significant drawback. In any case, we plan to evaluate both kits further, and with Kaz Sekiguchi's help (he's now a member of the IAU Task Group), we're in contact with the kits' manufacturers to explore whether either or both kits might serve our purposes for IYA2009. Already the manufacturer of the Spica kit has expressed interest in the project and optimism that in sufficient quantities, his optics and other parts can be produced at costs that would make possible widespread distribution of the telescopes. We're also discussing possible modifications to the design to improve its performance further as well as to simplify its assembly.

Conclusion

Great progress is being made in the design, optical analysis and testing of telescope kits. The next steps are to obtain a better understanding of the manufacturing and production issues, to work on reliable cost estimates, and to develop dissemination plans further. We are quite confident that this very important Cornerstone project of the IYA2009 will be successful — perhaps more successful than any of us dared to imagine!

Acknowledgements

The Hands-On Optics and the Astronomy from the Ground Up projects are funded by the National Science Foundation ISE programme. NOAO is operated by the Association of Universities for Research in Astronomy (AURA), Inc., under cooperative agreement with the National Science Foundation.

References

- Pompea S. M. (1995), The Management of Stray Radiation Issues in Space Optical Systems, Space Science Rev., 74, 181-193
- Pompea S. M., Hawkins I. (2004), Increasing Science Literacy in Optics and Photonics through Science Centers, Museums, and Web-based Exhibits, Pro. SPIE: Education and Training in Optics and Photonics, 4588
- Walker C. E., Sparks R., Pompea S. M. (2007), "Optics Education in the International Year of Astronomy", Education and Training in Optics and Photonics 2007, Ottawa, Canada, 3–5 June, 2007

Photo by Craig Michael Utter, courtesy Sky & Telescope.

Figure 1 – The starting point for development of the IYA2009 Galileoscope is the Project STAR telescope kit from Learning Technologies . With simple acrylic lenses and cardboard tubes, it provides a relatively poor-quality image at a magnification of 16x.

Photo by Richard Tresch Fienberg, courtesy Sky & Telescope.

Figure 2 – Two inexpensive telescope kits from Japan offer very good performance thanks to their glass achromatic objectives and compound eyepieces. Either or both of these kits may prove adaptable to the Galileoscope project.

IYA2009 newspaper insert in your community

Janice Harvey
Gemini Observatory (jharvey@gemini.edu)

Abstract

The Gemini PIO (Public Information Officer) offers suggestions on how to approach your local newspaper about a newspaper insert for your community being published during IYA2009. Local government support, articles by astronomers, advertisers, and appointing someone within your organisation to manage the content will be discussed. We will explain the timeline required, the number of personnel hours required, developmental stages and income a local newspaper would have to generate to produce a quality, table-top supplement.

In 2003, over 30,000 copies of *Stars over Mauna Kea*, a special supplement in tabloid format were produced and distributed in the local newspapers in Hilo, Hawaii. The publication, 48 pages in total, featured profiles of the observatories on Mauna Kea, stories about the geology and legends of Mauna Kea, and historical information about the evolution of astronomy in Hawaii. In addition the publication included a series of essays titled *In their own words*. These articles were written by key members of the astronomy community.

Sixty thousand copies of *Stars over Mauna Kea II* were printed as a follow-up to the first edition in 2005. This second edition included an article on the `Imiloa Astronomy Education Center, explanations about the types of telescopes on Mauna Kea and columns written by scientists about the fascinating and significant discoveries made on Hawaii. Personal stories about careers in astronomy were also highlighted.

In Chile, a similar eight-page supplement, featuring Gemini, CTIO and SOAR telescopes, was published in 2005 and 5000 copies were distributed throughout the country.

Background

Gemini Observatory approached their local newspaper about the distribution of a publication that covered up-to-date astronomy discoveries, outreach and education, profiles of employees, career opportunities, and the history of astronomy on Mauna Kea. It was decided that a PIO representative of Gemini would work alongside newspaper staff to produce a supplement that would be published in a Sunday edition.

Conclusion

Stars over Mauna Kea and *Stars over Mauna Kea II* were published in 2003 and 2005 with a combined distribution of over 90,000 copies. From summer 2008 the Gemini PIO department will work

once again with the Hawaii Tribune Herald to publish a more extensive insert for IYA2009 with a projected distribution of over 100,000 copies.

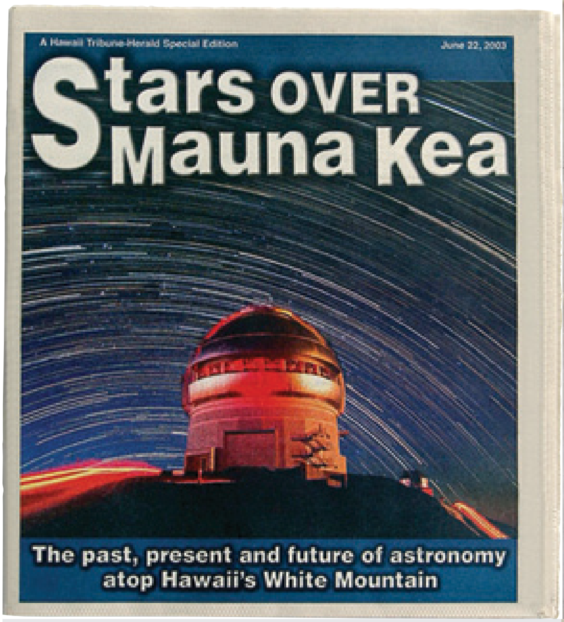


Figure 1 – Stars over Mauna Kea I

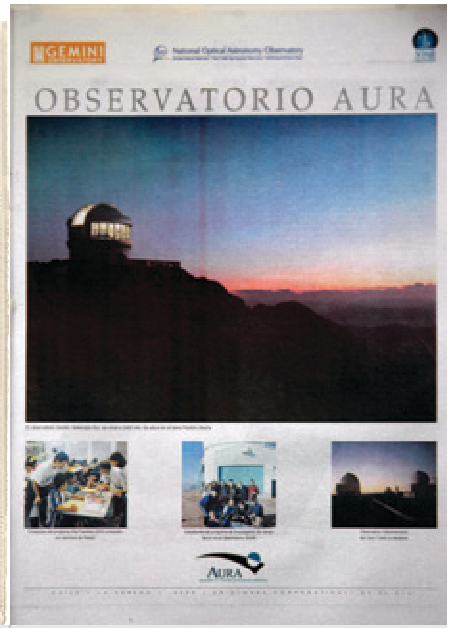


Figure 2 – Observatorio Aura

Gemini Observatory

Figure 3 – Stars over Mauna Kea I

The Universe from Earth: A Cornerstone for the IYA2009

Kimberly Kowal Arcand[1], Megan Watzke[1], Lars Lindberg Christensen[2] & Manolis Zoulias[3]
[1] Chandra X-ray Center/Smithsonian Astrophysical Observatory (kkowal@cfa.harvard.edu, mwatzke@cfa.harvard.edu)
[2] ESA/Hubble (lars@eso.org)
[3] Academy of Athens/Research Center for Astronomy (mzoulias@academyofathens.gr)

Abstract

Astronomical images are many things. They can be seen as objects of beauty, art, culture and, of course, science. We propose to help generate and facilitate exhibitions of astronomical images around the world in a variety of settings during IYA2009[1]. These multi-wavelength images would come from both professional and amateur astronomers using a variety of space and ground-based observatories.

One crucial goal of this effort would be to place these images in “non-traditional” locations. That is, we hope that in addition to having these images featured in “traditional” settings such as science centres and planetariums, other types of location such as public parks, metro stations, art centres, and others would be host to these images. In short, we hope to expose astronomy to the general public in an unexpected yet accessible manner.

Which images?

A call has been placed to those actively known to engage in producing astronomical images for the public. Details of the image submission can be found in the website given below[2]. Because some limits needed to be set, the decision was made to include only data images of astronomical objects. No artist’s illustrations, spacecraft or hardware graphics, or other related visuals will be used. Ultimately, we hope to select one hundred images that will serve as the core of the exhibit. Local organisers may choose to add to this core with images or other materials or displays that are relevant to the location host. Such flexibility and creativity is encouraged.

Venues?

As mentioned above, one main goal of this project will be to bring astronomy to audiences that might not otherwise come into contact with it. Or, in other words, we hope to “surprise” the public with these images in settings where they are not accustomed to finding science. If we can make these images (and the science behind them) available in such a way, we hope that we can engage individuals who might normally fear or dislike astronomy in particular or science in general.

---

[1] http://www.astronomy2009.org/content/view/302/91/
[2] http://www.communicatingastronomy.org/cap2007/image_exh.html

Scalability?

As we plan for the IYA2009, there remain many unknown factors. Issues such as funding, location availability, and other major planning elements are still to be determined. Therefore, we suggest that this concept has the greatest likelihood for success if we can create a flexible plan that can accommodate a wide range of support in a host of different settings. Below we outline the basic categories we have designed. These “levels”, however, should not be seen as absolutes. Rather, a particular exhibit may incorporate various elements based on that the particular location and the local interest and support.

Platinum exhibit

As the name suggests, this is the most ambitious and, of course, expensive of our ideas. We envision a semi-permanent outdoor exhibit in a prominent location such as the National Mall in Washington, DC, or the Champs Elysee in Paris. Such “under the sky” installations would require illumination at night and high-quality weather proofing treatments. The core exhibit of images could be enhanced with such features as interactive kiosks, large-scale sky maps, alternatives for visually-impaired and other challenged visitors.

Gold exhibit

As with the platinum level, the gold exhibit would consist of up to 100 astronomical images in large printed format, roughly 4ft x 3ft in size (120 cm x 90 cm), with appropriate captions. In order to keep costs to a minimum, these images could be directly mounted on pre-existing walls or less expensive stands with less sophisticated or no additional lighting. Simple packaging could be developed so that it would be relatively inexpensive to ship these images to multiple locations. Or, depending on printing costs in a particular location, the exhibit could be duplicated locally.

Silver exhibit

This is the “do it yourself” version of the image exhibit for science centres, planetariums, and other interested groups. The images would be available “off the shelf” or use pre-existing technologies such as light boxes, large-scale prints, or other formats already being used at any given location.

Supporting materials

There are many possibile ways to introduce visitors to the astronomy behind the images. Another important goal is to allow easy and obvious access to the science so it is possible for a visitor to learn something significant. The ideas include:

- A well-designed website that acts as a gateway to information on the objects, concepts and missions that constitute the aesthetics. Informative and educational, this website should be as engaging and entertaining as possible.
- Other elements tied to the website could include a sky-map, World Wide Telescope and Google Sky features, Flickr, interactive voting opportunities.

- Free “take away” brochures with information on images and website.
- Possible feature in the annual Sky & Telescope “Beautiful Universe” publication.
- On demand printing.
- Potential merchandising opportunities with entities or individuals who are prepared to license their images.
- Tie-ins to other IYA activities. Examples include hosting star parties at image venues, arranged field trips and other educational activities on site, etc.

Financing

As a recognised Cornerstone project for both the international and US IYA efforts, the image exhibition concept is acknowledged as a worthwhile project to proceed with for 2009. However, at this point, it is not obvious that any significant funding can be obtained from the major agencies (NASA, ESA, IAU, etc.). Therefore, in order for this project to succeed, financial backing must be found.

We propose that corporations, foundations, and other entities be approached and asked for their support. Each individual location will most likely need to obtain its own funding. Hence, if there is interest in having an image exhibit come to a location, the organiser for that location must take responsibility for securing the funding to make it possible. (See more details in the “How to participate” section below.)

It is difficult to supply specific costs for each “level” of the image exhibition concept because many of the expenses will vary from location to location. For example, printing costs – which should be as local as possible – will change. Also, if there is a fee to use a particular site, this will have to be factored in as well. There are many other details that may also affect the ultimate cost. But, in order to begin planning, we provide a very loose estimate below.

Platinum:	$250,000–$500,000
Gold:	$25,000–$50,000
Silver:	$2,000–$10,000

Again, these numbers encompass a very wide range and should only be used in general planning.

Prototype exhibit in Athens

Because of the work done in preparation for CAP2007, we have identified Athens as the location for a prototype of the larger IYA image exhibition effort for 2009. This prototype, which should open in early 2008, will give us better ideas on issues such as cost. But hopefully this prototype will help us identify other details that we have not anticipated.

How to participate

If you would like to see an image exhibition in your area in 2009, please consider the following responsibilities.

1. Scout Locations: Suggest a public space with room to house large format images (wall mounted or on stands) with high traffic – parks, metro stations, art museums, etc.
2. Serve as Point of Contact: A lot of logistical planning will be necessary to secure locations. We need a person(s) who is willing to pursue and coordinate with all of the necessary local officials and act as an intermediary with the IYA Image Exhibit Task Group.
3. Find Local Printing and Related Companies. We would like to have these images printed locally, when it makes sense. Therefore, the local organiser would need to find suitable companies that could provide the quality required (details will be forthcoming). Also, lighting, mounting and other elements of the exhibit – again, to be determined by the specific location – will also need to be solved.
4. Find Funding: As mentioned above, it is imperative for the success of this project to identify and secure funding from outside entities: corporations, foundations, etc. The local organiser of the host country or region must take responsibility for acquiring funding for the scope of the exhibit they would like to see go forth in their area.

Conclusion

We believe that exhibitions of astronomical images across the world in 2009 will serve as a powerful way to engage potentially millions of people in the wonders of astronomy. It is a large project that could involve many agencies, companies, governments, and of course, individuals. We hope to serve as a catalyst for this project, providing core materials that can be used freely and openly in a multitude of ways. The success of this project will depend on the combined efforts of the local organisers, the image exhibit Task Group, and many more. If you are interested in serving as a local organiser, please contact us as soon as possible. We look forward to working on this exciting project.

Contacts

Megan Watzke (Chandra X-ray Center/SAO)
mwatzke@cfa.harvard.edu
+1 617.496.7998

Kimberly Kowal Arcand (Chandra X-ray Center/SAO)
kkowal@cfa.harvard.edu
+1 617.218.7196

Manolis Zoulias (National Observatory of Athens)
mzoulias@academyofathens.gr

Lars Lindberg Christensen (ESA/Hubble)
lars@eso.org

& the IYA2009 Image Exhibition Task Group

Relevant Websites

- http://www.astronomy2009.org/content/view/302/91/
- http://www.communicatingastronomy.org/cap2007/image_exh.html

The International Year of Astronomy 2009 — An opportunity too good to miss

Pedro Russo[1] **& Lars Lindberg Christensen**[2] on behalf of the IAU IYA2009 project
[1] IAU & ESA/Hubble (prusso@eso.org)
[2] ESA/Hubble & IAU (lars@eso.org)

Abstract

The International Astronomical Union (IAU) started the International Year of Astronomy 2009 (IYA2009) project in 2006. This paper presents a snapshot of the current status of the project, and re-iterates the IYA2009 vision, goals, objectives and deliverables. Part of the paper will deal with some important IYA evaluation parameters as well as the global strategy for the future.

Figure 1 – The IYA2009 Logo

Vision and goals of the International Year of Astronomy 2009

Vision

The vision of the IYA2009 is to help the citizens of the world rediscover their place in the Universe through the day- and night-time sky, and thereby engage a personal sense of wonder and discovery. Everyone should realise the impact of astronomy and basic sciences on our daily lives, and understand better how scientific knowledge can contribute to a more equitable and peaceful society.

IYA2009 activities will take place at the global and regional levels, and especially at the national and local levels. National Nodes have been formed in each country to prepare activities for 2009. These nodes will establish collaborations between professional and amateur astronomers, science centres, educators and science communicators in preparing activities for 2009. More than 90 nations are already involved, with well over 140 expected. To help coordinate this huge global programme, and to provide an important resource for the participating countries, the IAU has established a central Secretariat and an IYA2009 website as the principal IYA2009 resource for public, professionals and media alike.

[1] www.astronomy2009.org

Goals and objectives

Goals To:	**Objectives**[2] To:	**Evaluation estimator**
1. *Increase scientific awareness* among the general public through the communication of scientific results in astronomy and related fields, as well as the process of research and critical thinking that leads to these results.	• Make astronomical breakthroughs more visible in the daily lives of billions of people through all available means of communication (TV/radio documentaries, newspapers, web pages, exhibitions, stamps, blogs, web portals, advertising campaigns etc). • Facilitate individual astronomical observing opportunities.	• The number of people "touched": • Number of press clippings and readership. • Number of people visiting national, regional and global web pages (webstats). • Number of activities. • Number of new products etc.
2. *Promote widespread access to the universal knowledge of fundamental science* through the excitement of astronomy and sky-observing experiences.	• Enable as many laypeople as possible, especially children, to look at the sky through a telescope and gain a basic understanding of the Universe.	• Number of laypeople, especially young people and children, viewing the Universe through a telescope at street astronomy events, star parties, professional observatory webcasts etc. • Number of "cheap" new telescope kits produced, assembled and distributed.
3. *Empower astronomical communities in developing countries* through the initiation and stimulation of international collaborations.	• Involve astronomical communities of the developing nations in the Year, thereby providing examples of how outreach and education is carried out in different parts of the world.	• Number of participating developing nations as measured by the establishment of IYA National Nodes. • Number of new international partnerships and joint programs formed. • Number of people reached by new initiatives.
4. *Support and improve formal and informal science education* in schools as well as through science centres, planetariums and museums.	• Develop formal and informal educational material and distribute all over the world. • Conduct focused training of event leaders and presenters.	• Number of participating teachers and schools. • Number of educational materials distributed. • Number of new event leaders and presenters trained.

[2] The fulfilment of these objectives will be achieved through national, regional and global activities, see http://www.astronomy2009.org

5. *Provide a modern image of science and scientists* to reinforce the links between science education and science careers, and thereby stimulate a long-term increase in student enrolment in the fields of science and technology, and an appreciation for lifelong learning.	• Popular talks by scientists of all ages, genders and races. • Facilitate portraits wherever possible: on TV, in web blogs, • Biographies of scientists that break with the traditional "lab coat view" of scientists, showing the excitement of scientific discovery, the international aspect of scientific collaborations and portraying the social sides of scientists.	• Number of popular talks. • Number of scientist portraits. • Public response questionnaires. • Evidence for penetration of astronomy into popular culture (media, web, TV, radio talk shows…).
6. *Facilitate new, and strengthen existing, networks* by connecting amateur astronomers, educators, scientists and communication professionals through local, regional, national and international activities.	• Connect as many individuals (named "IYA ambassadors") as well as organisations (amateur and professional) in networks; for instance, by creating of new internal and external electronic communication infrastructures. These networks will become part of the heritage of IYA2009.	• Number of National IYA Nodes. • Number of new networks and partnerships formed.
7. Improve the gender-balanced representation of scientists at all levels and promote greater involvement by underrepresented minorities in scientific and engineering careers.	• Provide access to excellent role models and mentors, formally and informally, and publicise them. • Provide information about the female "dual-career" problem and possible solutions.	• Number of active new role models and mentors. • Number of new international partnerships, projects and activities.
8. Facilitate the preservation and protection of the world's cultural and natural heritage of dark skies in places such as urban oases, national parks and astronomical sites, through the awareness of the importance and preservation of the dark skies and astronomical sites for the natural environment and human heritage.	• Involve the dark-sky community in IYA2009. • Collaborate in the implementation of the UNESCO and IAU "Astronomical and World Heritage" initiative. • Lobby organisations, institutions, and local, regional and national governments to approve preservation laws for dark skies and historical astronomical sites. • Put the issues of natural environment and energy preservation on the agenda of decision makers.	• Number of activities and events related with night-sky protection. • Number of countries/cities with laws or guidelines for dark sky preservation. • Areas protected by dark sky laws. • Number of historical astronomical sites identified and protected under the UNESCO's World Heritage Convention.

The team behind the scenes

IAU

The International Astronomical Union (IAU)[3] is the initiator and international leader of IYA2009. The IAU was founded in 1919 with the mission of promoting and safeguarding the science of astronomy through international cooperation. It maintains a small secretariat in Paris. Its individual members are professional astronomers active in research and education in astronomy all over the world. It is a "bottom-up" organisation run by its members for the benefit of astronomy worldwide and maintains friendly relations with organisations that include amateur astronomers in their membership.

Currently the IAU has nearly 10,000 individual members in 87 countries worldwide. In addition to arranging scientific meetings, the IAU promotes astronomical education and research in developing countries through its International Schools for Young Astronomers, Teaching for Astronomy Development, and World Wide Development of Astronomy programmes, and through joint educational activities with UNESCO and other bodies.

The IAU acts as a catalyst and coordinator for IYA2009 at the global level largely, but not exclusively, through the IYA2009 website and Secretariat. The IAU will organise a small number of international events such as the web portal "The Portal to the Universe", the image exhibition "The Universe from Earth" and the "Galileoscope" project. The IAU will be the primary interface with bodies such as UNESCO and the United Nations.

The next triennial General Assembly of the IAU takes place in Rio de Janeiro in August 2009. Some 2500 astronomers from all over the world will attend. Considerable media attention is always given to the General Assemblies, with regular briefings and news releases provided. Naturally, the programme of the General Assembly will be closely linked to the themes and activities of IYA2009, and this will provide a further opportunity for the Global Sponsors of IYA2009 to promote their activities through displays and speakers at dedicated sessions, particularly those devoted to communication and education.

The IAU/IYA2009 Secretariat

The central hub of the IAU activities for IYA2009 is the Secretariat established by the IAU to coordinate activities during the planning, execution and evaluation of the Year. The Secretariat will liaise continuously with the Single Points of Contact, Task Groups, Global Official Partners, Global Sponsors and Organizational Associates, the media and the general public to ensure the progress of IYA2009 at all levels. A website[4] has been set up and more than 90 member countries have established national committees and appointed "Single Points of Contact". The Secretariat and website are the most important coordination and resource centres for all the countries taking part, particularly for those developing countries that lack the national resources to mount major events alone.

---

[3] http://www.iau.org
[4] www.astronomy2009.org

IYA2009 Global Cornerstone Projects

100 Hours of Astronomy

This is a round-the-clock, round-the-globe event, including live webcasts, observing events, public talks, open doors, and other activities connecting the astronomy community around the world. One of the key goals is to allow as many people as possible to look through a telescope, and see what Galileo saw — the four Galilean moons around Jupiter. The 100 Hours of Astronomy might coincide with a “Dark Sky Event” with a controlled reduction of city illumination in a “Wave of Darkness” around the globe to raise awareness that the dark sky is a majestic, but often overlooked, cultural resource for everyone (security and safety issues to be considered).

The Galileoscope

Who doesn’t remember the first time they looked at the Moon through a telescope and were amazed by the details of the mountains and craters? The same is true of Jupiter’s cloud belts and its fascinating Galilean moons, Saturn’s rings and a sparkling star cluster. Observing through a telescope for the first time is a unique experience that shapes our view of the sky and Universe. The IYA2009 programme wants to share this observational and personal experience with as many people as possible across the world and is collaborating with the US IYA2009 National Node to develop a simple, accessible, easy-to-assemble and easy-to-use telescope that can be distributed by the millions. Ideally, every participant in an IYA2009 event should be able to take home one of these little telescopes. This simple telescope enables people to build and observe with a telescope that is similar to Galileo’s. Sharing these observations and making people think about their importance is one of the main goals of IYA2009: Promote widespread access to new knowledge and observing experiences. A do-it-yourself Galileoscope could be the key to pursuing an interest in astronomy beyond IYA2009, especially for people who cannot afford to buy a commercial telescope.

We aim to give 10 million people their first look through an astronomical telescope in 2009. This is achievable if, for example, 100,000 amateur observers each show the sky to 100 people. Millions of small telescopes are sold every year, but anecdotal evidence suggests that most are rarely used for astronomy. A worldwide telescope amnesty programme will invite people to bring their little-used telescopes to IYA2009 events, where astronomers will teach people how to use them and offer advice on repairs, improvements, and/or replacements, encouraging more people to stay involved in the hobby. We encourage the organisers of IYA2009 celebrations in all countries to promote similar activities, with a common goal of giving 10 million people worldwide their first look through an astronomical telescope.

Cosmic Diary

This project is not just about astronomy; it is more about being an astronomer. Professional astronomers will blog in text and images about their life, families, friends, hobbies, and interests, as well as their work — their latest research findings and the challenges that face them in their research. The Cosmic Diary aims to put a human face on astronomy. The bloggers represent a vibrant cross-section of female and male working astronomers from around the world. They will write in many different languages and come from five different continents. Outside the observatories, labs and offices, they are musicians, mothers, photographers, athletes, amateur astronomers. At work, they are managers, observers, graduate students, grant proposers, instrument builders and data analysts. Although inspired by the Quantum Diaries made for the International Year of Physics 2005, we believe that the Cosmic Diary has the potential to produce valuable science communication items and enhance public awareness of astronomy and space sciences. At some point during this project, the bloggers will be asked to explain one particular aspect of their work to the public. In a true exercise of science communication with the public, these scientists will be asked to translate the nuts and bolts of their scientific research into more popular language. This will be their challenge. These "explanations" will be highlighted on the web at regular intervals. They will be used to produce a book and a video documentary, both to be released during the IYA2009. The book and documentary will be the legacy of this project.

The Portal to the Universe

The science of astronomy is extremely fast moving, and delivers new results on a daily basis, often in the form of spectacular news, images of forms and shapes not seen anywhere else, enhanced by illustrations and animations. Public astronomy communication has to develop apace with the other players in the mass market for electronic information such as the gaming and entertainment industries. The problem today is not so much the availability of excellent astronomy multimedia resources for use in education, outreach and the like, but rather finding and accessing these materials. Laypeople, press, educators, decision-makers and even the scientists themselves deserve better access to press releases, images, videos and background information. We all need a single point of entry into all the cosmic discoveries that take place on a daily basis — a global one-stop portal for astronomy-related resources. Modern technology (especially RSS feeds and the VAMP — Virtual Astronomy Multimedia Project[5]) has made it possible to tie all the suppliers of such information together with a single, almost self-updating portal. The *Portal to the Universe* will feature a comprehensive directory of observatories, facilities, astronomical societies, amateur astronomy societies, space artists, science communication universities, as well as a news-, image-, event- and video- aggregator and Web 2.0 collaborative tools for astronomy multimedia community interaction such as ranking of the different services according to popularity.

A range of "widgets", small specialised applications, will be developed to tap live into the existing resources. The start page will feature a selection of these resources. The selection will initially be based on editorial decisions derived from their experience of the behaviour and needs of the target groups, but will gradually move towards a live, community-based selection determined by the real behaviour of the visitors. The visitors may naturally tailor their own *MyPortaltotheUniverse* with the widgets if they wish. In summary, The *Portal to the Universe* will enable innovative access to, and vastly multiply the use of, astronomy multimedia resources — including news, images, videos, events, podcasts and vodcasts.

She is an Astronomer

IYA2009 has the aim of contributing to four of the UN Millennium Development Goals, one of which is to "*promote gender equality and empower women*". Approximately a quarter of professional astronomers are women. The field continues to attract women and benefit from their participation. However, there is a wide geographical diversity, with some countries having none, and others having more than 50% female professional astronomers. Also, the very high level of

---

[5] http://www.virtualastronomy.org

female dropouts shows that circumstances do not favour female scientists. Gender equality is of a major concern to the whole scientific community regardless of geographic location. The problems and difficulties are different in all regions and continents. IYA2009's "*She is an Astronomer*" programme will offer platforms that address some of these problems. *She is an Astronomer* will contain the following components:

- The *Portal to the Universe* global web portal will provide a collection of links to all the existing regional and national programmes, associations, international organisations, non-governmental organisations, grants and fellowships supporting female scientists.
- Part of the programme will appear in the Cosmic Diary featuring the work and family lives of female researchers.
- The project intends to seek cooperation agreement with prestigious initiatives that are already running, to provide fellowships to female scientists to support their career prospects.
- A Woman Astronomer Ambassador programme will be established to reach girls at school and university level with the messages of the programme.

Dark Skies Awareness

It is now more urgent than ever to encourage the preservation and protection of the world's cultural and natural heritage of dark night skies in places such as urban oases, national parks and astronomical sites, as well as to support UNESCO's goals of preserving historical astronomical sites for posterity. For this Cornerstone Project, the IAU will collaborate with the US National Optical Astronomy Observatory, International Dark-Sky Association and other national and international partners in dark sky and environmental education on several related themes, including worldwide measurements of local dark skies by thousands of citizen-scientists using both unaided eyes and digital sky-quality meters (as in the successful GLOBE at Night programme), star parties, new lighting technologies, arts and storytelling, and health and ecosystems.

IAU/UNESCO Astronomy and World Heritage

UNESCO and the IAU are working together to implement a research and education collaboration as part of UNESCO's Astronomy and World Heritage project. This initiative aims at the recognition and promotion of achievements in science through the nomination of architectural properties, sites or landscape forms related to the observation of the sky through the history of mankind or connected with astronomy in some other way. The proposed lines of action are: identification, safeguarding and promotion of these properties. This programme provides an opportunity to identify properties related to astronomy located around the world, to preserve their memory and save them from progressive deterioration. Support from the international community through IYA2009 is needed to develop this activity, which will allow us to help preserve this sometimes very fragile heritage.

Galileo Teacher Training Programme

There is an almost unfathomable amount of rich and very useful astronomy educational resources available today — mostly in digital form, freely available via the internet. However, experienced educators and communicators have identified a major "missing link": the training of the educators to understand the resources and enable them to use it in their own syllabuses. To sustain the legacy of the International Year of Astronomy 2009, the IAU — in collaboration the National Nodes and leaders in the field such as the Global Hands-On Universe project, the US National Optical Astronomy Observatory and the Astronomical Society of the Pacific — is embarking on a unique global effort to empower teachers by developing the Galileo Teacher Training Programme. The Galileo Teacher Training Programme's goal is to create a worldwide network of certified Galileo Ambassadors, Master Teachers and Teachers by 2012. The use of workshops and online training tools to teach the topics of robotic optical and radio telescopes, webcams, astronomy exercises, cross-disciplinary resources, image processing, and digital universes (web and desktop planetariums) is included in the programme.

Universe Awareness

Universe Awareness (UNAWE) will be an international outreach activity that aims to inspire young disadvantaged children with the beauty and grandeur of the Universe. UNAWE will broaden children's minds, will awaken their curiosity in science and will stimulate internationalism and tolerance. Games, songs, hands-on activities, cartoons and live internet exchanges are devised in partnership with UNAWE communities throughout the world for children from the age of four onwards. UNAWE will enable the exchange of ideas and materials through networking and interdisciplinary workshops. Universe Awareness is imagination, excitement and fun in the Universe for the very young.

From Earth to the Universe — an exhibit of astronomical images

The fantastic images of the Universe captured by humanity's fleet of ground and space-based telescopes are largely responsible for the magical appeal that astronomy has for lay people. Indeed, popular images of the cosmos can engage the general public not only in the aesthetics of the visual realm, but also in the science of the knowledge and understanding behind them. IYA2009 is an unprecedented opportunity to present astronomy to the global community in a way that has never been done before. The *From Earth to the Universe* project is an exhibition arranged by the IYA2009 that will bring these images to a wider audience in non-traditional venues such as public parks and gardens, art museums, shopping malls and underground stations.

Make it happen

How can I participate in the International Year of Astronomy?

One of the International Year of Astronomy goals is to enable as many people as possible to experience the excitement of personal discovery that Galileo felt when he spied lunar craters and mountains, the moons of Jupiter, and other cosmic wonders. It is also meant to encourage citizens to think about how new observations force us to reconsider our understanding of the natural world.

If you're a newbie or an astronomy enthusiast…

If you are a beginner and would like to get some advice, the best thing you can do is to contact a local astronomy club, planetarium or science museum. A list of organisations worldwide can be found on the web[6].

[6] See for instance http://skytonight.com/community/organizations or http://www.astronomyclubs.com

If you're an amateur astronomer...

For every professional astronomer, there are at least 20 knowledgeable and engaged amateur astronomers. The IAU is encouraging amateur astronomers to pay a major role in the organisation of astronomy outreach activities. As an amateur astronomer, you can join a local astronomy club and plan some cool astronomy outreach activities. Lots of ideas can be "lifted" from the IYA activities pages, and don't be afraid of replicating and adapting them according to your own country's history and culture. Get in touch with science teachers in the local schools and propose some practical activities for the students involving the observation of the sky.

If you're a professional astronomer...

You can do all the above, and contact your country's Single Point of Contact[7] for advice and new ideas on what can be done in order to promote astronomy in your region. You can coordinate activities together with amateur astronomers, help them to publish your results and contribute to science.

I have an idea for an activity that's not listed in the activities pages. How can I submit it?

If you have a new idea and you are sure it is not listed in the national, regional and global activities, pages, you should contact the Single Point of Contact from your own country and propose your ideas to them.

Conclusion

There are very good reasons for celebrating a global year of astronomy. We live in what may be the most remarkable age of astronomical discovery in history. The IAU hopes and believes that by declaring 2009 the International Year of Astronomy, universities, schools, museums, observatories, societies, and others will be encouraged to increase their efforts to reach out to the public, and especially to young people to enthuse them about astronomy in particular, and about science and technology in general. We believe that IYA2009 has the potential to become one of the largest and most successful global astronomy outreach events in history.

[7] Look at http://www.astronomy2009.org under "National Nodes".

Credit: Sze-leung Cheung

An international network of observations for the International Year of Astronomy

Jean-Eudes Arlot[1], Alain Vienne[1,2] & Anny-Chantal Levasseur-Regourd[3]
[1] IMCCE, Observatoire de Paris (arlot@imcce.fr)
[2] Université de Lille (alain.vienne@univ-lille1.fr)
[3] Université de Paris 6 (aclr@aerov.jussieu.fr)
[1,2,3] French Committee for IYA2009

Abstract

The equinox of Jupiter, defined as when the Sun passes through the plane of the equator of Jupiter and hence through the orbital plane of the Galilean satellites, will take place in 2009. The French committee for IYA2009[1] will take this opportunity to propose coordinated observations. The equinox of Jupiter is favourable for many events such as eclipses of the Galilean satellites by the planet Jupiter, occultations and transits and also mutual phenomena among the satellites themselves. These events are very easily observable, even with a small telescope, since the Galilean satellites are very bright. The events are spectacular since the satellites will disappear within a few seconds. We propose that these phenomena be observed worldwide by amateur astronomers, students and schoolchildren. Observers should send their data to a central website which will analyse each observation and provide a database of all the observations. Many observations can be explained in terms of the physics and the dynamics of the Galilean satellites themselves. The history of astronomy is also relevant as the Galilean satellites were the first celestial objects observed extensively from Earth and were used as the first reliable clock for longitude calculations. At the end of the observational campaign, the results will be collated and the scientific benefits from these observations will be explained and published.

Introduction

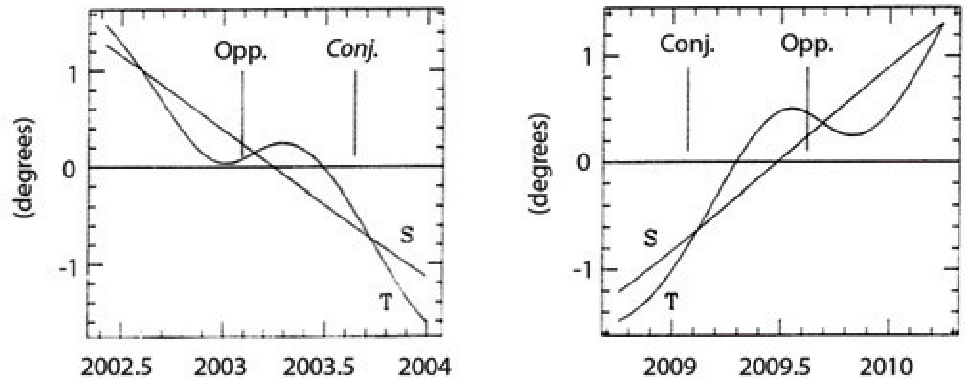
The equinox of Jupiter will take place in 2009 and the French committee for IYA2009 will take this opportunity to propose coordinated observations gathered on a unique internet site providing analysis and global results.

The equinox of the planet occurs when the planetocentric declination of the Sun and the Earth become zero, see Figure 1. The equinox of Jupiter is favourable for many events such as eclipses of the Galilean satellites by the planet Jupiter, occultations and transits and also mutual phenomena among the satellites themselves, as illustrated in Figure 2.

Observations of the events

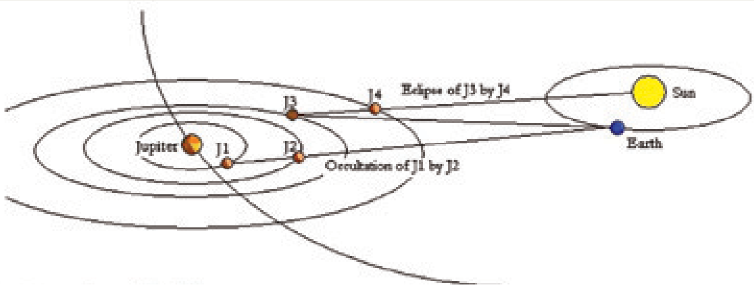
These events are very easily observable, even with a small telescope and a digital camera, since the Galilean satellites are very bright. Typical views are shown in Figures 3 and 4.

[1] http://www.astronomy2009.fr/



W. Thuillot/IMCCE

Figure 1 – Jovicentric declinations of the Sun and the Earth for the occurrences of 2003 and 2009 regarding the date of the opposition of Jupiter.



J. Mc Auliffe

Figure 2 – Configuration of the intersatellite events: the satellites are in the same plane, the equatorial plane of Jupiter.

Where two satellites are involved, we will record the quantity of light received from the satellites as a function of time in Universal Time Coordinates to an accuracy of 0.1 second of time to produce a light curve similar to that in Figure 5.

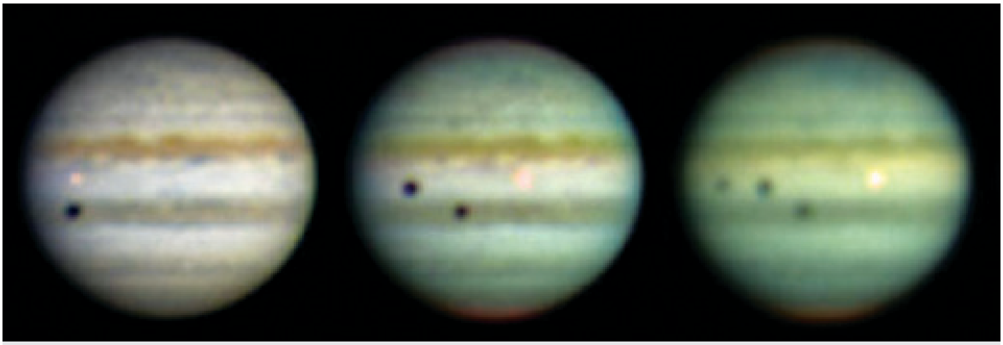
Observations worldwide

We propose that these events be observed worldwide by amateur astronomers, students and schoolchildren, and their results collected on a central website, which will analyse each observation and create a database of all the observations.

Interest of the observations

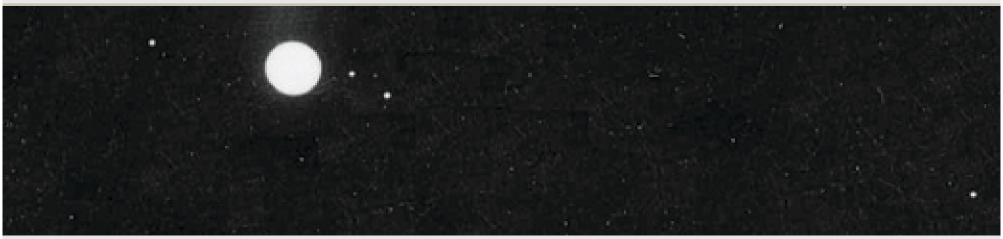
Many observations can be explained in terms of the physics and the dynamics of the Galilean satellites themselves. They are among the most interesting bodies in the Solar System with volcanoes, ice, and many other interesting physical features, and some may even be suitable for life (such as Europa, Figure 6).

The Galilean satellites are important to the history of astronomy: they were the first celestial objects observed from Earth extensively and they became the first reliable clock available for measuring longitudes. Timings of the eclipses of one of the satellites were also used to measure the speed of light.



E. Karkoshka/NMSU

Figure 3 – Transits of satellites and shadows on the disc of Jupiter. They are also spectacular since the satellites will disappear within a few seconds.



IMCCE

Figure 4 – The Jovian system as seen in a small telescope.

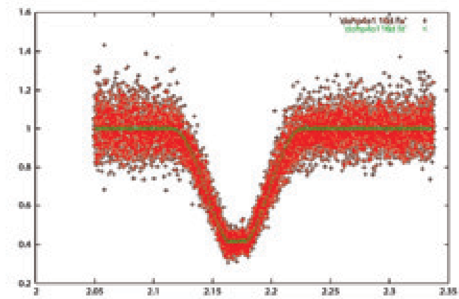
Results and publications

At the end of the observational campaign, the results will be collated and the scientific benefits from these observations will be explained and published. Educational material, such as a method for determining the speed of light, will be developed from observations by students and pupils. Scientific results will be published using data from amateur astronomers. The IMCCE[2] has experience of such an association.

References

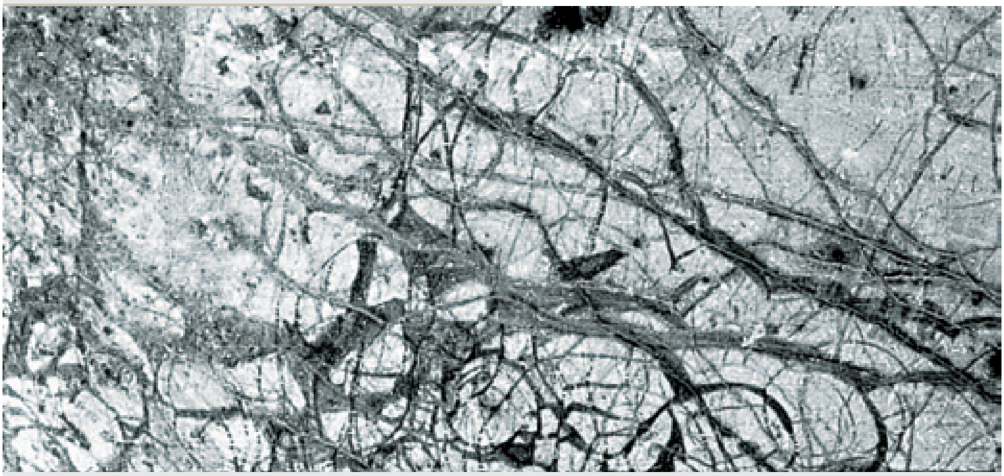
- Arlot J.E. (2007), Predictions of the mutual events of the galilean satellites of Jupiter in 2009, To appear in Astron. & Astrophys.
- Vienne A. (2007), Dynamical objectives of observations of mutual events, To appear in Planetary and Space Sciences

[2] http://www.imcce.fr/phemu09



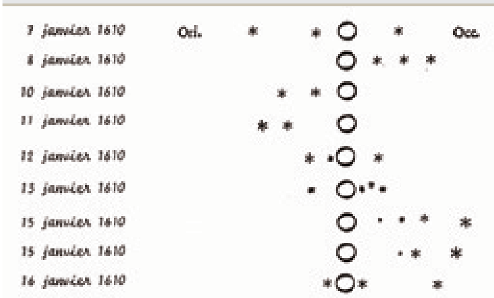
IMCCE

Figure 5 – A light curve recorded during an event showing the magnitude drop during the occultation or the eclipse.



NASA

Figure 6 – The ice crust on Europa: accurate astrometric observations of the intersatellite events may help reveal internal structure of the Galilean satellites.

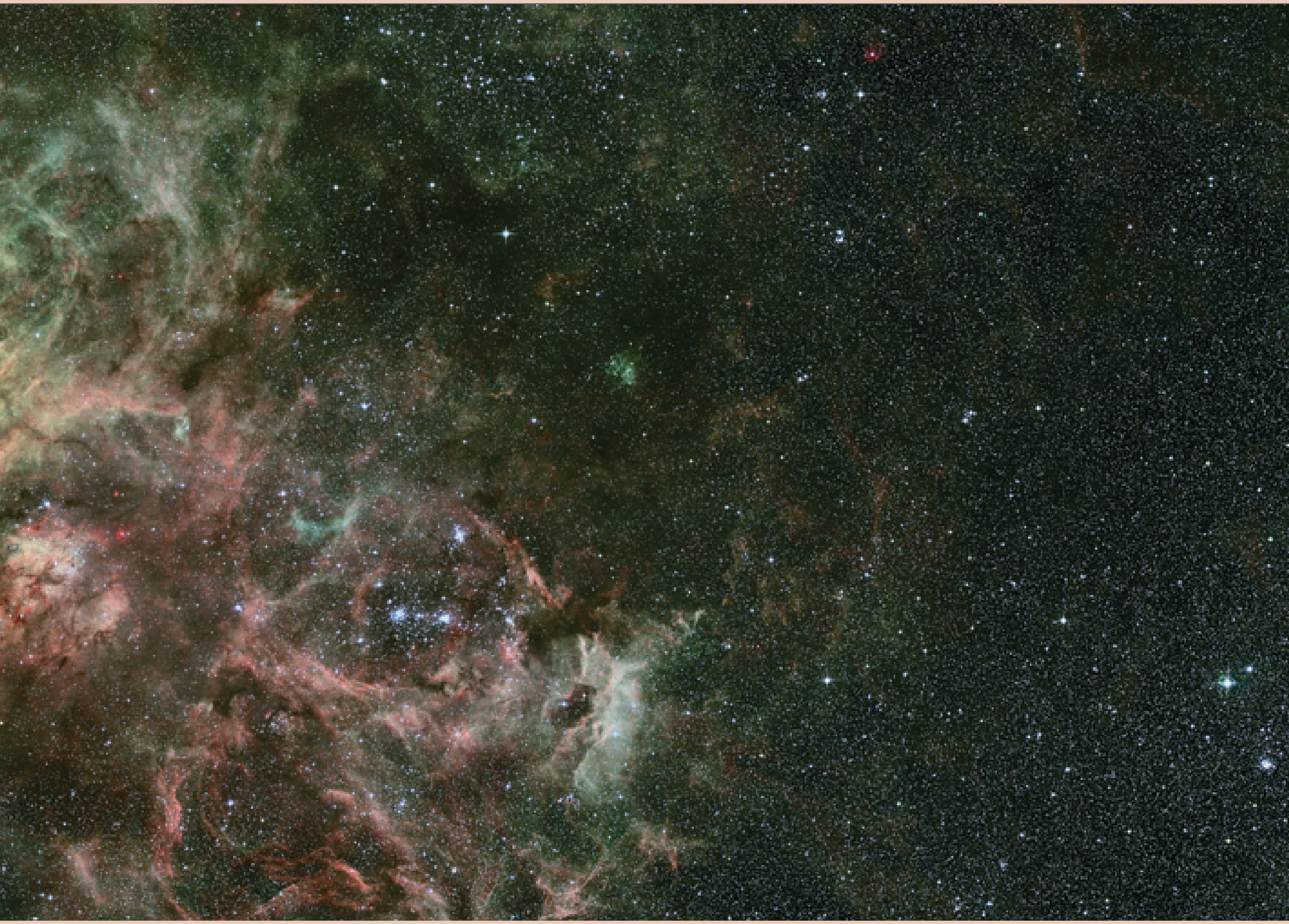


IMCCE

Figure 7 – Observations by Galileo in 1610

Credit: ESO

Session 3
Astronomy for the Visually Impaired



One square degree image of the Tarantula Nebula and its surroundings. The spidery nebula is seen in the upper-centre of the image. Slightly to the lower-right, a web of filaments harbours the famous supernova SN1987A. Many other reddish nebulae are visible in the image, as well as a cluster of young stars on the left, known as NGC 2100. The image was taken with ESO's Wide Field Imager (WFI) at the 2.2-m telescope on La Silla.

Creating opportunities in astronomy: Communication for people who are blind or visually impaired

Noreen Grice
You Can Do Astronomy LLC[1] (Noreen@youcandoastronomy.com)

Abstract

Astronomy is such a visually rich field that you may wonder if access is possible for a person who is blind or visually impaired. The good news is that with creative strategies and available resources, students who are blind need not be excluded. Braille text, tactile illustrations, hands-on models, and descriptive narration can remove many barriers.

Introduction

According to the American Foundation for the Blind[2] and the National Federation of the Blind[3], there are approximately 10 million blind or visually impaired people in the United States. Unfortunately, only 45% of students in the US with severe visual impairment or blindness complete high school studies, compared with the 80% success rate of their sighted peers. And only about 32% of legally blind working-age Americans are employed.

It is critical that educators devise new ways to make science, technology, engineering and mathematics topics accessible to students with visual impairments. The following strategies will benefit all students by presenting information for a variety of learning styles.

1) Listening: In addition to students listening to the instructor, it is important that the instructor pays close attention to the needs of students. If a student cannot comprehend a topic, consider alternative, non-visual, approaches.

2) Seeing: To "see" does not always mean to see only with your eyes. A person can see with their "mind's eye" by touching an object or listening to a very descriptive explanation.

3) Doing: Many visually impaired students are not given equal opportunities to participate in laboratory experiences because the subject is deemed too visual or assumed to be inaccessible. Almost anything can be made accessible through alternative approaches and/or assistive technology. Talking calculators, Braille rulers or software that can speak the words on the computer screen are but a few of the ways visually impaired students can fully participate.

---

[1] www.youcandoastronomy.com
[2] www.afb.org
[3] www.nfb.org

Figure 1 – Students explore puff paint costellations inside a tactile planetarium tent.

4) Discussing: Pictorial description brings subjects to life! Books on tape are a great example of the power of descriptive narration for both sighted and blind listeners. By using this technique, everyone will experience a higher quality and more productive learning environment.

5) Touching: Students exploring topics such as graphs or abstract images benefit greatly from the use of a hands-on model or tactile pictures. Use tactile materials whenever possible for all students.

Resources and strategies

Here are some specific ways to make educational materials more accessible to people who are blind or visually impaired.

- Use Quick Draw paper from the American Printing House for the Blind[4] to make quick and simple tactile graphics. Quick Draw paper is sponge-like so when the user draws on it with a water-based marker, it swells instantly. Do not use this paper in places with high humidity!
- Push brass fasteners through a piece of dark cardboard to create instant constellations. Brass fasteners are very inexpensive and available at most office supply stores.

[4] www.aph.org

Figure 2 – Students compare a variety of sport ball planets in a scaled model of the Solar System.

- Attach string to pushpins to make tactile graphs. Students who are blind or visually impaired can create these tactile graphs with Braille graph paper. The instructor can also create tactile graphs to share with the entire class.
- Apply puff (also called fabric) paint onto a piece of cardboard or foam paper. Puff paint is inexpensive and sold at most art and craft supply stores. The paint comes in a variety of colours and in small bottles. Allow at least 24 hours for the puff paint to dry before use in the classroom. A science teacher (Ben Wentworth) took puff paint to the next level. He and his students at the Colorado School for the Blind used puff paint to map constellations inside portable tents to create unique tactile planetariums.
- Fasten foam stickers to foam paper to create simple tactile star patterns or other astronomical images. Foam stickers are very popular and inexpensive items at your local craft supply store. Add in some fuzzy pipe cleaners and you can create a 3-dimensional surface of the Sun, with dynamic prominences and solar flares.
- Tape two hula hoops together to create a hands-on explanation for the Moon's path about the Earth and why we don't experience an eclipse each month.
- Compare differently sized sport balls in a scaled-diameter model of the planets. Or create a distance-scaled model of the Solar System by attaching jingle bells at pre-measured locations.

The following processes require specific equipment and machines to create or use tactile graphics.

1. Thermoform machines (also called heat vacuum machines) can duplicate tactile pictures onto plastic paper called Braillon. You make a "master copy" by carving an aluminium sheet with tools from the American Printing House for the Blind or by gluing different textures to cardboard. Creating the master copy can be a time consuming process and is not recommended if you only need a small number of copies or have a limited amount of time. It may be possible, however, to work with a Braille printing house or tactile artist to create the master and duplicate a large quantity of copies.

2. The swell form machine (also called a swell touch or thermal expansion machine) is one of the easiest ways to make tactile graphics. You can design your image (it must be a black image on a white background) in a graphics program like Adobe Photoshop or Illustrator or even draw a picture by hand. Use a photocopy machine to transfer the image onto the swell touch paper, and then run the copy through the swell form machine. Swell form paper has a special coating on it so anything that is black will "puff up" and become tactile.

   If you have access to a swell form machine, you can make telescopic views at a star party accessible to visually impaired or blind participants. Capture an astronomical image as a JPG file and invert the image (in Photoshop or other software) so that space is white and the object is black. If you have your computer, printer, photocopy machine and swell form machine close by, you should be able to print out tactile versions of telescopic views quickly and have them available in a few minutes. I did this at the 2007 National Federation of the Blind Youth Slam at Johns Hopkins University and it worked out great! In fact, the local college students who happened to stop by thought that tactile images must be a usual part of any star party because the pictures were interesting for everyone!

3. The Talking Tactile Tablet (TTT) is an electronic device that allows a thermoform or other tactile page to dynamically interact with the user. The TTT is connected to a computer, and you can program it to respond with narration or sounds when a person presses different areas of the tactile picture.

   It is important to remember that we all have special needs. When we make materials accessible to people who are blind or visually impaired, we are also making them accessible to many other people with different learning styles.

References

- American Thermoform Corporation, www.americanthermoform.com
- Grice, N. (2006), Resources for Making Astronomy More Accessible for Blind and Visually Impaired Students, Astronomy Education Review, Volume 5, Issue 1
- National Federation of the Blind Science Web Portal, www.blindscience.org.

Touch the Invisible Sky: A multi-wavelength Braille book featuring NASA images

Simon Steel[1], **Noreen Grice**[2] **& Doris Daou**[3]
[1] Harvard-Smithsonian Center for Astrophysics (sjsteel@cfa.harvard.edu)
[2] "You Can Do Astronomy" LLC (noreen@youcandoastronomy.com)
[3] NASA Headquarters (Doris.Daou-1@nasa.gov)

Abstract

Multi-wavelength astronomy – the study of the Universe at wavelengths beyond the visible, has revolutionised our understanding and appreciation of the cosmos. Hubble, Chandra and Spitzer are examples of powerful, space-based telescopes that complement each other in their observations spanning the electromagnetic spectrum. While several Braille books on astronomical topics have been published, to this point, no printed material accessible to the sight disabled or Braille reading public has been available on the topic of multi-wavelength astronomy. *Touch the Invisible Sky* presents the first printed introduction to modern, multi-wavelength astronomy studies to the disabled sight community. On a more fundamental level, tactile images of a Universe that had, until recently, been invisible to all, sighted or non-sighted, is an important learning message on how science and technology broadens our senses and our understanding of the natural world.

According to the National Federation of the Blind, there are about 1.3 million legally blind persons in the United States with 93,600 of these persons being of school age. Students who are blind often face increased difficulty in obtaining educational materials. Books must have text translated into Braille, be read into audio files or have text pages made accessible for computer screen reading software. Illustrations are either audio described, recreated into tactile graphics, or completely eliminated. The time required to make the materials accessible can cause students to loose ground and fall behind their peers.

Why create a tactile book on wavelengths that are not accessible to human eyes? Tactile images of a Universe that, until recently, had been invisible to human eyes, is an important learning message on how science and technology broadens our senses and our understanding of the natural world.

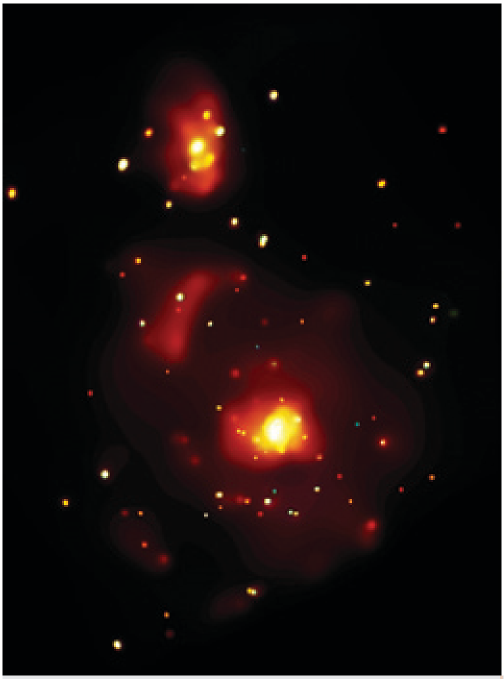
Touch the Invisible Sky: A Multi-Wavelength Braille Book Featuring Tactile NASA Images brings images of astronomical objects observed at multiple wavelengths to the fingertips of visually impaired readers. The text pages have both print and Braille, with the colour images themselves overlaid with clear acrylic TechnoBraille®. *Touch the Invisible Sky* not only displays tactile images of previously unseen celestial objects, but also presents them in a "family album" style. Each celestial object is shown as a set of four multi-wavelength views so the reader can directly compare and explore distinctive features.

[1] www.blindscience.org

One major challenge with the development of such a book is a lack of familiarity with the objects even for readers who have a reasonable knowledge of astronomy. Whereas readers probably have a mental model of objects such as the planets or the Sun, images of supernova remnants or galaxy mergers, even at optical wavelengths, defy comparison with the familiar. The job of describing the key features in the images, and to bringing such esoteric, yet beautiful and powerful, images alive in the mind of the reader, required considerable care. The task of unlocking the story behind the image is just as important for the sighted reader as for the non-sighted.

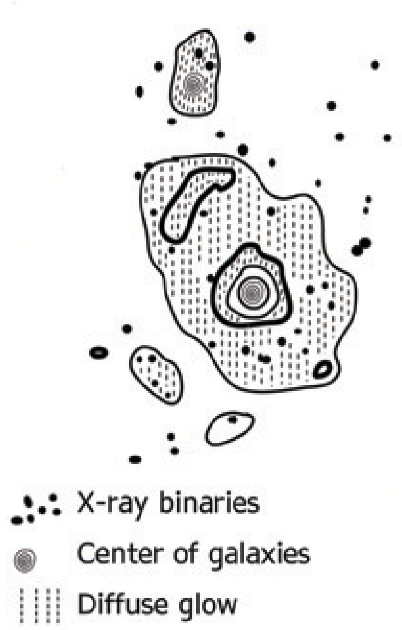
The main body of the text begins with an introduction to wavelength and the electromagnetic spectrum. Tactile views and descriptions of Hubble, Spitzer, Chandra and an antenna from the Very Large Array radio telescope, introduce some of the equipment and techniques used to reveal new views of the cosmos. By showing cut-away illustrations of reflecting surfaces and light paths, the views highlight the similarities and differences in the technologies needed to detect light of hugely differing wavelengths and energies.

The celestial objects were chosen to give a flavour of the diverse nature of the Universe, from our own Sun to distant galaxies and the extreme Universe of supernovae and pulsars. The features revealed by the different wavelength ranges show how multi-wavelength observations can be synthesised to attain a deep understanding of the structure of astronomical objects and mechanisms that shape them.



Credit: NASA/CXC/SAO/ R.DiStefano et al.

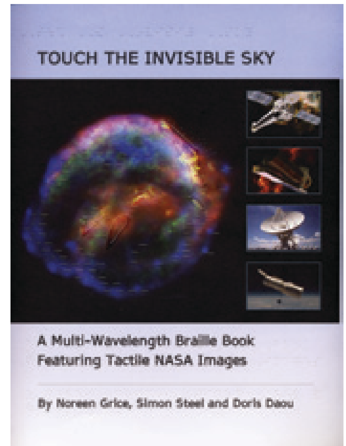
Figure 1 – M51Chandra: X-ray image of spiral galaxy M 51



Ozone Publishing

Figure 2 – TextureImage: Tactile outline for Chandra X-ray image of spiral galaxy M51

The exploration starts at the Sun, and highlights the role of magnetic fields in sunspots and solar flares. Images of the star Eta Carinae reveal the complex winds and ejecta that tell the story of the death throes of perhaps the greatest star in our galaxy. The Crab Nebula and Kepler's supernova remnant highlight the endpoint of stellar evolution, and the incredible idea that even stars live and die. Unimpressive in visible light, Kepler's Supernova Remnant comes together like a jigsaw puzzle when four wavelength bands are combined. And in X-ray light, the Crab's central pulsar engine, one of the most bizarre objects in the Universe, shines brightly.



Ozone Publishing

Figure 3 – Cover: Front cover of book: Touch the Invisible Sky

Moving out to the realm of the galaxies, multi-wavelength views of the famous Whirlpool Galaxy bring out vastly different features, from the giant dust lanes to magnetic fields to the glow from X-ray binary systems that pepper the galaxy. Finally, to reveal the dynamism of the Universe at the largest of scales, the incredible turmoil of the Antennae galaxies is dissected to reveal the shocked star-forming regions, super-heated gas and sweeping hydrogen tails.

Noreen Grice designed the tactile images and teacher Ben Wentworth and the students at the Colorado School for the Blind evaluated the prototype tactile images. The book includes a foreword by professional mountain climber Erik Weinhenmayer, who describes his sense of discovery as the world's first blind person to climb Mt. Everest. Erik's frontiers widen as he climbs to new heights, just as our understanding of the Universe widens through previously unseen views.

Funding for the prototype of this book was by a peer-reviewed Cycle 5 education and public outreach grant from the Chandra X-ray Center to Dr. Mark Lacy of the Spitzer Science Center. Funds for publication were contributed by the Space Telescope Science Institute, the Chandra X-ray Center, the Spitzer Science Center and NASA's Origins and Universe Forums. TechnoBraille® acrylic overlay by Ozone Publishing, San Juan, Puerto Rico.

References

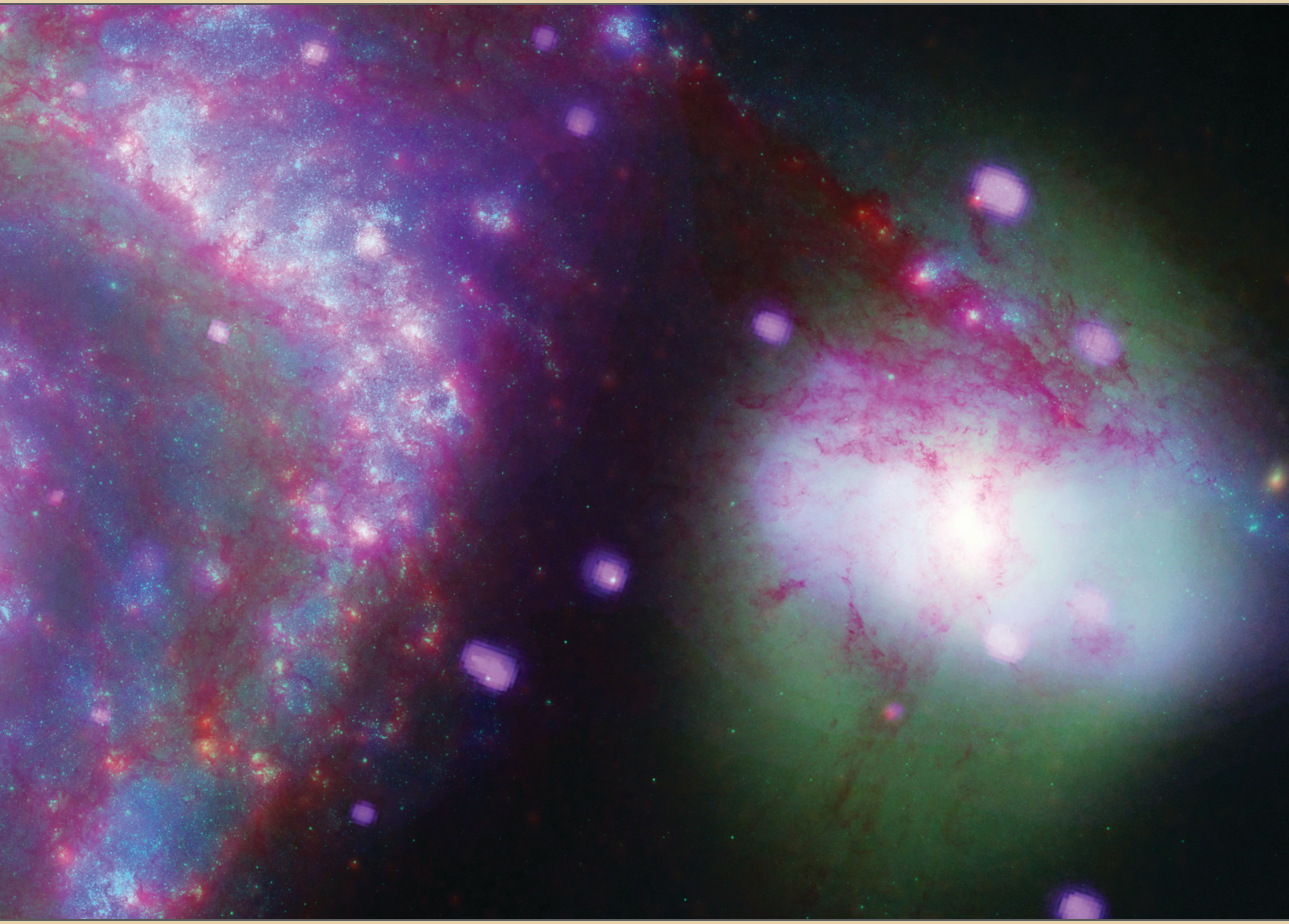
- Grice N. (2002), Touch the Stars. National Braille Press
- Grice N. (2002), Touch the Universe: A NASA Braille Book of Astronomy. Joseph Henry Press
- Grice N. (2005), Touch the Sun: A NASA Braille Book.
- Joseph Henry Press.
- Grice N. (2005), The Little Moon Phase Book (and El Libro Pequeno de las Faces de la Luna). Ozone Publishing
- Grice N., Steel S., Daou D. (2007), Touch the Invisible Sky: A Multi-Wavelength Braille Book Featuring Tactile NASA Images. Ozone Publishing
- Hurd D., Matelock J., Our Place in Space, Edinboro University of Pennsylvania.
- National Federation of the Blind, Astronomy Resources Web Portal www.blindscience.org

Credit: Sze-leung Cheung

Credit: X-ray (NASA/CXC/Wesleyan Univ./R.Kilgard); UV (NASA/JPLCaltech); optical (NASA/ESA/S. Beckwith & Hubble Heritage Team (STScI/AURA)); IR (NASA/JPLCaltech/ Univ. of AZ/R. Kennicutt)

M51, the 51st entry in Charles Messier's catalogue, is considered to be one of the classic examples of a spiral galaxy. At a distance of about 30 million light years from Earth, it is also one of the brightest spirals in the night sky. This composite image of M51, also known as the Whirlpool Galaxy, shows the majesty of its structure in a dramatic new way through several the work of space observatories. X-ray data from NASA's Chandra X-ray Observatory reveals point-like sources (pur-

Session 4
Planetariums



ple) that are black holes and neutron stars in binary star systems. Chandra also detects a diffuse glow of hot gas that permeates the space between the stars. Optical data from the NASA/ESA Hubble Space Telescope (green) and infrared emission from the NASA Spitzer Space Telescope (red) both highlight long lanes in the spiral arms that consist of stars and gas laced with dust. A view of M51 with NASA's GALEX telescope shows hot, young stars that produce lots of ultraviolet energy (blue).

Real-time data standards for the planetarium

Brian Abbott
American Museum of Natural History (abbott@amnh.org)

Abstract

The American Museum of Natural History and the Hayden Planetarium have built the most accurate, comprehensive, 3-D atlas of the cosmos called the Digital Universe (DU)[1]. The DU enables one to journey from the mountains on Earth to the farthest quasars. The DU enjoys many distribution channels, including pre-rendered space-shows and news bulletins, live planetarium programmes, and a free version available on the internet. Recently, we have partnered with three planetarium vendors to bring the DU to planetariums around the world. These partnerships necessitate the adoption or creation of standards for three-dimensional data and associated metadata. Many standards exist in the current Virtual Observatory framework and additional standards are being proposed as part of the VAMP programme. We intend to identify additional standards necessary for 3-D, real-time rendering tools for fulldome and flat-screen environments.

Introduction

The Digital Universe (Abbott et al., 2004b) is a scientifically accurate, interactive, 3-D atlas of the Universe created by the American Museum of Natural History (AMNH). The DU lies at the intersection of scientific knowledge and technology that exploits the power of visualisation. AMNH's strong academic partnerships ensure the continual growth and evolution of the DU for the future. By building various datasets into one self-consistent atlas, we provide a contextual environment in which to understand the Universe.

The DU enjoys many outlets for dissemination and distribution. Within AMNH, the atlas is showcased in our space-show productions, which in turn are distributed to dozens of institutions and seen by millions of visitors worldwide. The DU is also featured in AMNH's Science Bulletins news subscription service that reaches over three dozen institutions. In addition, we utilise the interactivity of the DU in Hayden Planetarium programmes, where we present the Universe with a live pilot and guide. And, of course, we offer the DU free on the web along with the open-source software Partiview (Levy, 2003; Abbott et al., 2004a).

In the past few years, we have focused on getting the DU into more planetariums. To that end, we co-developed Uniview via an internship programme with Linköping University in Sweden, from which SCISS, AB was formed to develop and distribute Uniview. We partnered with Sky-Skan, Inc.

[1] http://haydenplanetarium.org/universe/

in 2005 to integrate the DU into their DigitalSky system, which is now installed in Sky-Skan domes around the world. And recently, we have signed an agreement with Evans & Sutherland to do the same, which we expect will dramatically increase the number of DU-enabled domes.

Now that we have four different software viewers for the same data, it is necessary to place more emphasis on data management and delivery. Producing multiple versions of one dataset is inefficient and unmanageable. Furthermore, multiple delivery methods create a development nightmare for software engineers and data processors. We are looking to the astronomical community in general and the EPO community specifically for strategies and experiences in data format and delivery standards.

Existing standards

Currently, there are efforts underway to build standards for astrophysical data. They include the work of the International Virtual Observatory Alliance (IVOA), the Astronomy Visualization Metadata (AVM), and the Fulldome Standards Group. For the DU, we are in the process of choosing the best development path for us, whether we adopt existing standards, create our own standard, or find a middle-ground solution that involves using existing standards as our basis and creating a layer specific to our needs.

The most mature standards for astrophysical data today are those approved by the IVOA[2]. The IVOA was formed in 2002 and comprises Virtual Observatory (VO) projects from sixteen countries. The IVOA manages the development of standards for a range of data formats and access mechanisms. The most important recommendation for data formatting is the VOTable Format Definition (Ochsenbein et al., 2004), which was released in 2002 and revised in 2004. VOTable is an XML standard for the exchange of data represented as a set of tables and was derived from the FITS table format.

Another group (Hurt et al., 2007) is creating standards for the EPO community called the Astronomy Visualization Metadata (AVM)[3]. Their work involves developing metadata, or “tagging,” astronomical images making them accessible to software and on-line resources. Ultimately, these resources will be indexed in the Virtual Astronomy Multimedia Project (VAMP), which will provide a clearinghouse for EPO related metadata.

Even more specialised, the Fulldome Standards Group is developing guidelines for pre-rendered content for fulldome theatres. These include video and sound specifications, and image generation. While these may not seem related to DU standards, in the future we will need to be mindful of this work as pre-rendered and real-time content begin to blend together.

Standardising the Digital Universe

The DU has unique issues that fall outside the current specifications of the IVOA or AVM standards. These include DU-generated data and metadata, three- and four-dimensional (time-evolving) data and environmental settings.

[2] http://www.ivoa.net/Documents/
[3] http://virtualastronomy.org/

In order to maintain consistency between the various data in the DU, datasets are pre-processed then pass through a curatorial step before becoming part of the DU. This step may add data or metadata, thereby creating unique data attributes that differ from the original, published source. The most obvious example is the calculation of distance for our star catalogue, where source catalogues only publish a parallax value. An additional example is the 1.14 million 2MASS Redshift Catalogue, for which it was necessary to develop a density-based proximity factor so that we can see the denser regions (large-scale structure) through the field galaxies located in less dense regions. These added data are unique to the DU, and may not become part of the published dataset.

Beyond the pre-processing step, some data are not compatible with existing standards. Distance is the thorn in every astronomer's side; one object may have a dozen different distance values associated with it. Because distance is so difficult to determine, there has been little attention paid to including it in standards. Furthermore, the expression of distance in and of itself is challenging due to the vast scales in the Universe. We may want to use metres on one scale and megaparsecs on another.

Scale presents another unique data type for the DU. For each dataset, a scale specification is needed which, in turn, signals to the display software what scale to operate in. This is critical to the ability to explore a particular dataset effectively since it determines the flight speed.

Existing standards also do not address the problem of theoretical data. While the DU is mainly an atlas of observed data, theoretical and grid-based datasets will inevitably be utilised. These may include, but are not limited to, galaxy mergers, nebula evolution, stellar evolution, and cluster dynamics. While there are working groups for standardising theoretical datasets, these efforts have not yet produced an accepted standard.

Data delivery and distribution

Beyond data formats, data delivery standards are critical to the efficient distribution of the DU. Will we deliver the DU in bulk to the client? Will we stream it over the internet? Currently, we believe a hybrid solution involving each of these will be most efficient.

Two standards exist for image survey data. These are the World Map Service (WMS) and the World Coordinate System (WCS). The WMS produces maps and metadata invoked by submitting requests in the form of a Uniform Resource Locator (URL). The WMS operation returns a map with well-defined geographic and dimensional parameters accompanied by metadata and information about particular features shown on the map.

The WCS are keywords in the header of a FITS file that describe the relationship between pixel coordinates on the image and coordinates in the sky. Many of the large-scale survey projects, including the Sloan Digital Sky Survey, are including this information in their data, making it easy to stream these data directly from the source.

Appearance and presentation

Once we settle on a standard for data format and delivery, we will focus on the daunting task of standardising the appearance of the DU. Each of the four different software solutions render scenes differently. For example, the stars and Milky Way may appear too bright on one system and too dim on another. There are settings to accommodate these variations and, of course, this is also a function of the display system in each planetarium. However, companies who supply such systems typically have no more than a few standard systems for image generation.

Currently, we perform on-site quality control to ensure the atlas looks consistent and correct. This is time-consuming and expensive, but remains the most effective way to guarantee that the DU appears the same on all systems. In the future, it may be possible to build settings for each display system so that the quality control step is automated.

Conclusions

The Digital Universe (DU) is an interactive atlas of the Universe that allows one to travel from the mountains on Earth to the most distant objects known. In an effort to bring the DU to a world-wide audience, we are working with three companies who build and install planetarium systems: SCISS, AB; Sky-Skan, Inc.; and Evans & Sutherland. Working with three different companies produces data management and delivery challenges that can only be solved by the creation or adoption of data standards.

We plan to develop standards that will automate the process of reading and updating data from the DU. These may be informed by the efforts of the International Virtual Observatory Alliance and the Astronomy Visualization Metadata, but currently they are both insufficient for our needs. We seek cooperation from these groups to make the necessary amendments and recommendations to these existing standards.

References

- Abbott B.P., Emmart C.B., Levy S., Liu C.T. (2004), Visualizing and Analyzing Massive Astronomical Datasets with Partiview. In: Toward an International Virtual Observatory: Proceedings of the ESO/ESA/NASA/NSF Conference Held at Garching, Germany, 10–14 June 2002. Springer, Berlin, pp 57–61
- Abbott B.P., Emmart C.B., Wyatt R.J. (2004), Virtual Universe. In: Natural History. April 2004, Volume 113, Number 3, pp 44-49
- Hurt, R.L., Christensen, L.L., Gauthier, A., Wyatt, R., Berriman, B. (2007), Get the Picture: The Virtual Astronomy Multimedia Project. American Astronomical Society Meeting 210, #05.05.
- Levy S. (2003), Interactive 3-D visualization of particle systems with Partiview. In: Makino, J. and Hut, P. (eds.) Astrophysical Supercomputing using Particle Simulations, IAU Symposium #208. Astronomical Society of the Pacific, San Francisco, pp 343-348
- Ochsenbein, F., Williams, R., Davenhall, C., Durand, D., Fernique, P., Hanisch, R., Giaretta, D., McGlynn, T., Szalay, A., Wicenec, A. (2004), VOTable: Tabular Data for the Virtual Observatory In: Toward an International Virtual Observatory: Proceedings of the ESO/ESA/NASA/NSF Conference Held at Garching, Germany, 10–14 June 2002. Springer, Berlin, pp 118-123

Exploring the Cold Universe — A planetarium show for the IYA2009

Henri M.J. Boffin[1] & Agnès Acker[2]
[1] ESO(hboffin@eso.org)
[2] Observatoire de Strasbourg & APLF (acker@astro.u-strasbg.fr)

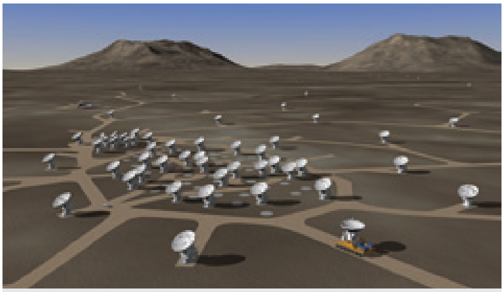
Abstract

ESO and the Association of French-speaking Planetariums are currently developing, in the framework of the International Year of Astronomy, a new planetarium show centred on the ALMA international astronomical project. The show, available in three formats and several languages, will allow the public to participate in a unique international project, whose main aim is to probe our cosmic origins by exploring the invisible part of the spectrum.

A new show

As part of a wide range of education and public outreach activities for the International Year of Astronomy 2009 (Pierce-Price et al., 2007), ESO[1], the European Organisation for Astronomical Research in the Southern Hemisphere, is presently collaborating with the Association of French-speaking Planetariums[2] (APLF) and other partners in Europe to produce a new planetarium show, of a duration of 30 minutes. This builds on the experience already gained by the APLF to produce unique planetarium shows at the European level. The APLF, born in 1984, but officially created in 1989, coordinates the operations of about 50 planetariums, totalling about 1,300,000 visitors per year in France. As member of the International Planetarium Society (IPS), the APLF has also established close links with planetariums from many other countries.

In 2001 the APLF produced, in collaboration with the French space agency CNES, a show about the Earth as seen from space, while in 2002, with ESO, it made a show for the 40th anniversary of ESO about the “Mysteries of the Southern Sky”, celebrating the VLT’s performance. Both shows featured in around 40 planetariums it in France, Germany, Belgium, Italy, Spain, etc. About 30 planetariums in several countries have already agreed to present the new show. The show will be available for



Credit: ESO

Figure 1 – ALMA will comprise initially 66 antennas to observe the sky in the millimetre and sub-millimetre wavelength domain.

[1] http://www.eso.org
[2] http://www.aplf-planetariums.org
[3] http://www.eso.org/public/astronomy/projects/alma.html

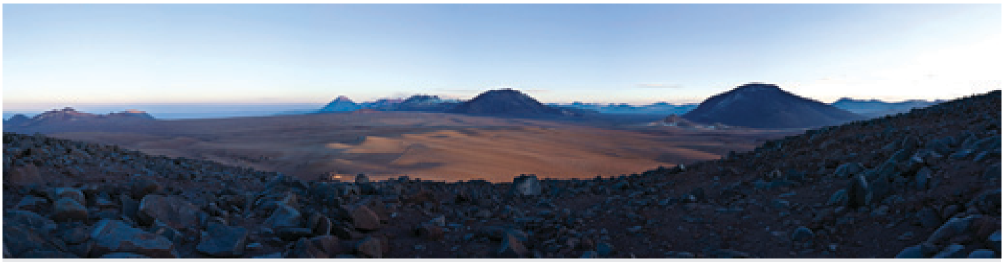


Figure 2 – The Chajnantor plain, at 5000 m altitude in the Chilean Atacama Desert, will host an array of 66 antennas.

viewing from autumn 2008 — in order to be included in the school programmes — and officially inaugurated early 2009.

The ALMA project

ALMA[3] stands for Atacama Large Millimeter/submillimeter Array, and is without any doubt one of the largest ground-based astronomy projects of the next decade. It is presently being built on the 5000-m high plateau of Chajnantor in the Chilean Atacama Desert. This is higher than the highest summit in Europe, and yet astronomers are now building a fantastic facility to explore the Universe there! And not a small one. ALMA consists of two arrays. The first contains 50 antennas 12 m in diameter whose signals are combined electronically to achieve unprecedented resolution and sensitivity. The second, so-called Compact Array, consists of four 12 m and twelve 7 m antennas. The whole array is fully reconfigurable and the antennas can therefore be moved from a compact configuration where all the antennas are packed in a region about 150 metres in radius, to a very wide configuration, with antennas as far as 18 km from the centre of the array.

And in the same way that we need to combine many antennas to achieve the best results, ALMA can only exist because it is an international endeavour that covers four continents. ALMA is a partnership between East Asia — Japan and Taiwan, North America — the US and Canada, ESO for Europe, and Chile as the host country. The construction of ALMA started at the end of 2003 and has progressed very well since then. The first antennas arrived this year — five are already at the base camp — and the first science with a reduced array will begin in 2010, while the full array will be completed around 2012–13.

ALMA is not only a matter of scientific prowess; it is also a technological challenge. With the correlator at an altitude of 5000m, this is certainly the highest high-tech installation in the world. At such a high altitude there is only 50% of the oxygen available at sea level, which puts a heavy load not only on the people working there, but also on the material and equipment. Moreover, the conditions in this desert can be extreme, from very hot to freezing cold.

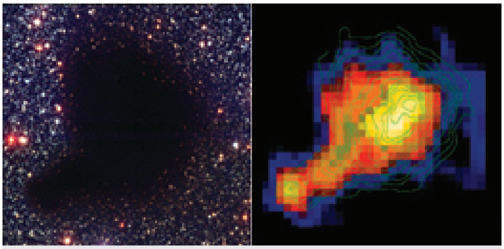


Figure 3 – Millimetric observations allow astronomers to probe the coolest objects in the Universe, where stars and planets form. A cloud of gas and dust is opaque to visible light (left), hiding its secrets, while with observations in the millimetre wavelength range, astronomers can see how stars form.

Credit: CNES/HST/ESO/APLF

Figure 4 (a-b) – APLF European productions in 2001 and 2002.

The 115-ton antennas need to be moved regularly, which calls for the use of transporters that have the equivalent of two Formula 1 engines and weigh 130 tons, but still can, with the help of a laser system, place the antennas with a precision of a few millimetres.

ALMA is working in the millimetre-submillimetre (mm/submm) wavelength domain, to probe the coolest objects in the Universe. Light at these wavelengths shines from vast cold clouds in interstellar space, at temperatures only a few tens of degrees above absolute zero, and from some of the earliest and most distant galaxies in the Universe. Astronomers can use it to study the chemical and physical conditions in molecular clouds — the dense regions of gas and dust where new stars are being born. Often, these regions of the Universe are dark and obscured in visible light, but they shine brightly in the millimetre and submillimetre part of the spectrum. ALMA will provide scientists with detailed images of stars and planets being born in gas clouds near our Solar System. It will also detect distant galaxies forming at the edge of the observable Universe, which we see as they were roughly ten billion years ago. ALMA will provide a window on celestial origins that encompasses both space and time, providing astronomers with a wealth of new scientific opportunities. Current mm/submm telescopes have already led to many discoveries — but compared to ALMA, these were only the tip of the iceberg. ALMA, with its incomparable power, both in terms of sensitivity and spatial resolution, will really open a new window on our cosmic origins.

A fruitful collaboration

The new planetarium show's emphasis is the incomparable scientific endeavour that the ALMA project represents and the technological challenges scientists are solving to address the quest for our cosmic origins. The show will be available at three different levels: fulldome video, AllSky immersive projection and video windows, and image projection and video window for the smaller planetariums. It will be available to all planetariums worldwide for a very small fee, depending on the type of planetarium, to cover basic costs.

ESO is responsible for the scientific data and the validation of the storyboard, providing visual elements such as images, computer simulations and videos, providing the associated documents, producing a Chilean version, and financially supports the project. The APLF is in charge of making the storyboard, producing the show in the three formats and five languages, and is responsible for the promotion, duplication and distribution in France and in Europe. We also have an agreement with the German Planetarium of Augsburg to produce a German version, while others will most probably make Italian and Portuguese versions.

As far as the scientific content of the show is concerned, the emphasis will be on what ALMA will study, such as the analysis of distant galaxies and the study of the cold Universe, that is, the formation of stars and planets and looking back at our cosmic origins.

More specifically, the content describes how ALMA is an amazing instrument, doubling as a time machine, that allows astronomers to be a modern version of explorers seeking knowledge. The unique setting of ALMA in the Atacama Desert at an altitude of 5000 m is also emphasised, as well as the difficulty of building something in such a remote, inhospitable place. A rainbow analogy is made to explain the extent of the electromagnetic radiation, and the place of millimetre wavelengths between visible and radio waves. This is then linked to the use of ALMA to study the most distant galaxies — the first to have emerged from the Big Bang — as light is redshifted by huge amounts. Another analogy shows how millimetre radiation is an invisible form of light, extending its role to study clouds of gas and dust where stars and planets form but which are opaque to visible light.

In summary, ESO and the APLF strive to produce a spectacle of high quality, both technically and scientifically, in seven languages, that will not only be part of the IYA2009 programme, but will also be related to educational and outreach activities. Concerning education, the show will be associated to an ALMA Interdisciplinary Teaching Project ESO is currently developing, while the outreach activities are part of the ALMA EPO International Working Group's remit (Adams et al., 2007). All in all, it is our aim to have a spectacle that is attractive to everyone, from 7 to 77 years old.

References

- Adams M., Boffin H., Garnier W., Iono D. (2007), The Global ALMA EPO Programme: Communicating Astronomy with the Public at Millimetre and Submillimetre Wavelengths. This volume.
- Pierce-Price D., Madsen C., Boffin H., Argandoña G. (2007), ESO Education and Public Outreach for IYA2009. This volume.

Astronomers for one night: When a telescope enters a planetarium dome

Gianluca Masi[1,2], Gabriele Catanzaro[2], Giangiacomo Gandolfi[2], Stefano Giovanardi[2] & Vincenzo Vomero[2,3]

[1] The Virtual Telescope Project, Italy (gianluca@bellatrixobservatory.org)

[2] Planetario di Roma, Italy

[3] Musei Scientifici della Sovraintendenza Comunale di Roma, Italy

Abstract

While sharing the astronomical experience with our public at the Rome Planetarium, we tried to transform the dome into a real observatory. For this purpose, we used the Virtual Telescope – a remote, fully robotic observatory – with an astronomer on site. This way, it was possible to blend the atmosphere of the planetarium with the typical environment where astronomers work: the former was used in concert with the observing facility, with the remote astronomer guiding and explaining the observing session. Each observation was previously introduced under the dome, hunting for the right corner of sky, before switching to the telescope. We have had very positive feedback from our visitors, who enjoyed the excitement of a typical night at the telescope. Images were also properly enhanced live, to show and explain the benefits of image processing. Whenever possible, we have chosen last-minute targets (like newly discovered comets and near-Earth asteroids) or true astrophysical targets (like fast variable stars), to reinforce the return of such a live experience. In this work our approach, the format of the show, the techniques and the feedback from the public are presented and discussed.

Introduction

Doing and communicating astronomy in our technological era is a very exciting experience. Plenty of tools are available to explore this fascinating science fully, to leave our planet and discover the wonders of the Universe. While the many and marvellous accomplishments of this science itself are continuously attracting people of any age and any nationality, the ancestral view of the sky at night is still unsurpassed in both its charm and beauty. This is the ground that scientists are probing each night with their powerful instruments, to unveil the secrets of the cosmos, eventually answering its intriguing questions. Besides science, many meanings, such as cultural, historical and ethnological meet each other “up there”. It is not easy to merge all of them with science, but, it is a challenge we can try to face with modern technology. First of all, we need to recover all the elements involved.

It is well known that the real sky is slowly disappearing. Most people living in urban areas can see just a few tens of stars, completely missing the ancient actors up there, the constellations. While they can experience a dark site from time to time, the sky is no longer an obvious part of our lives.

A planetarium is often the only place where people can meet the stars again, as, even in a very light polluted city; it can promote the protection of the natural sky and the recovery of the feeling of enchantment and discovery. By properly blending the available contents and technology, a planetarium can offer an amazing, immersive experience that carries the contents and meanings of modern science.

The next, natural step would be to bring the feeling of real research under the dome: in short, to share the experience of astronomers with the public. While people can easily enjoy reading or hearing about the latest discovery, we are often left without the right perception of the efforts needed by modern science to reach a given result. We have tried to fix this, blending the benefits of two technological resources, the Planetarium of Rome and the Virtual Telescope Project, to go beyond the virtual sky.

Rome Planetarium

After being shut down for more than 20 years, the Rome Planetarium[1] re-opened to the public in May 2004 with a completely new set up. The modern planetarium is hosted at the Museo della Civiltà Romana, in the EUR district of Rome.

The dome is 14 metres in diameter and the projector is a RS Cosmos SN95, showing a very realistic sky with 4,500 stars. Two sets of fulldome diapo projectors and three digital projectors complete the equipment; a total of 98 ergonomic seats are available, see Figure 1. Since it opened the planetarium has been great success with the public. Each year, it hosts about 100,000 visitors of all ages, with special attention to students; it is very popular with children as well.

There are a wide variety of programmes on offer: to date, about 60 different shows, mainly live lectures, with a few automatic shows and special live, interactive ones for children. Special observing sessions are organised for important astronomical events (eclipses, comets, occultations, planetary oppositions, space missions and discoveries). The Planetarium also offers a series of monthly talks, hosting a leading scientist in a given research field. Since its new opening, the Rome Planetarium has participated in all the annual "Notte Bianca" events, hosting about 10,000 visitors on each occasion. We adopted a particular approach to exploring astronomy under the dome, fine-tuning the scientific content and properly interspersing it with artistic elements. For a complete account of our philosophy, please see Gandolfi et al. (2005).


Planetarium of Rome

Figure 1 – Inside the dome of the Planetarium of Rome before of a public event.

The Planetarium also contains an Astronomical Museum, which occupies seven rooms

[1] http://www.planetarioroma.it

and is inspired by three key themes: space, time and the origin of the elements. The visitor is taken on a journey from the Earth to the distant Universe and back, crossing the Solar System and the nearby stars, using 3D models. Dioramas of the Moon and of icy Europa emphasise the immersive feeling of the environment, while several multimedia positions help in the understanding of a key process of the place where the visitor is situated.


Planetarium of Rome

Figure 2 – The Orrery inside the Astronomical Museum, showing the motion of the Earth, Moon and eclipses.

The Virtual Telescope Project

The Virtual Telescope Project[2] consists of a remote observing facility hosting several robotic telescopes, fully accessible on the internet. It is installed in Ceccano, Central Italy, about 100 km south of Rome. It was founded by G. Masi in 2006 and since then it has enjoyed a rewarding success. The Virtual Telescope Project provides a complete setup for real-time astronomical observations, including instruments for both research and “aesthetic” imaging. True colour, as well as narrow-band imaging, is possible. During the observing session, the user can control every parameter, which makes the Virtual Telescope a unique facility.

The primary telescope is a C14 optical tube assembly (diameter 355.6 mm and 3910 mm of focal length, typically used at f/6) installed on a Paramount ME robotic mount, from Software Bisque.

At the primary focus there is a SBIG ST8-XME, high efficiency CCD camera, as well as a motorised filter wheel. Filters for standard photometry and colour imaging are available. The secondary telescope is a C11 optical tube (diameter 279.4 mm and 2800 mm focal length, typically used at f/5) and it is installed on a robotic New Atlux mount, from Vixen. The imaging instrumentation consists of a SBIG ST8-XME, high efficiency CCD camera equipped with a motorised filter wheel, equipped with filters for colour and narrow-band imaging. In the near future this telescope will be upgraded and will become an exact twin of the C14.

A high quality Fluorite refractor and a solar, H-alpha telescope complete the available instrumentation are also available. The Virtual Telescope has served 35,000 images to more than 400 users since its launch, while its website has been surfed by more than 160,000 individual visitors. It has contributed to many scientific projects, including the co-discovery of two exoplanets. To learn more about the Virtual Telescope Project and how to use it, please refer to Masi (2007).

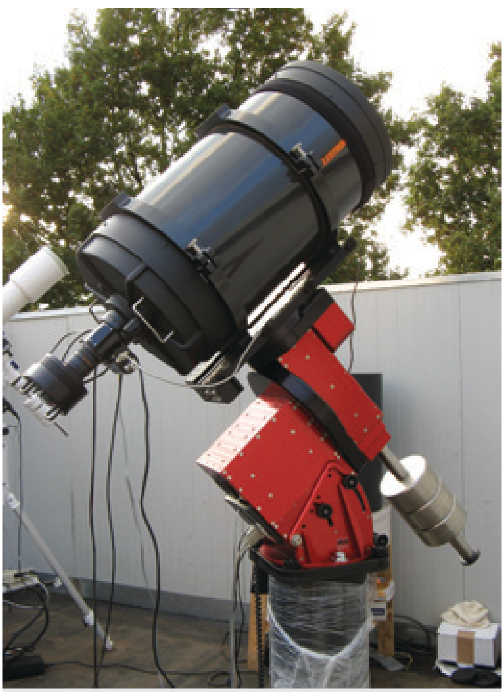
[2] http://www.virtualtelescope.eu

Beyond the virtual sky: Astronomers for one night

As mentioned earlier in this paper, at the Rome Planetarium we were keen to enrich the experience under the dome, carrying the meaning and the efforts of modern research as well as its discoveries and results. We had previous experience with our live show "Southern Skies", where we introduced real-time observations of the celestial bodies, imaged remotely using a telescope located in Chile. The public found this fascinating, actively asking for other similar experiences. We were motivated to take another step: to share with the public the work of an astronomer in his/her observatory, inviting visitors to "be astronomers for one night" (*Astronomi per una notte* is the title of the show)!

We decided to leave the astronomer at the remote site, connecting with him by video conference, so that the public could see him in his own environment. The astronomer would discuss his work with the host in the planetarium and explain what he is doing, how and why, using the proper scientific language in the process. The goal is to bring the feeling of performing actual research to our guests, including unpredictable side effects such as weather changes, wind, schedule variations, noise, etc.

We mixed the Virtual Telescope features with the peculiarities of the virtual sky. After discussing the work the astronomer at the observing site is doing and the best targets available, the public is guided to the right corner of sky using the planetarium. After this, we go back to the remote observatory, slew the telescope to the target, following its movement through a webcam, and finally try to capture real-time images. It is important to note that the telescope can be controlled both by the planetarium staff (in principle, by anyone in the audience) and the remote astronomer.



Gianluca Masi

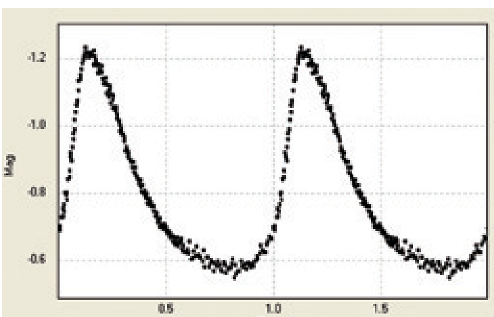
Figure 3 – The primary telescope unit of the Virtual Telescope. A C14 OTA in installed on a robotic Paramount ME mount, while a CCD camera is at the telescope focus.

Images are shared in real-time, as soon as they are downloaded from the CCD camera, with all their artifacts and noise, without any processing. The astronomer comments on each image; what it tells us about the nature of the observed object; continuously interacting with the staff at the planetarium to make each step clear to the public. Then the astronomer calibrates the image and the object can be seen at its best. He also does some quick image processing, to show how a single image actually contains lots of information: something that is not obvious to the public.

We try to focus especially on objects like bright near-Earth asteroids, comets and so on that are visible at the observing time, what we call *The Astronomical Chronicle*. Of course we also include galaxies and clusters but we prefer to share targets with an easily visualised astrophysical meaning, clearly showing the sense of time and evolution. After all, we want everybody to be an astronomer for one night, not a mere viewer! Our goal is to spy evolving and/or moving objects (like those above, plus fast variable stars), to exploit the meaning of time and reject the feeling of an immutable Universe or a sky that changes beyond our ability to witness it. We find it interesting to share how the 3D structure of a body (i.e. an asteroid) can be modelled even if it is just a dimensionless, point-like source, showing no details, and the benefits of true-colour imaging, by combining RGB frames. But we never forget that we are in a planetarium and so, each object is properly placed in its celestial frame on the dome. To strengthen the experience, we also invite the public to propose a target to observe or to question the remote astronomer.

Examples

We would like to show a few examples taken from recent performances of the show *Astronomi per una Notte*. Figure 4 shows the light-curve of the variable star CY Aqr. The star produces a regular cycle and strong variation in just 90 minutes, which is the length of a football match! Figure 5 shows the passage of the potentially hazardous asteroid 2006 RZ, moving very fast against the starry background. Figure 6 finally shows how colour images are assembled. The entire sequence of telescope pointing, imaging and image processing is performed live in the show.



Gianluca Masi

Figure 4 – The light-curve of the CY Aqr variable star, showing a complete cycle after only about 90 minutes.Oct. 2006. The asteroid appears as a trail, as it was moving fast against the stars.

Gianluca Masi

Figure 5 – The potentially hazardous asteroid 2006 RZ, grabbed on 5 Oct. 2006. The asteroid appears as a trail, as it was moving fast against the stars.

During the last *Notte Bianca* (September 2007), we installed a telescope in the square outside the planetarium showing the variable star V455 and, at that time, a primary astrophysical target. It was visited by more than 13,000 people.

Discussion and Conclusions

After about 18 months of experience with this format we can try to draw some conclusions. The (virtual) presence of a telescope is an obviously fascinating factor: every time we offer the *Astronomers for One Night* show (about ten occasions so far), we have been strongly overbooked, even during less popular periods (like in summer, with many people on holiday). Quite surprisingly, we see that visitors are generally satisfied even when the sky is cloudy. In these cases, while continuing to monitor the weather with the public, we reproduce the whole observing experience working with backup material. The use of previously re-

Figure 6 – A true-colour picture of the Orion Great Nebula (M42) is finally obtained by assembling RGB images

Gianluca Masi

corded images is declared: after all, clouds are part of the game. People are somewhat surprised to learn that a given setup on the telescope is not able to get good views both of deep-sky objects and planets. After surfing nebulae and clusters, they usually ask to see fine details of the Moon, Saturn and so on, discovering that substantial changes to the set up would be necessary: another way to "see" the differences among astronomical objects and instruments.

We have often received spontaneous feedback from the public, and they said they liked the experience, as they touched the world of real astronomical research, which adds to the value of the planetarium experience. Accordingly following some other suggestions, we will try to increase the realism, even asking the public (and not only the planetarium staff) to slew the telescope directly to its destination. In conclusion, we regard the results and the emotional, scientific and cultural return of the Virtual Telescope-Planetarium combination as very encouraging for an innovative approach to planetarium shows.

Acknowledgements

The Virtual Telescope technology is powered by Software Bisque and Santa Barbara Instrument Group (SBIG). We thank A. Altamore for presenting the talk in Athens.

References

- Gandolfi G., Catanzaro G., Giovanardi S., Masi G., Vomero V. (2005), How to Tell Science under the Dome while Preserving the "Enchantment". In: Robson I., Christensen L. L. (eds.) Communicating Astronomy with the Public 2005: Proceedings from the ESO/ESA/IAU Conference 14–17 June 2005.
- Masi G. (2007), The Virtual Telescope Project: Frequently Asked Questions, http://virtualtelescope.bellatrixobservatory.org/vt_faq.pdf

Planetariums — New tools for a greater impact

António Pedrosa & Marco Silva
Navegar Foundation, Centro Multimeios de Espinho (apedrosa@multimeios.pt, marco@multimeios.pt)

Abstract

The International Year of Astronomy will be a celebration of astronomy. Planetariums will definitely be one of the major vehicles used to transmit its message. The digital technology that is now becoming available to planetariums will bring an enormous change to how planetariums work and to the possibilities and impact of the message they transmit.

The Espinho Planetarium, managed by the Navegar Foundation, has been dedicating its efforts to different areas of digital planetariums, including content creation and the development of software tools. In particular we would like to present two tools that have been developed recently for pre-rendered content production. We would like also to present a new tool, dedicated to test content under production and to perform real-time presentation of shows in the planetarium, integrating real-time sky simulations and the display of pre-rendered content.

Introduction

The new millennium has brought a revolution to the planetarium world. Systems that can project digital footage filling the entire dome have become available. This revolution has, in turn, generated new challenges, one of which is the need for new content creation tools. Tools to handle digital content in cinema or on TV have been available for quite some time. However the fulldome paradigm is, in several aspects, quite different from cinema and TV, mainly due to the nature of the projection screen. To tackle this problem, plugins have been created to add new features to pre-existing digital tools, so as to be able to handle or produce dome content without the need to create an entirely new tool.

Another important requirement is the need to test content. Usually content is created and managed in a 2D projection of the sphere in the plane, which gives a good notion of the result, but can be misleading in many important aspects, due to the extremely wide image field involved. A testing tool that visualises content on a computer screen can also be designed to offer an easy and simple solution for small and portable digital planetariums, based on a single projector.

Fulldome, a composition tool for spherical environments

One of the main tools needed to handle digital video is a composition/editing tool. In traditional digital video the input footage that is processed and the final result are of the same type. Usually they have the same rectangular aspect, and apart from possible special effects, no image distortions are involved. For fulldome, this is often not the case. The footage that is being composed is usually in standard format (recorded with a video camera or created using a standard camera in animation software), and both the compositing window and the final result are a projection of the spherical screen in the plane, usually a fisheye projection, see Figure 1.

A tool, called the FullDome plugin[1], was designed to handle all the different aspects of dome content compositing/editing in the form of a plugin for Adobe After Effects[2]. Besides being able to distort the content to adapt for the curved surface screen, the software is able to place the footage in a specified position on the dome, now defined in terms of altitude (reference is the spring line) and azimuth (reference is North). A set of astronomical features is available that enable the precise location on the celestial sphere to be set, as well as simulating many astronomical phenomena. Although conceptually, the hemispherical surface tends to be more difficult compared with the traditional flat screen, the use of the plugin is very intuitive. The user imports content to the composition, sets up all the necessary parameters associated with the kind of input footage used, such as place and size.

All figures courtesy of the authors

Figure 1 – A fulldome frame in Fisheye and Cylindrical projection.

WFCam4D — A wide field camera for Cinema4D

Producing content using animation software involves taking a sequence of images or a movie obtained by a camera available in the software. The types of cameras available are of a standard type and are intrinsically limited to a usable field of view that is not much in extent of 100 degrees. To render images involving a very large field of view (FOV), the usual procedure is to set up a rig of six cameras, pointing front, back, left, right, up and down, with a FOV of 90°, see Figure 3. The six images are then combined to create a single image that fills the entire FOV.

A plugin for the animation software Cinema4D[3] was designed to avoid all the intermediate steps, obtaining a single wide field image immediately. WFCam4D[4] simplifies the production phase considerably, and the images can fill the entire 360° by 360° FOV, see Figure 2. Many different types of image projections are available, including fisheye, orthographic, stereographic and others.

[1] http://fulldomeplugin.multimeios.pt
[2] http://www.adobe.com/products/aftereffects
[3] http://www.maxon.net
[4] http://WFCam4D.multimeios.pt

Figure 2 – A render of a scene using WFCam4D showing a full 360º field of view, in Fisheye and Aitoff projections.

Figure 3 – A 3D view of the projection in the planetarium, as seen from the dome centre.

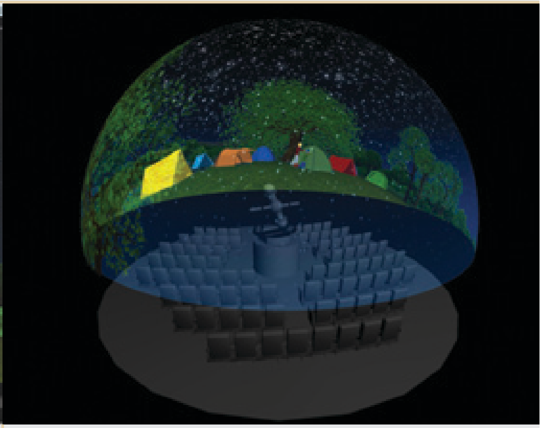


Figure 4 – A 3D view of the projection in the planetarium, as seen from outside. A planetarium model was added for a more realistic view.

DomeView, software to view and preview dome content Goals

The content produced for fulldome projection is made in a frame (the Master) with a format corresponding to a projection of the dome on a plane. The standard is the fisheye projection, see Figure 1. Due to the distortions involved, looking at the Master does not give a clear idea of the final result once projected on a planetarium dome. One of the solutions is to use different Master projections, like those in Figure 1, or to go through an interactive process, with successive projections on a planetarium until the desired result is achieved. Repeated access to a planetarium is difficult, costly and time consuming. So a tool was designed to give the user a clear notion of the final result in the planetarium directly at the desktop.

Capabilities

DomeView[5] is a real-time tool designed to view and preview dome content. For previewing, DomeView displays the content projected on a spherical surface, like a planetarium dome, in 3D, see Figure 3. The viewing position can be changed, just as a spectator can change seats in the planetarium or even see the scene from outside the planetarium. A model of a planetarium can be

[5] http://domeview.multimeios.pt

added for a more realistic view, see Figure 4. The inclination can be set so the system can cope with many modern planetariums. This software is able to display the entire dome up to 360º.The viewing feature displays the content in a 2D projection of the dome and supports the projection in a dome using a single video projector, fisheye for example. The content can also be viewed in a spherical mirror projection. This enables a fulldome projection to be done in a planetarium using a regular projector and a spherical mirror, see Figure 5.

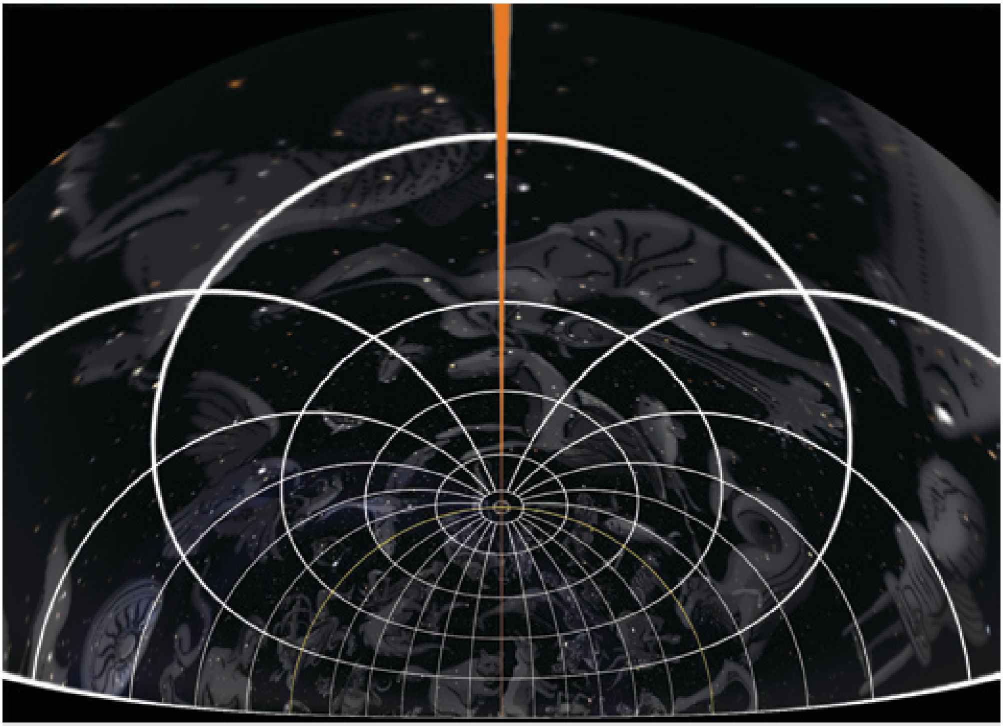


Figure courtesy of the authors

Figure 5 – A scene generated by Stellarium, distorted using the Spherical Mirror projection.

Content

DomeView handles video and images of different types. The content can also arrive directly from third party programs, such as Adobe After Effects, Adobe Photoshop, the free open source planetarium Stellarium or a webcam. The media content is displayed according to the selected location in the dome, size and projection. If the media source is the FullDome plugin under Adobe After Effects, all options are disabled since the media is configured automatically.

Features

The software has many features that makes it highly versatile, and suitable for several different uses:

- 3D previewing:
    - Spherical View, where the content is projected on a sphere.
    - Cylindrical View, where the content is projected in a cylinder.
    - 3D model imports, e.g. a planetarium model.

In the planetarium mode model, the viewing position can be chosen freely, both inside and outside the dome/cylinder.

- 2D viewing:
    - Fisheye projection, to project content in a planetarium using a fisheye projector.
    - Standard Projection, to project content in very small (1–2 m) domes using regular projectors.
    - Spherical Mirror Projection, to achieve fulldome projection in a planetarium using a regular projector and a spherical mirror.

DomeView accepts different types of media content, videos (.mov, .wmv, .avi, mpg, mpeg, etc) and images (.jpg, .gif, .bmp, .tga). It can also handle content arriving in real-time from other sources, such as Adobe After Effects, Adobe Photoshop, Webcam and Stellarium. It is hyperdome ready, being able to display content in dome with a spherical angle of up to 360º.

Conclusions

We have presented a set of tools that have been developed by the Navegar Foundation, dedicated to fulldome applications. They cover different areas, from production to projection, and, although powerful, they are simple to use, requiring only a simple notebook, meaning that the user can concentrate on what's most important, the content itself.

Credit: Sze-leung Cheung

Using still photography to make fulldome time-lapse movies

Kirk Pu'uohau-Pummill
Gemini Observatory (kpummill@gemini.edu)

Abstract

This paper presents a demonstration of, and a technique for, creating high-resolution, fulldome time-lapse movie content for planetariums using a Canon 1Ds Mk II digital camera. The objective is to produce educational content for planetariums, including those using state-of-the-art 4K x 4K digital mono and stereo 3D-projection systems. The finished movies show the operation of the Gemini telescopes as seen from the observing floor over the course of a night.

Introduction

A high-resolution camera that can shoot RAW file format is set up with a 180° fisheye lens. The camera used here is a Canon EOS 1Ds Mk II with a Sigma 8 mm circular image fisheye lens. A laptop computer controls the camera and stores the downloaded images. The camera shutter is set to the "bulb" setting and the exposure duration and frequency are controlled by an intervolometer. The exposure sequence begins at sunset and runs automatically via the laptop for the entire night. The individual exposure time is set to about 50 seconds in every 60 seconds.

All the images are archived using Adobe Bridge© before any editing is done and the file names are changed to reflect site, project, date and any other valuable information or metadata that might be helpful in retrieving a file at some future date.

The renamed RAW files are opened from Bridge into Adobe Camera RAW© (ACR), an Adobe PhotoShop© plug-in. The RAW files are fine-tuned within ACR, including making any correction for chromatic aberration. Chromatic aberration is a particularly vexing problem for the extreme wide angle or fisheye lenses used in this kind of project.

Once the images are adjusted in ACR, they are opened in Adobe PhotoShop© via ACR. Once in PhotoShop© an action or script is created to automate any further work. The new image file is saved to a new directory via the action and the finished movie will be made from this file using QuickTime Pro or another more sophisticated program depending on the final need.

Sample movies can be found online at:
www.gemini.edu/index.php?option=com_gallery

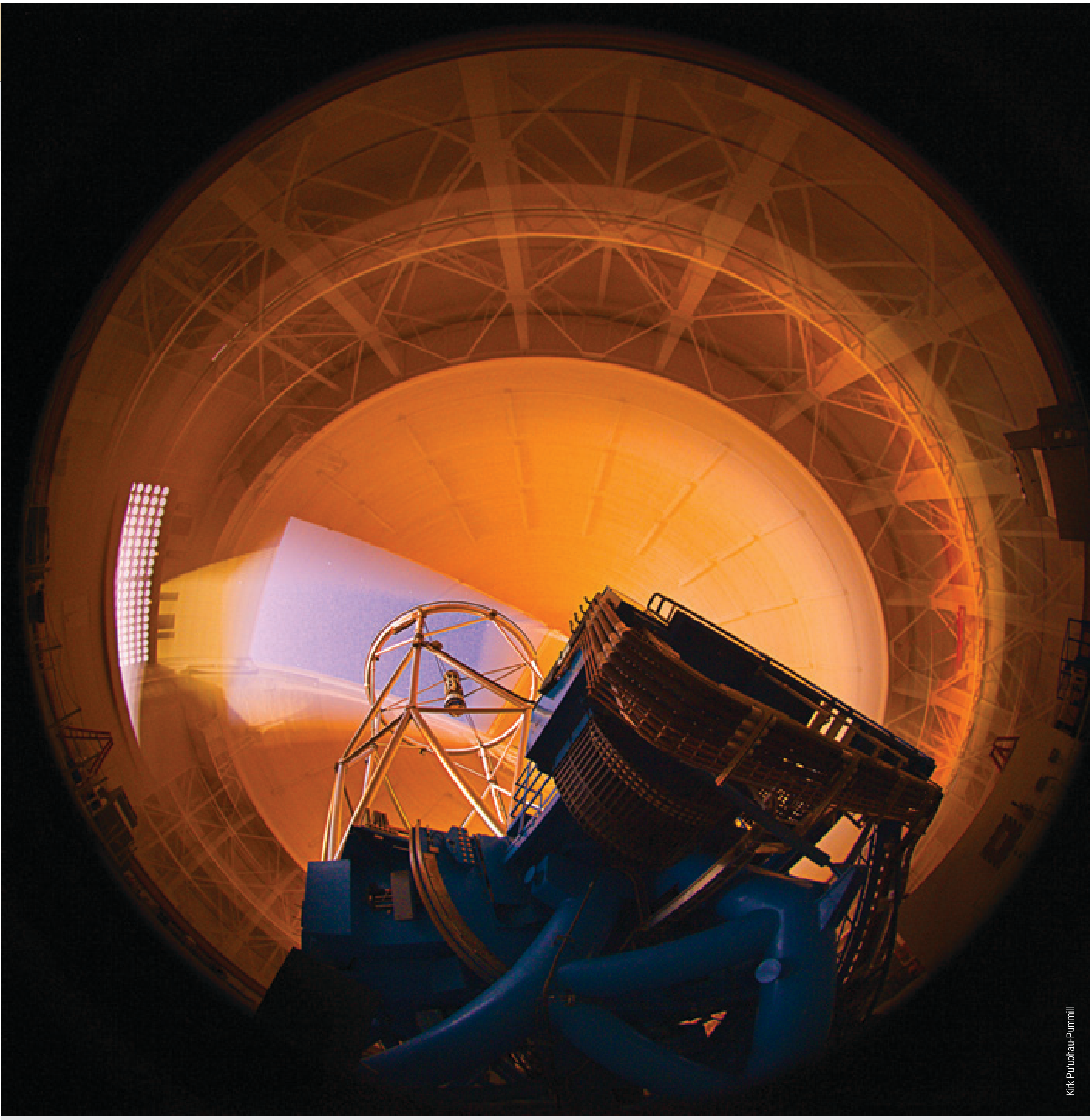


Figure 1 – The Gemini telescope seen from the observing floor.

UNIVIEW: A computer graphics platform bringing information databases to life

Jan Warnstam
SCISS AB (jan@sciss.se)

Abstract

Uniview is a PC-based software platform for three-dimensional exploration of the Universe and the visualisation of information that is located at any position in this Universe, be it on the surface of the Earth or many light-years away from home. What began as a collaborative project with the American Museum of Natural History[1] in New York in 2003 has now evolved into one of the leading visualisation platforms for the planetarium and science centre market with customers in both Europe and USA.

Three key values

Uniview[2] is focused on three key values – usability, flexibility and scalability. These stem from a standardised mouse-driven user interface based on normal Windows components and a hierarchical object structure. Flight paths can be recorded and played back and events can be scripted using the built-in scripting language. Uniview can render frame-by-frame output to most standard formats in order to facilitate show production for fulldome, cinema or television. Using the power of the ScaleGraph technology Uniview can visualise data in many different scales, from earth science and regional GIS data to large scale structures and cosmology, increasing the usability of the display venue. Uniview can be run either on a single PC or by a large scale cluster solution. Also, the system allows for remote collaboration and shared experiences between display venues, schools and field experts, using the Octopus networking toolkit.

Key points

In this specific presentation we want to highlight two main feature sets – the support for GIS (Geographic Information System) data via the widely used KML format, originating from the Google Earth[3] community, and also we have introduced a new volumetric model of our Milky Way galaxy.

GIS

We start by demonstrating a dynamic sunrise, possible thanks to an advanced atmosphere model coupled with high resolution Landsat[4] satellite data and elevation maps (streamed via WMS[5], Web

---

1 http://www.amnh.org/
2 www.scalingtheuniverse.com
3 http://earth.google.com/
4 http://landsat.gsfc.nasa.gov/
5 http://www.opengeospatial.org/standards/wms

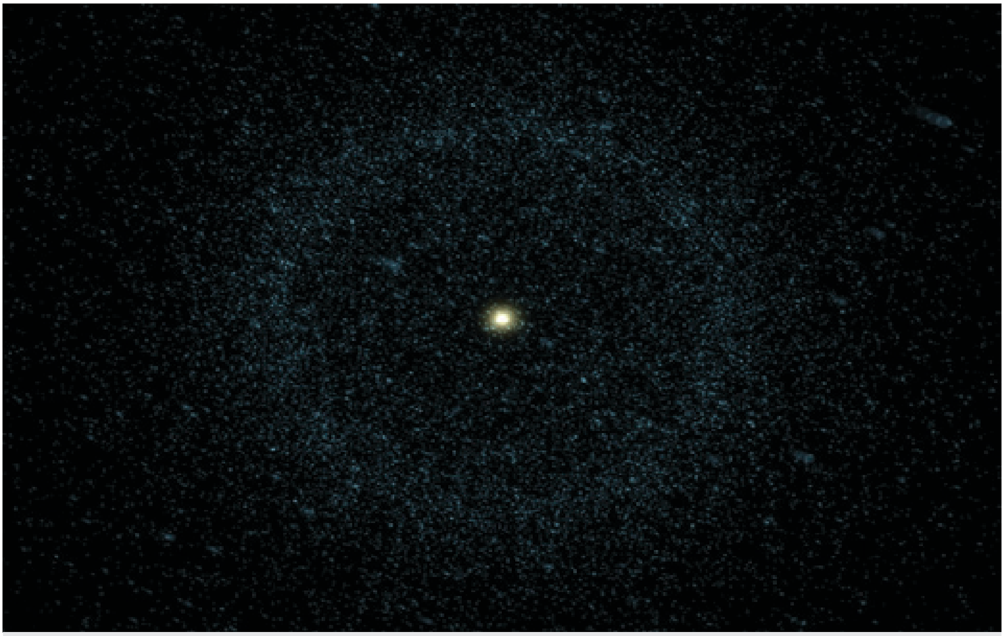


Figure 1 – Particle system Oort cloud 3D model in Uniview. Data from Tsunehiko Kato & 4D2U, NAO, Japan.

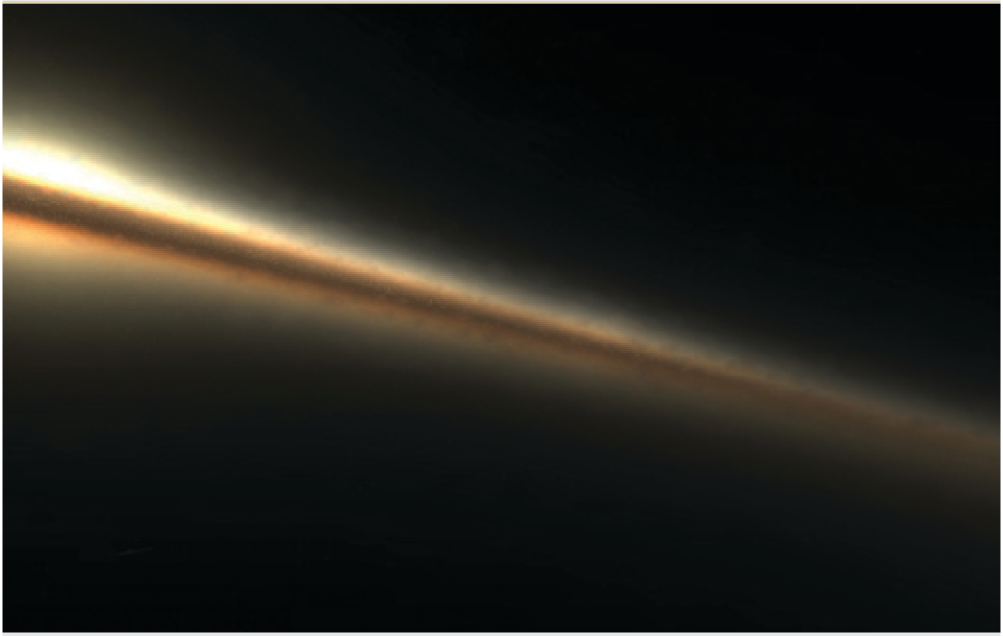
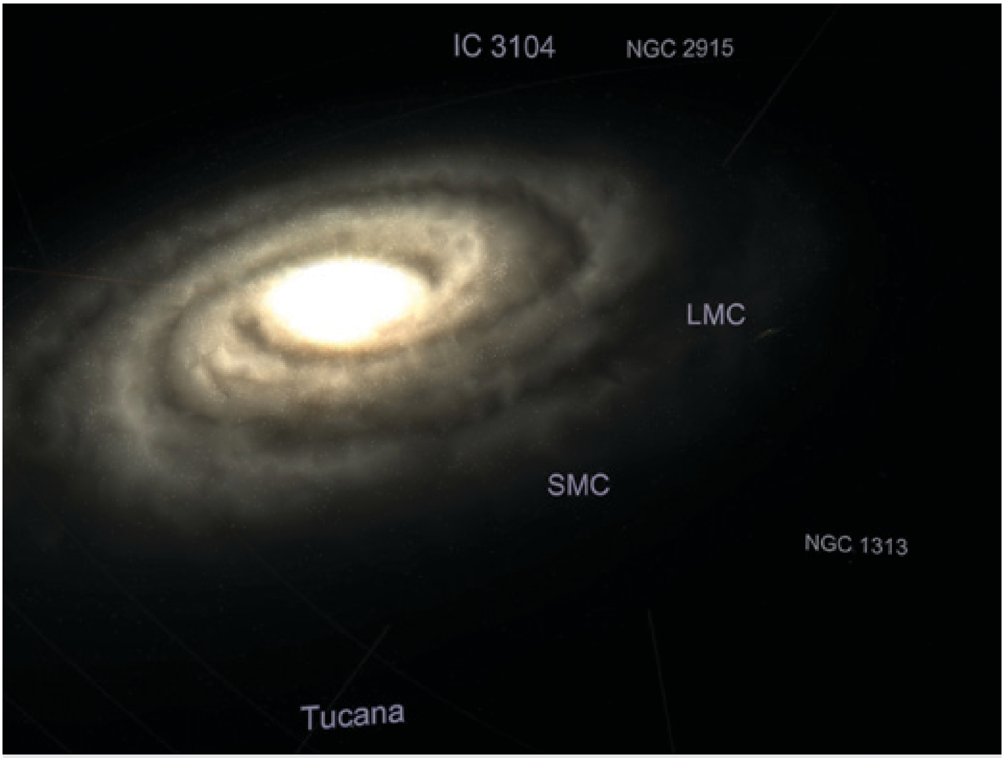


Figure 2 – Volumetric Milky Way galaxy 3D model in Uniview. Data from Tsunehiko Kato & 4D2U, NAO, Japan.



UNIVIEW

Figure 3 – Volumetric Milky Way galaxy 3D model and complementary labels of nearby galaxies.

Map Services), then time moves forward and the audience is taken on a journey from the Alps to Athens.

The next step is to show a dataset from Bolivia created by Marieke Dechesne at the Denver Museum of Nature & Science[6]. This data, outlining areas that were flooded in the plains of Bolivia during February 2007, is coupled with a general border outline of the country itself. Using the Landsat satellite surface textures we can also see where the river flows and draw immediate conclusions.

Next we invite Ryan Wyatt from California Academy of Sciences[7] on stage to present GIS data created by his colleague Healy Hamilton; this data shows different scenarios of the habitat of a wolf in North America, where the scenarios are based on different models of future climate change.

6 http://www.dmns.org/
7 http://www.calacademy.org/

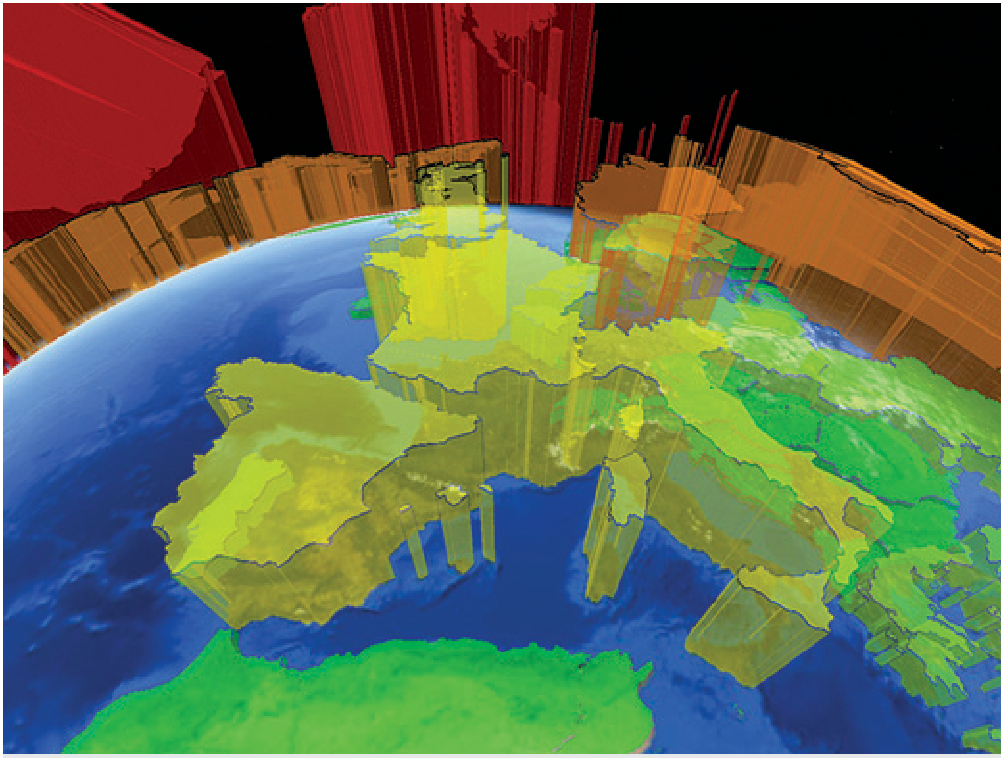


Figure 4 – World oil consumption 3D graph using KML visualisation in Uniview. Data from the CIA World Factbook.

Following this, we zoom out to watch a three-dimensional graph showing the oil consumption in the world today – this data is downloaded straight from the Keyhole bulletin board[8] community where a wealth of KML datasets can be located.

Galaxy

Finally, we zoom out from the Earth into the Solar System and further out through the Oort cloud[9], which is now visualised using an actual point cloud showing the distribution of the Oort cloud in space. As we get even further out using the logarithmic scale of Uniview, the actual parallax movement of the stars begins to appear and we soon exit the realm of the nearby stars.

This is where we reach the final destination of this demonstration; the new three dimensional, volumetric galaxy model, developed in association with Toshiyuki Takahei, based on a galaxy model by Tsunehiko Kato, 4D2U Project, NAOJ.

[8] http://bbs.keyhole.com/
[9] http://solarsystem.nasa.gov/planets/profile.cfm?Object=OortCloud

Science visualisation within a planetarium setting

Ryan Wyatt
California Academy of Sciences (rwyatt@calacademy.org)

Abstract

In less than a decade, a dramatic shift has taken place inside planetariums. Hundreds of theatres of various sizes have adopted immersive video technology, filling domes with computer-generated visuals that can depict current astronomical discoveries with unprecedented fidelity. Whereas planetarium programming once depended on informed artwork to tell science stories, the opportunity now exists to incorporate science visualisation into high-impact "narrative journeys" that immerse audiences inside the content. Observed data and computational simulations can provide a rich basis for such simulated excursions, giving people an experience of 21st century astronomy that approximates an alternate reality.

Proper utilisation of the new technology requires the worldwide planetarium community to mature in certain ways. Broadened science topics require significant professional development on the part of educators, production teams need to devise ways of incorporating data into their work, and collectively, we must learn how to tell stories with an enriched palette of data-driven visuals. The international astronomy education community must consider how to support this emerging medium. Some ideas include the development of community standards (e.g. the Virtual Astronomy Metadata Project), specifically engineered content (e.g. HubbleSource's pre-rendered sequences), and increased visibility of the medium at conferences (e.g. the special session at the 2006 Astronomical Society of the Pacific meeting). As the chair of the Fulldome Video Committee of the International Planetarium Society — and the director of an immersive theatre under construction—the author is seeking ways to increase collaboration and cooperation across our varied subdisciplines.

Introduction

A remarkable opportunity exists within a rapidly growing community of planetariums: fulldome video allows for the incorporation of accurately visualised astronomical content, and theatres hunger for content. Although most planetariums still follow a traditional model, with an opto-mechanical star projector complemented by slides and video, the medium is changing quickly. Technology offers new tools and new venues for teaching science, and public outreach professionals should take notice — the planetarium community will be grateful for the attention. The current opportunity results from a confluence of factors, including the changing nature of planetariums, of technology, and of science itself. Of course, it does not come without challenges — both technological and social — but the potential benefits are significant.

Changing nature of planetariums

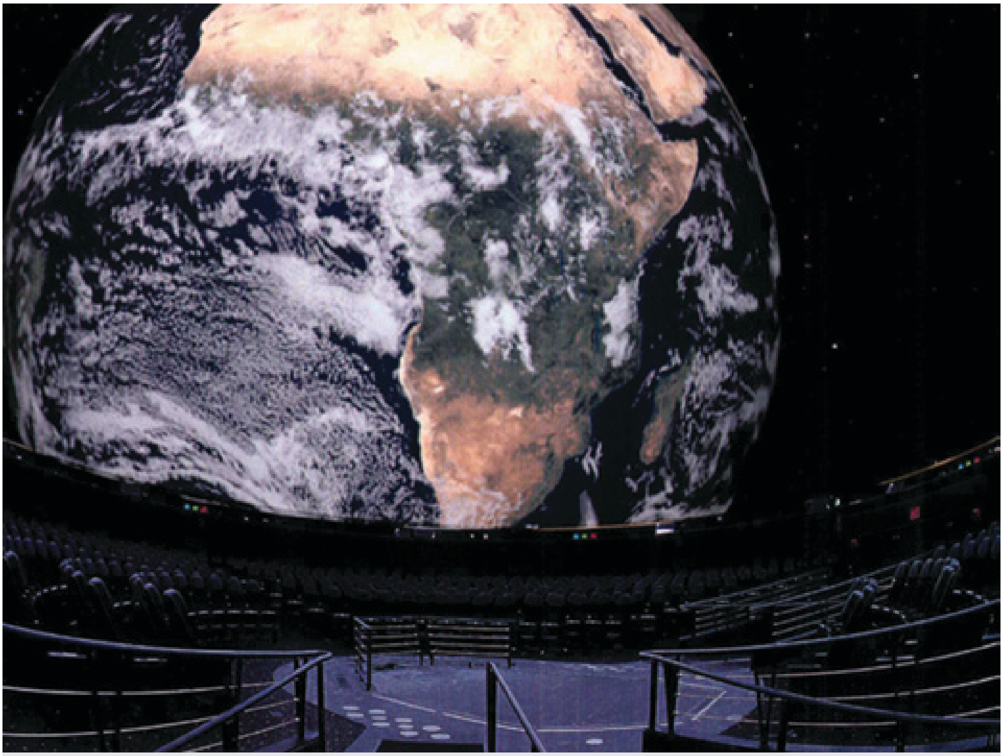
The term "planetarium" has remained in flux for centuries, referring originally to complex mechanical devices that reproduced the motion of planets around the Sun (known as "orreries" in English). The breakthrough technology that gave birth to what most people think of as a planetarium occurred in Germany in the 1920s, when the Carl Zeiss Company developed the opto-mechanical star projector.

The original Morrison Planetarium at the California Academy of Sciences featured just such an instrument, shown in Figure 1. Basically, finely-tuned optics projected point-like stars on the interior of a hemispherical projection screen, thereby replicating the experience of a terrestrial night sky with varying degrees of authenticity. Over their 80-year history, planetariums extended this core experience with numerous additions and changes: slide and video projectors, multimedia shows, and even interactive buttons all made appearances over the years. The majority of planetariums worldwide use a suite of technology with the opto-mechanical star projector at its core. But a little over a decade ago, technology appeared that has radically changed the planetarium experience.

California Academy of Sciences

Figure 1 – The original Morrison Planetarium at the California Academy of Sciences in San Francisco, California, USA, featured a unique opto-mechanical star projector. The new Morrison will showcase entirely digital technology.

Fulldome video allows a planetarium dome to be treated as an immersive environment, effectively creating a gateway to a virtual space; Wyatt (2005) describes how this affects the creation of "narrative journeys" in planetariums. For the most part, theatres using fulldome video have focused on playback movies—essentially immersive films. The Rose Center for Earth and Space at the American Museum of Natural History (see Figure 2) in New York adopted fulldome technology in 2000, and millions of visitors have seen *Passport to the Universe*, *Search for Life*, and *Cosmic Collisions*, all of which follow a prerecorded, playback format. But the Rose Center also runs live programming, including a monthly *Virtual Universe* programme, which presents digital datasets and contextualises current discoveries and research. Many facilities follow a similar recipe, relying on playback content for most of the day while presenting live programmes somewhat less frequently. The new Morrison Planetarium will use a mixture of real-time and playback material, with a presenter in every show. Smaller theatres, especially those situated in school settings, may focus more on real-time capabilities.



American Museum of Natural History

Figure 2 – A single frame of the fulldome presentation "Search for Life" projected onto the dome at the Rose Center for Earth and Space.

Thus, planetariums with new technology continue to offer the variety of programmes that characterised traditional theatres. What has changed is the type of content they can offer, realistically addressing topics that extend far beyond the experience of the night sky. The potential now exists to create programming that relies on science visualisation in lieu of conceptual illustration.

Phenomena can be placed in relation to one another, with objects nested at their appropriate scales inside a digital model of the Universe, tacitly communicating the enormity of astronomical distances. Almost every fulldome system sold today includes some form of "virtual universe" software that a skilled pilot can manoeuvre and use as a presentation tool. For its fidelity to scientific concepts alone, fulldome video should be of great interest to the public outreach community.

Furthermore, the number of fulldome theatres is growing exponentially. Figure 3 shows how rapidly the number of systems has increased in the last decade, from a literal handful at the turn of the millennium to more than 200 last year. (The total number of theatres as of 8 October 2007, the date of this presentation, clocks in at 315 worldwide.) Also, an important tipping point took place last year: more than half of these systems are now in domes less than ten metres in diameter. This has dramatic implications for outreach potential, and it means that fulldome content can access a sizable variety of audiences.

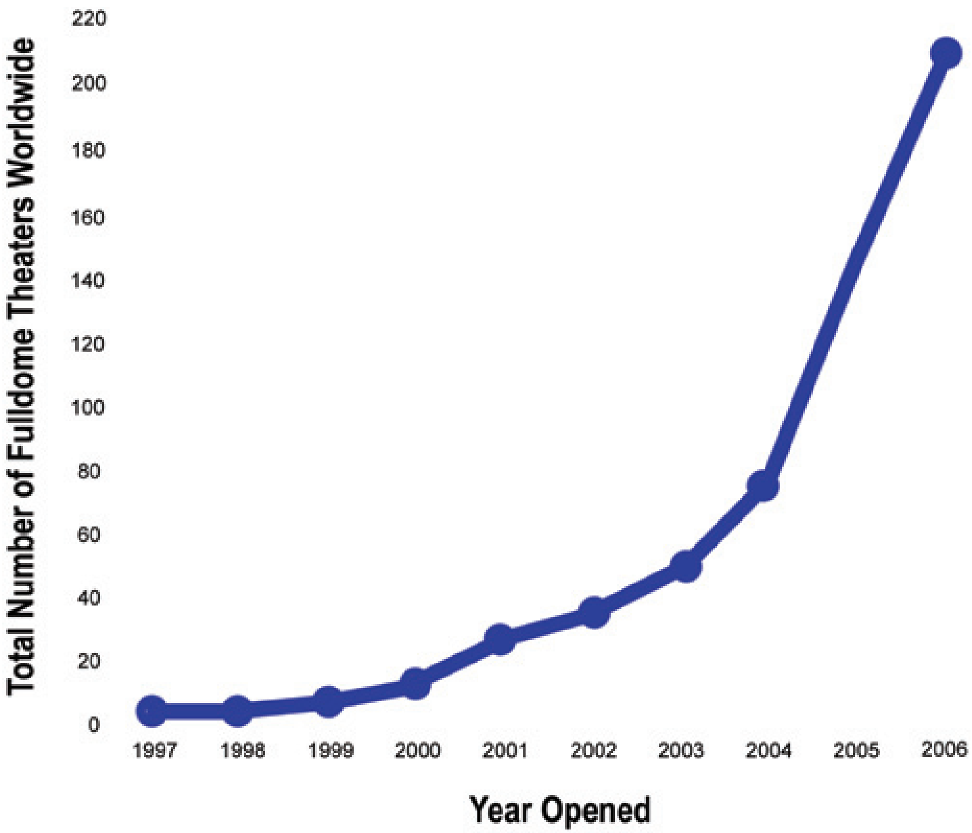


Figure 3 – The number of fulldome theatres worldwide is increasing exponentially. Adapted from Lantz (2007). Current numbers available from Petersen (2007).

Changing nature of technology

Technology changes quite quickly, particularly the computer graphics hardware that has helped fuel the digital revolution in planetariums. Video games demand increasingly fast graphics cards, and although the planetarium world requires specific enhancements (e.g. genlock) to such hardware, the fundamental performance advances are driven by the gaming industry. fulldome video thus rides on the coat-tails of a much, much larger community.

The planetarium community's dependence on commodity hardware represents an important shift in the economics of technology for the medium. When the aforementioned Rose Center opened in 2000, its real-time capabilities required highly-specialised computational power, which increased expenses not just in terms of the initial purchase price, but also in terms of upkeep and staffing costs. The opportunity to make use of widely-available computer equipment means that the overall affordability of these systems will make them more and more commonplace.

Changing nature of science

Of course, science itself is changing. Research is not only increasingly digital — astronomy blazed the trail, in many ways, with digital detectors that date back to the 1970s — but it is also increasingly computational. Digital data favour digital displays, and science visualisation can now provide the basis for storytelling within planetariums.

The prevalence of digital displays should affect how we think about the data we provide to educators and the public at large. Take, for example, the compelling images released by Hubble, Spitzer, Chandra, and other observatories. Such image products can have associated metadata — including coordinates, orientation, and scale as well as captions and other information — accessible by planetarium software. A planetarium operator (a.k.a. a "planetarian") could potentially display an image, properly aligned in the sky, while having portions of the caption or press release appear on a computer monitor at the console. This kind of value-added media plays an important role in supporting planetarians and other educators, and Hurt et al. (2006) describe an emerging standard in the form of the Astronomy Visualization Metadata (AVM). Hurt et al. (2007) also outline an implementation of an AVM archive that will facilitate access to imagery.

Indeed, the inclusion of metadata about the imagery allows the experience to transcend the merely aesthetic. A "pretty picture" offers an enticing gateway into astronomy, but added information and interpretation helps an individual pass through the gateway into a deeper appreciation of the topic.

Technological challenges

An enormous variety of companies produce hardware and software for fulldome planetariums in an environment with little standardisation. This creates significant challenges for users who wish to exchange content — and for content creators who want wide distribution across systems. The proceedings of a 2004 summit by Lantz et al. (2004) provide a primer on the breadth of technical issues that confront the user community.

Social challenges

Even if the technological challenges of file formats and display systems can be overcome, we face an additional hurdle: the actual implementation and interpretation of data necessitates solid lines of communication between the sources of data and their users. A planetarian needs to understand fundamental topics in astronomy and the context for the imagery and datasets that might appear in a programme. Planetarium vendors need to have access to new discoveries and need to integrate them appropriately into their software. Facilitating such information exchange amounts to a social challenge.

We need to create more opportunities for astronomers to interact with planetarians and other educators, especially since the new universe of complex datasets requires a deeper understanding of astronomy than the typical night-sky programmes of a traditional planetarium. Furthermore, the vendors who supply data and imagery to planetarians need to be included in the loop as well; often, they assume the burden of accurately incorporating new discoveries into the digital systems they sell.

Figure 4 suggests a cartoon of the relationships, with the boldness of the double-headed arrows suggesting the strength of connections as they currently exist. Planetarians typically have well-developed relationships with the vendors who support them, and more tenuous lines of communication have developed between professional astronomers and planetarians as well. However, planetarium vendors often have not developed connections with the research or public outreach communities. Note that the arrows in Figure 4 point in both directions: astronomers must act not merely as sources of information, but also have to listen and respond to the needs of the planetarium community.

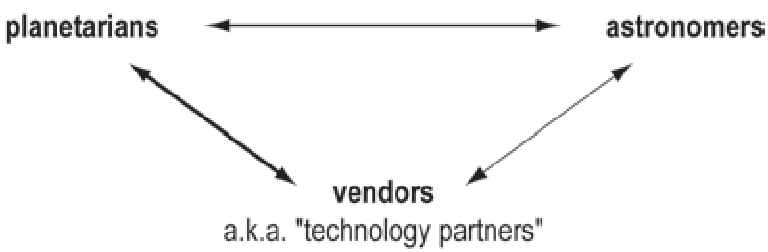


Figure 4 – The author's schematic of relationships between planetarians, their vendors, and members of the astronomy community. Line strength is intended to suggest the strength of the relationships between the various groups; astronomers need to cultivate relationships not just with planetarium professionals but also with the companies that supply planetariums with software and (effectively) data.

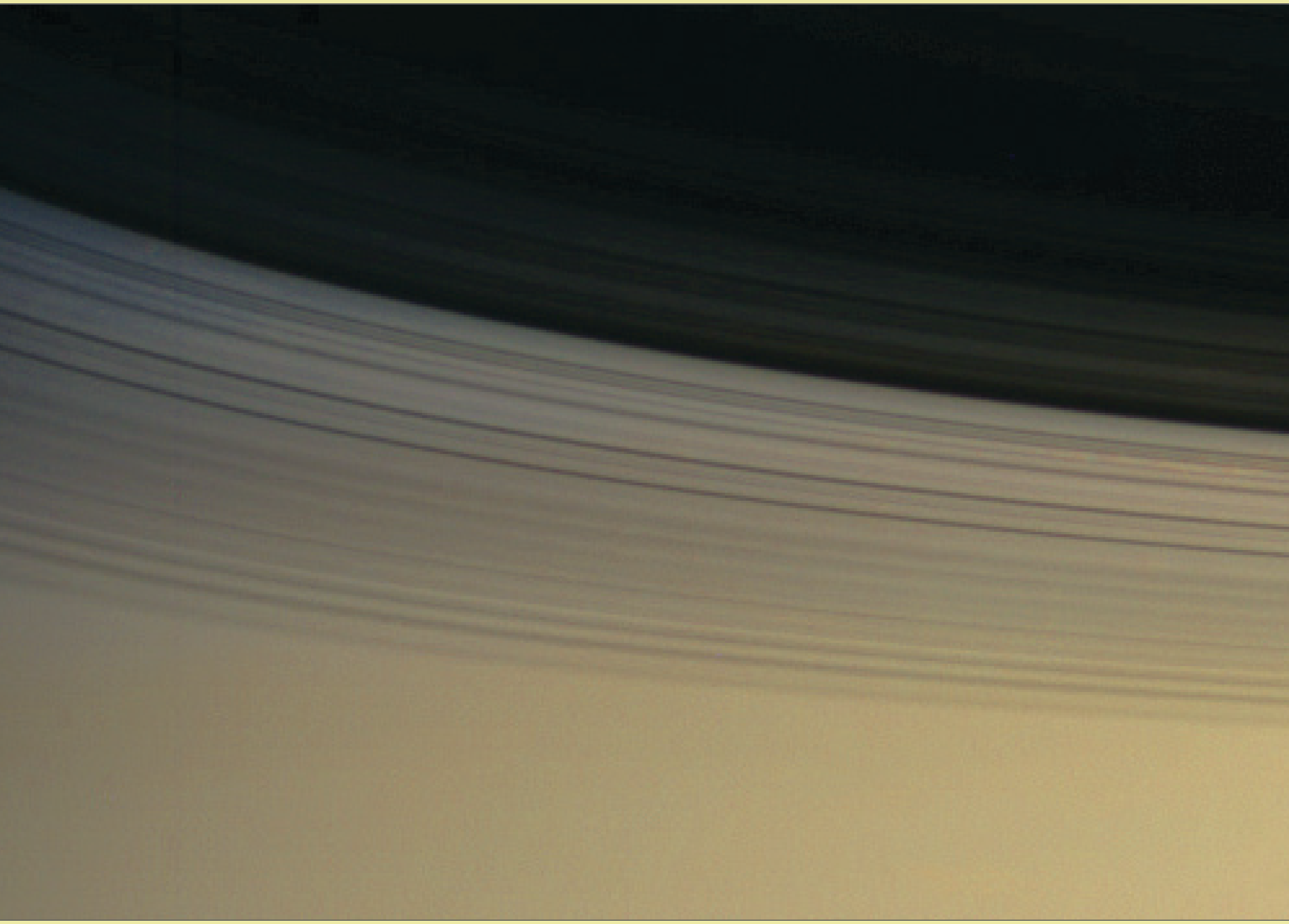
Conclusion

Thanks to the increasingly popularity of fulldome video, astronomical data can reach a much broader audience than ever before. Planetarium audiences (and others) have an opportunity to experience storytelling rooted in the same data that researchers use to understand the complexities of the Universe. The confluence of high-speed graphics cards and our constantly expanding collection of digital datasets gives us both a medium and a message to communicate. By working closely with planetarians and their associated vendors, astronomers and public outreach professionals can facilitate access to existing data and enhance the impact of astronomical research within planetariums. Fulldome video is a remarkable opportunity; it deserves to overcome its associated challenges.

References

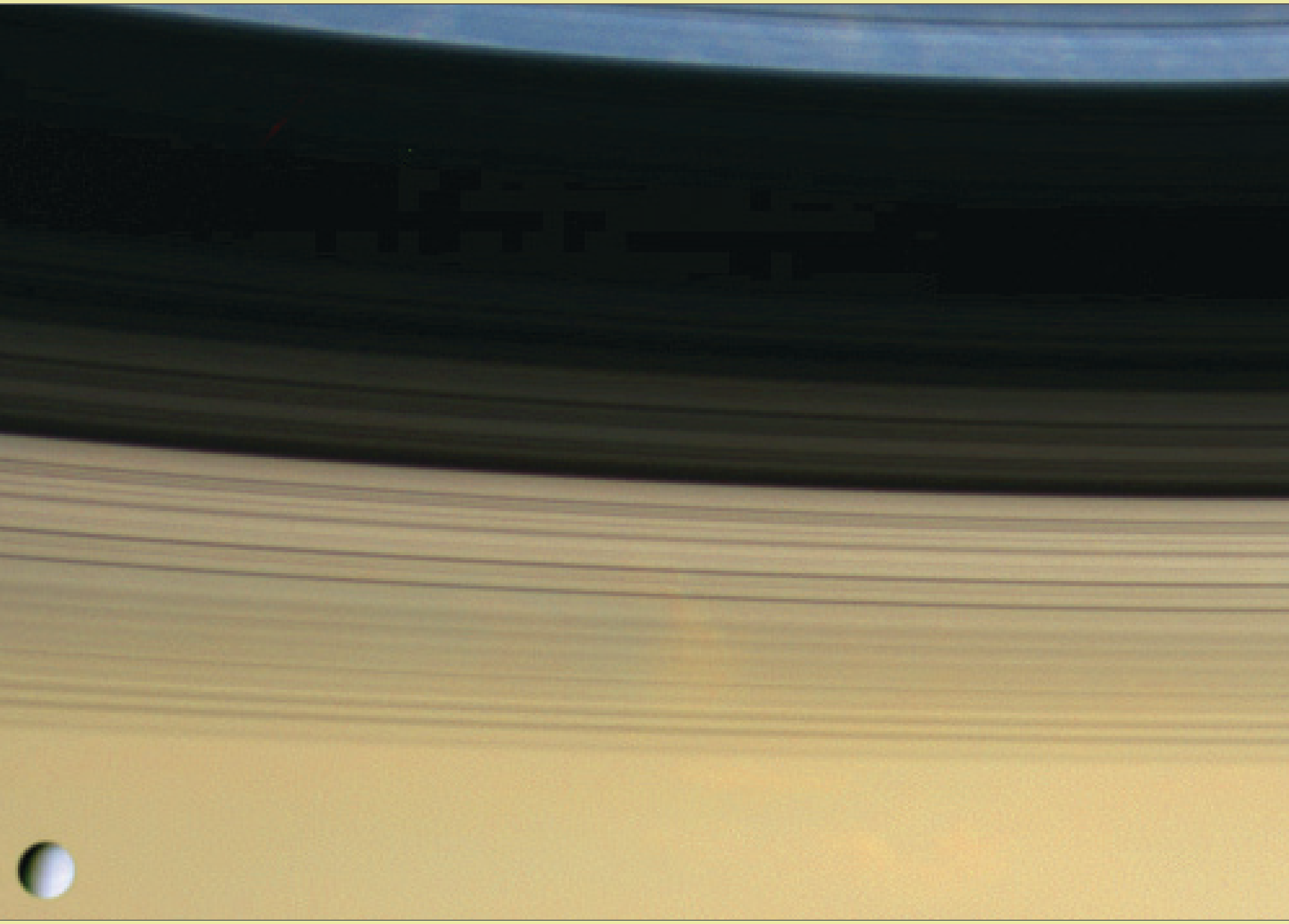
- Abbott B.P., Emmart C.B., Wyatt R.J. (2004), Virtual Universe. In: Natural History. April 2004, Volume 113, Number 3, pp 44-49
- Chartrand M.R. (1973), A Fifty Year Anniversary of a Two Thousand Year Dream: The History of the Planetarium. In: The Planetarian, September 1973, Volume 2, Number 3, also available online at http://www.ips-planetarium.org/planetarian/articles/twothousandyr_Dream/twothousandyr_dream.html
- Lantz E.J. (2007), Digital Frontiers. In: The Planetarian. June 2007, Volume 36, Number 2
- Lantz E.J., Wyatt R.J., Bruno M., Neafus D. (2004), Proceedings of the IPS 2004 Special Session, Fulldome Standards Summit, http://extranet.spitzinc.com/reference/IPS2004/default.aspx
- Hurt R.L., Christensen L.L., Gauthier A.J. (2006), Astronomical Outreach Imagery Metadata Tags for the Virtual Observatory Version 1.00, September 2006, http://www.ivoa.net/Documents/latest/AOIMetadata.html
- Hurt R.L., Gauthier A.J., Christensen L.L., Wyatt R. (2007). Sharing Images Intelligently: The Astronomy Visualization Metadata Standard. In Christensen L.L., Zoulias M. & Robson I. (eds.) Proceedings from Communicating Astronomy with the Public 2007
- Petersen M.C. (2007), The Fulldome Theater Compendium Online, http://www.lochnessproductions.com/lfco/lfco.html
- Wyatt R.J. (2004), The Big Picture: Planetariums, Education and Space Science. In: Proceedings of the 2002 NASA Office of Space Science Education and Public Outreach Conference, ASP Conference Series, Volume 319, pp 169-173, also available online at http://planetarium.ryanwyatt.net/oss2002proceedings.html
- Wyatt R.J. (2005), Planetarium Paradigm Shift. In: The Planetarian. September 2005, Volume 34, Number 3, pp 15-19, also available online as part of a “special focus” issue at http://www.ips-planetarium.org/planetarian/articles/special_focus1.pdf

Credit: Sze-leung Cheung



Credit: NASA/JPL/Space Science Institute

Session 5
IYA2009 National



Cool and icy Dione floats in front of giant Saturn bedecked in a dazzling array of colours. The surface of Dione, which exhibits contrasting bright and dark areas when viewed up close, appears pale in this image. It is Saturn's multi-hued cloud bands that boldly steal the show. Discrete clouds and eddies in Saturn's northern hemisphere can be seen within the faint shadows of the rings on the planet. Dione is 1118 kilometres across.

The International Year of Astronomy 2009 in Belgium

Rodrigo Alvarez
Royal Observatory of Belgium (ralvarez@oma.be)

Abstract

As far as the communication of astronomy is concerned, Belgium is well endowed with many planetariums, public observatories, amateur astronomical societies, science centres and renowned astronomical institutes. But, as in many countries that are well supplied with cultural activities, numerous opportunities for sightseeing and many entertainment parks, the stakeholders who are willing to promote astronomy to the public have to stand out continuously to keep attracting people. The International Year of Astronomy 2009 is the perfect opportunity to help the Belgian people to focus even more on astronomy.

Astronomy in Belgium

Astronomy is a particularly rich subject in Belgium. Indeed, its 10 million inhabitants have access to:

- seven public observatories;
- six planetariums;
- more than 80 amateur astronomical clubs or working groups (established in associations like VVS — Vereniging Voor Sterrenkunde);
- five science centres;
- eight world class astronomical institutes;
- industries connected to ESO (VLT) and ESA's large projects.

Thus both astronomy aficionados and those who are curious have a vast choice of competent facilities at their disposal to welcome and guide them.

Furthermore, besides this choice of activities, amateurs and professionals involved in astronomy can participate in a series of regular events that aim to publicise the sciences in general and more particularly astronomy:

- star-gazing events (Sterrenkijkdagen, De Nachten, La Nuit des Etoiles);
- science festivals (Wetenschapsfeest, Ruimtevaartdagen, Expo-Sciences, Printemps des Sciences);
- open doors (Kinderuniversiteit [KULeuven], Royal Observatory of Belgium, Experimentarium [ULB]);
- international events (Researchers' Night [European Union], Science on Stage, International Years [Heliophysical, Polar, Earth]).

Competition between events

These regular events allow the stakeholders promoting astronomy to attract the interest of the media and the general public. But all the other “cultural” vocations have their own events calendar as well. Located in the heart of Europe, there is a wealth of events for the public: Night of the Museums, Spring of the Museums, Monuments’ Day, Movie Day, Jazz Marathon, and other various celebrations.

Even if the target-public is not necessarily the same for all events it can be difficult to attract the attention of the media and the general public. As a recent example, we cite the Researcher’s Night on 28 September, which was bracketed by the Celebration of the French-speaking Community and the Brussels Museums’ Night on the 27th and with the White Night on the 29th, i.e. several events on successive evenings competing for the attention of young people!

Euro Space Center

Figure 1 – The “Nuit des Etoiles“ poster.

Royal Observatory of Belgium

Figure 2 – The Open doors at the Royal Observatory of Belgium poster.

www.belspo.be & www.doppio.be

Figure 3 – The “Researchers’ Night“ poster.

Added value of the International Year of Astronomy 2009

In this context, an event like the International Year of Astronomy 2009 makes it easy to arouse the interest of the general public and to attract media attention due to:

1. its unique character and fixed time period (2009);
2. the support of prestigious institutions (IAU, UNESCO, maybe UNO);
3. its international scale (nearly a hundred participating countries).

.

A Belgian Steering Committee has been set up to define and bring to a successful conclusion a series of actions for IYA2009. It includes the major stakeholders promoting astronomy in Belgium, both at the amateur and professional level:

- Universities (of Leuven, Gent, Liège, Brussels, Namur);
- Research institutes (Royal Observatory of Belgium, Belgian Institute for Space Aeronomy);
- Authorities (Senate);
- Amateur associations (Vereniging Voor Sterrenkunde, Astro Event Group, Fédération Francophone d'Astronomes Amateurs de Belgique, Société Astronomique de Liège);
- Public observatories and planetariums (Urania, Mira, Altair, Beisbroek, Astronamur, Club Astronomique d'Ottignies, Astronomie Centre Ardennes, Observatoire Fleurus-Sivry, Europlanetarium, Planetarium of Brussels).

Among the many possibilities under consideration, we can already mention:

- Theatre drama on Galileo Galilei (several companies have been contacted);
- Foucault pendulum (to be installed in a church in Liège);
- Astronomy Olympiad (the Senate can host the final competition);
- TV broadcast of *Tous sur Orbite*, a currrent astronomy programme (5 minutes daily);
- Special stamp edition;
- 3 national dates for star-gazing events (instead of 1+1+1: per region/association);
- Astronomical city tour;
- Special edition of the magazine *Science Connection* (edited by the Federal Science Policy), dedicated to astronomy in Belgium;
- Weekly astronomical fact sheets (for the press and the website);
- Astronomy kits (collaboration between planetariums);
- Conferences;
- Travelling exhibition.

Conclusion

The Steering Committee is willing to implement many actions that will benefit from the support and enthusiasm of all the main stakeholders promoting astronomy in Belgium. Indeed, given the tough competition between all cultural events, the International Year of Astronomy 2009 is the perfect opportunity to help the Belgian people to really focus on astronomy and its achievements.


Credit: Sze-leung Cheung

Public outreach activities and the IYA2009 in Slovakia

Drahomír Chochol
Astronomical Institute of the Slovak Academy of Sciences, Tatranská Lomnica (chochol@ta3.sk)

Abstract

The activities of the professional and amateur astronomical institutes in Slovakia in public outreach are presented. The projects are funded by grants from the Science and Technology Assistance Agency to support our goals for IYA2009.

Introduction

Astronomical research in Slovakia is carried out at the Astronomical Institute of the Slovak Academy of Sciences[1] (AISAS) Tatranská Lomnica, Comenius University[2] in Bratislava and P.J.Šafárik University[3] in Košice. These institutes, together with a network of 18 Public Observatories[4] (four with planetariums), two planetariums in Košice and many astronomical clubs and observational posts serve as centres for education and the popularisation of astronomy.

The launch of IYA2009 by the IAU stimulated all astronomical institutions in Slovakia to increase their public outreach activities. The coordination of the effort is guaranteed by the Organising Committee of IYA2009, which was officially established at the General Assembly of the Slovak Astronomical Society on 28 September 2007. The committee has 20 members: D. Chochol — Head of the Stellar Department of the AISAS and Single point of Contact (SPoC) of Slovakia, J. Svoreň — Director of the AISAS, J. Zverko — Chairman of the Slovak Astronomical Society, J.Žižňovský — Head of the Slovak Astronomical Committee of the IAU, V. Porubčan — Head of the Department of Astronomy in Faculty of Mathematics, Physics and Informatics of the Comenius University in Bratislava, M. Jaščur — Director of the Institute of Physical Sciences of the P.J.Šafárik University in Košice, P. Rapavý — Manager of the Slovak Union of Amateurs Astronomers, T. Pintér — Director of the Slovak Central Observatory Hurbanovo, representatives of public observatories and astroclubs, covering all regions in Slovakia: P. Hazucha (Hlohovec), D. Jančušková (Prešov), S. Kaniansky (Žiar nad Hronom), Z. Komárek (Michalovce), P. Kráčalík (Bratislava), I. Kudzej (Humenné), V. Mešter (Partizánske), J. Mäsiar (Kysucké Nové Mesto), R. Ondíková (Levice), M. Schmögner (Medzev), S. Štefeček (Sobotište), M. Znášik (Žilina).

Astronomical Institute of the Slovak Academy of Sciences and its public outreach activities

AISAS is a professional astronomical institute established in 1953. The Observatory Skalnaté Pleso (1786 m a.s.l.), was built in 1943 and equipped with a 60-cm reflector for stellar photography

[1] http://www.ta3.sk/homepage.php
[2] http://cyril.fmph.uniba.sk/mffuk/pracoviska/katedry/kafzm/kafzm_en.html
[3] http://www.science.upjs.sk/uk/
[4] http://www.vesmir.sk/index.php?id=linky&PHPSESSID

and photometry. It has been an integral part of the AISAS from the very beginning. In 1978, the old telecope was replaced by a new 60-cm reflector, used for photoelectric photometry of variable stars. In 1961, a 30-cm astrograph was installed in the small dome of the observatory, used for observations of asteroids and comets. In 2001, it was replaced by a 61-cm reflector with a CCD camera. In 1962, the Coronal Station at the top of Lomnický štít (2634 m a.s.l.) was built, where a 20-cm coronograph was installed. In 1987, the new headquarters of the AISAS was established at Stará Lesná (2 km from Tatranská Lomnica), together with three pavilions (810 m a.s.l.), where a 50-cm horizontal spectrograph for spectral observations of the solar surface, 60-cm and 50-cm reflectors for photoelectric and CCD photometry of variable stars, are placed. In the vicinity of the headquarters, the Congress Center Academia[5] (a hall with 160 seats) is located, where the both scientific and public outreach meetings take place.

Credit: Slovak Union of Amateur Astronomers (SUAA)

Figure 1 – Astronomical institutions in Slovakia.

Credit: V. Rušin

Figure 2 – Headquarters of the AISAS and observatory at Stará Lesná.

Credit: V. Rušin

Figure 3 – Observatory Lomnický štít.

Credit: V. Rušin

Figure 4 – Observatory Skalnaté Pleso.

The research in the Department of Solar Physics is focused mainly on solar magnetism, the dynamics of the photosphere, chromosphere, transition region and corona (based on data from the Canary Islands telescopes, SOHO spacecraft, TRACE and Hinode satellites); the connection between cosmic ray modulation and solar flares, open magnetic flux and coronal mass ejections; magnetic fields in specific coronal structures (own solar eclipse observations — 18 expeditions of the AISAS); coronal holes and their relation to the background and local magnetic fields; a time-latitudinal distribution and large-scale development of the solar prominences, the green coronal

[5] http://www.hotelacademia.sk/

line (530.3 nm) and the white-light corona over the solar cycles; a homogeneous coronal data set of the green coronal line intensity based on the Lomnický štít photometric scale and coronal index of solar activity was prepared for the period 1939–2007.

The main topics of research in the Department of Interplanetary Matter are: the CCD photometry and astrometry of asteroids and comets (based on the data from the 61-cm telescope at the Skalnaté Pleso Observatory); the filamentary structure of selected meteor showers and study of the meteor sporadic background (the forward scatter radio system operating over the triangle Lecce-Bologna-Modra); composition and physical properties of the cosmic dust particles (provided by NASA); cooperation in the European Fireball Network; transfer orbits among different populations of small bodies in the Solar System regarding near-Earth objects; the investigation of cometary nuclei and their activity at large heliocentric distances; the structure and dynamics of meteoroid streams and evolution of their parent bodies; cosmogony of reservoirs of small Solar-System bodies.

The research in the Stellar Department is focused mainly on the investigation of interactive binaries and multiple systems and determination of their basic parameters; study of physical processes during phases of activity of symbiotic stars and novae, their origin, structure and evolution including the physical conditions in the circumstellar environment (own photometric observations, ground-based spectroscopic observations within international projects, satellites data from the IUE, HST, ISO, FUSE). Spectroscopic data are used to derive stratification and surface distribution of elements in chemically peculiar stars.

AISAS is one of the leading institutes in the Slovak Academy of Sciences for public outreach activities. The annual number of lectures, articles in journals and newspapers, radio, TV performances and press conferences has reached 300. AISAS cooperates with the Slovak Astronomical Society[6] (SAS), Slovak Union of Amateur Astronomers[7] (SUAA) and Slovak Central Observatory[8] Hurbanovo to organise conferences, e.g. the 26th *European Symposium on Occultation Projects*[9] was held at Stará Lesná in August 2007.

The necessary funds for public outreach activities are provided by two projects, granted by the Science and Technology Assistance Agency (STAA), which started in 2007 and will last three years, so they will cover many activities related to the IYA2009:
1) *Meeting with the Universe*[10], LPP-0146 (2007–9), principal investigator: V. Rušin. The following activities were supported in the year 2007:

a) Teachers' workshop (4–6 October 2007) for 60 selected teachers from elementary and high schools in Slovakia. All expenses for teachers and lecturers (professional astronomers) were covered by the grant. Nine lectures will be published in the proceedings of the workshop and will be freely available for 200 schools in Slovakia together with the PowerPoint

[6] http://www.ta3.sk/sas/sas.html
[7] http://www.szaa.sk/
[8] http://www.suh.sk/
[9] http://esop2007.szaa.sk/
[10] http://www.ta3.sk/~zkanuch/apvv

presentations on CD.

b) Six articles in the journal KOZMOS 2007 No. 5 written by astronomers of the Department of Solar Physics of the AISAS about their research and results.
c) Twelve open door activities with guided excursions at the observatory Skalnaté Pleso and Lomnický štít coronal station.
d) 70 lectures and school excursions at headquarters in Stará Lesná.
e) 20 public lectures outside AISAS including six lectures in Bratislava.
f) Issuing posters and postcards.
g) Creation of the www glossary with basic astronomical terms for teachers and scholars of elementary and high schools.
h) Publishing the booklet *Astronomy in Slovakia*.
i) Organising press meetings and cooperation with radio, TV and journals.

2) *Astronomy — the Science for Teachers and Students*[11], LPP-068 (2007-9), principal investigator: A. Kučera. The project is devoted to the astronomy education of teachers and students in the Poprad region (where AISAS is located): the high school in Poprad and four elementary schools in Poprad, Tatranská Lomnica and Spišský Štiavnik. The lectures and practical lessons in astronomy at schools and excursions of the students at the Observatory Skalnaté Pleso took place in 2007. The SPoC of Slovakia has just applied for a STAA grant to cover the expenses of Slovakia in IYA2009 Global Cornerstone Projects.

The Slovak Astronomical Society as organiser of the Astronomy Olympiad

SAS is a voluntary and selective association of scientific and pedagogical workers and friends of astronomy. The activity is performed through regional branches, specialised sections (solar, stellar (variable stars), interplanetary matter (meteor showers, asteroids and comets), eclipses and occultations) and commissions (terminological, pedagogical). SAS contributes to the development of astronomy in Slovakia, executes publication activity, organises meetings and cooperates with the AISAS, universities, schools and public observatories. The STAA provided SAS with the grant *Olympiad in Astronomy*[12], LPP-172 (2006–10) principal investigator: L. Hric. The project is devoted to orgainising the competition between students from elementary and high schools in Slovakia. The first round was organised in schools at the beginning of 2007, the second round at the public observatories Partizánske and Prešov in May 2007 and final round at AISAS in June 2007. Three winners from elementary schools received astronomical telescopes as prizes. Two winners from high schools will participate in the 1st International Olympiad in Astronomy and Astrophysics, which will be held in Thailand in December 2007.

---

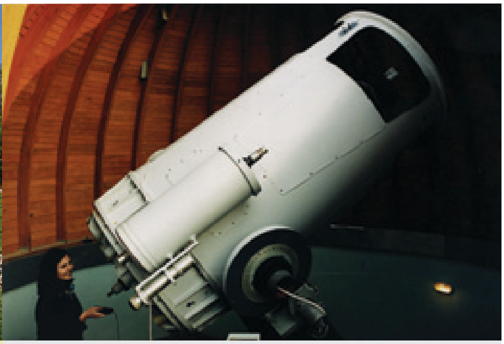
[11] http://www.ta3.sk/sas/sas.html
[12] http://www.szaa.sk/

Public observatories in Slovakia and their public outreach

The main aim of public observatories in Slovakia is to spread knowledge of modern astronomy and science among the public, to offer students at elementary and high schools, excursions and lectures and to organise public observations of interesting astronomical phenomena. They collaborate with SAS and SUAA to organise meetings, workshops and conferences for active amateurs. The STAA provided the Public Observatory in Rimavská Sobota[13] through by the grant *Astronomy is the Door for Science*, LPP-130 (2006–7), principal investigator: P. Rapavý. Lectures, observations, two exhibitions of astronomical images were organised and a booklet about light pollution: *Save the night* was issued. The STAA provided the Public Observatory in Humenné[14] with the grant *The Universe in Direct Transmission*, LPP-049 (2007-9), principal investigator: I. Kudzej. As part of this grant the ASTRO practicum for high schools in Snina, Humenné and Prešov was organised at the Kolonické sedlo Observatory[15] on 16–18 February 2007 (Variable stars), 20–22 April 2007 (Lyrids meteor shower), 25–27 May, 2007 (Eclipses by Moon and planets) and 21–23 September 2007 (Variable stars — visual observations). A 1-m reflector (donated by the Odessa Observatory, Ukraine) — the biggest telescope in Slovakia, was put into operation in 2002. The first observations with the double-channel photoelectric photometer mounted in the Cassegrain focus were obtained in February 2007.

Credit: I. Kudzej

Figure 5 – Kolonické sedlo Observatory.



Credit: I. Kudzej

Figure 6 – 1-m reflector at the Kolonické sedlo Observatory

[13] http://www.astrors.szm.sk/
[14] http://www.astrokolonica.sk/hvezdaren.html
[15] http://www.astrokolonica.sk/

Credit: Dennis Crabtree

Brazilian plans for the IYA2009

Augusto Damineli
SPoC for Brazil (damineli@astro.iag.usp.br)

Abstract

I present a list of activities we are planning for the year 2009. We have just started the work, which will be updated online[1].

Introduction

Brazil is a large country in South America, with 190 million people. Unlike its neighbours who speak Spanish, our language is Portuguese. Most of the children attend public schools and the government gives support (money) for families who keep their children attending classes, but generally there are huge problems in the education system: ~30% of the adults are not literate, teachers receive low salaries, and internet connections are almost nonexistent in public schools. Our primary problems for social inclusion are not driven by the segregation of minorities, but by the poverty of a large fraction of the population and low investment in public education. Textbooks for elementary schools contain only a few chapters on astronomy and are frequently plagued by misconceptions. Students and the general public love astronomy, but, as for other sciences, the press doesn't treat news on scientific discoveries well; coverage is not frequent enough and the explanations are not easy to follow. The number of books and magazines containing astronomy is also very small. In modern times, the impact of science and technology on society is huge and people must have a scientific perspective in order to influence the government to make the best choices.

Astronomy in Brazil

The modern era of astronomy in Brazil started in the 1970s. Previous activities had been isolated and institutions short lived. The situation changed after the first graduate courses started. The rate of growth of professional activities (number of papers in refereed journals, number of citations, number of PhDs, number of jobs) has increased by around 15% each year. This was mainly possible because the federal government built a national facility (a 1.6-m telescope managed by the Laboratório Nacional de Astrofísica), whilst several founding agencies put money into large projects, such as Gemini and SOAR telescopes, as well as supporting the construction of modern instruments. Currently we have 300 PhD astronomers and 35% are women. The gender balance is better than in most countries, but our goal is to reach 50%. We have a national association,

[1] www.astronomia2009.org.br

SAB — the Brazilian Astronomical Society, affiliated to IAU — that comprises almost all astronomers in the country (400 members) and has had annual Meetings since 1974. The fact that we have a young and continuously growing astronomy community was one of the driving forces behind the IAU's decision to organise the 2009 General Assembly (GA) in Brazil (Rio de Janeiro).

With the inception of professional activities, the diffusion of astronomy through TV and magazines has improved significantly. The situation has also improved teaching at graduate courses in physics institutes; the benefits of this were seen in terms of the number of students selecting astronomy as a career. At the elementary level, however, the situation is changing very slowly. Teachers have no training at all in the subject, are not motivated to learn because all their time is consumed by teaching, salaries are low and courses to train in astronomy are rare. On the other hand, students are enthusiastic about the sky. This year 345,657 children took part in the 10th National Olympiad of Astronomy (OBA). The prize was a visit to the Laboratory of Satellite Integration and Tests and the winners were interviewed by the biggest TV channel, showing a lot of excitement. Thus we have a fertile terrain to explore and IYA2009 is a great opportunity to strengthen our connection with the public at several levels.

Coordinating committees

We have organised our work in four areas, grouping the programmes by the target public and by human resources. In this way, the programmes defined by IAU for the IYA can be adapted to the situation of our people and to what we can do with such meagre resources.

Research

In order to continue growing, Brazilian astronomy needs continuing support for student fellowships, infrastructure for building instruments and data analysis facilities. In 2009 we plan to show the public and the government what we have been doing with the investments they made and our plans for the next decade. In our area, research has proven to be the source for improving public education and science diffusion. News about discoveries made by Brazilian astronomers is followed with special interest. Our main goals are:

- To develop a strategic plan for Brazilian professional astronomy: observational and computational facilities, professional training, science education and diffusion.
- Talks on recent large impact developments in astronomy: this is devoted mainly to physicists, students, educated public and has the potential to attract young people for a career in astronomy.
- Talks on broader astronomical subjects; astronomy history as well as key questions raised by the public. We have named this project *Talk with an astrophysicist*.

Coordinator: Kepler Oliveira — Instituto de Fisica da Universidade do Rio Grande do Sul

Schools

Schools are where we have the biggest problems because of the large education system. Public schools have no internet connection, making it difficult for the Galileo Teachers programme to be adapted and there are no good channels of contact with the schools. Even so, the 10th OBA (Brazilian Astronomy Olympiad) reached 4891 schools, involving 36,487 teachers. It is possible to use the link opened by the OBA in 2009 to distribute kits and printed material. The federal government is looking to make the programme *One Laptop per Child* a reality and this may open up a great opportunity to offer educational materials in an electronic format. Our goals are:

- To improve communication with teachers in public schools.
- To distribute experimental kits and electronic books to be used by children in public schools.
- To bring the International Olympiad of Astronomy to Brazil in 2009.

Coordinator: Jaime Villas da Rocha — Universidade Federal do Rio de Janeiro

Science centres

We have a small number of science centres, museums and planetariums. They are very important, as they offer the opportunity of a longer and deeper exposure to science subjects and employ well trained people. Our main goals are:

- To develop and distribute astronomy programmes for planetariums and science centres. To circulate an exhibition of astronomical images.
- Talks on the Latin American Indian astronomy in all planetariums/science centres. The magnificent Milky Way allowed the local Indians create the “dark constellations”, based on black spots and stars.
- Megashow with popular songs inspired in astronomical themes to be held in Rio de Janeiro, during the IAU2009 General Assembly.

Coordinator: Alexandre Cherman — Fundação Planetário do Rio de Janeiro

Amateurs

Amateur astronomers will be essential to the success of IYA2009 in Brazil. They have good instruments, skills in showing and explaining astronomy to the general public and a lot of enthusiasm. Our goals:

- To connect Brazilian amateurs in a network. Presently 70 clubs are nodes of the IYA2009 and we expect to double this number.
- To get 1,000,000 people looking through a telescope in 2009.
- To increase the number of (small) public observatories and trained amateurs.

Coordinator: Tasso Napoleão — Clube de Astronomia de São Paulo

The Gallileoscope programme could be important for us, since not many people have telescopes or binoculars. However, it is particularly difficult to organise. Since the country and population is so huge, it would make sense to have more than 1 million Gallileoscopes distributed though we haven’t yet figured out who could sponsor the project and what company could build the instruments.


Credit: Sze-leung Cheung

IYA2009 in Africa — A South African perspective

Kevin Govender
South African Astronomical Observatory / Southern African Large Telescope (kg@saao.ac.za)

Abstract

In Africa the stars have always been a part of people's everyday lives, be it in the form of folklore, superstition or even agricultural indicators. Modern astronomy, however, has not been very widespread, with only a few African countries having sufficient facilities or academics to support a modern astronomical community. The International Year of Astronomy serves not only as an opportunity to boost these astronomical communities, but also to celebrate the rich history and culture that has existed for thousands of years. On this, the poorest continent, with so many millions living in rural areas, there is one glaring advantage over other continents — people's abundant access to a dark night sky. We would like to see 2009 as the year that everyone in Africa, no matter what their background or lifestyle, turn their heads to the skies in appreciation of the beauty of the Universe, in celebration of their cultural heritage, and in the hope that they are inspired to overcome harsh challenges that this small planet and its occupants may have placed on them. It is an opportunity not just to promote astronomy, but also to spark curiosity and spur on a culture of learning. The perspective will be given from South Africa, home to a number of major astronomical facilities, and a major player in the development of astronomy across Africa. IYA2009 progress to date and plans for the future will be discussed.

1. Introduction

The bulk of this paper is based on a plan for *Astronomy Education and Outreach in Africa* which was built on input from a number of people from across Africa (and beyond) who are involved in astronomy/space science/science education in some way. The need for such a plan for Africa was based on the glaring lack of representation by African countries on the IYA2009 scene. In the build up towards IYA2009 we wanted to ensure that Africa had a voice and reaped as much benefit as possible from this global event.

This paper is thus an abbreviated version of the draft Africa Plan, the full version of which can be obtained from the author.

Before getting into the plan however, it is important to briefly mention the South African Road Map as an example of IYA activities in an African country. South Africa has also, in past years, led the development of astronomy in Africa, and thus forms the benchmark or example of how activities could be carried out in other African countries.

South African Road Map to IYA2009:

- First meeting of astronomy stakeholders (26 January 2007);
- Survey of astronomy education and outreach (February 2007);
- SA representation at SPoC meeting in Garching (3–4 March 2007);
- Astronomy stakeholder meetings (7 May 2007 in Johannesburg and 25 May 2007 in Cape Town);
- AstroNet e-mail list set up (8 June 2007);
- New URL is launched[1] (11 June 2007);
- Call for consolidation of astronomical resources (22 June 2007);
- National Steering Committee for IYA finalised — representation from all major astronomy stakeholders (27 June 2007);
- Meeting of National Steering Committee (2 July 2007);
- 2nd Meeting of National Steering Committee — IYA business plan and budget (22 August 2007);
- Launch of interim resource database (5 September 2007);
- Launch of online discussion forum (27 September 2007);
- Tentative presentation to South African Department of Science and Technology for funding of business plan (November 2007).

2. The Africa Plan for astronomy education and outreach

Background

Astronomy is a subject that encompasses a large number of science, engineering and mathematics disciplines. As such it bears a distinct strength in the promotion of these disciplines to students and the public. It is also a subject that sparks the curiosity of young and old alike. In Africa, where education is probably the most sustainable solution to development challenges facing the continent, a group of astronomy, space science and education-related individuals and organisations have decided to come together to harness these useful characteristics of astronomy for the benefit of Africa as a whole. In building the astronomy community in Africa, the group aims to use the subject to spark an interest not only in science, engineering and mathematics disciplines, but also in education in general. The International Year of Astronomy will be used as a launching pad for a network of African individuals and organisations that intend to work together into the future using astronomy to enhance education in Africa.

Vision

The continent of Africa, with an ever-growing astronomy research community, united in the fields of education and outreach, working together and sharing resources, such that the people of Africa are educated, especially in the fields of science, engineering and technology.

Theme

The theme had to make IYA2009 relevant to Africa and after deliberations as to the importance of astronomy in an African context we settled on the theme: *Astronomy for Education*.

[1] www.astronomy2009.org.za

Core missions

The vision will be realised through the following four core missions (and related objectives), with a focus on building and supporting human resources:

- Enhance the teaching and interest in mathematics and science in schools through:
    - educational resource development and distribution;
    - educator development;
    - learner development;
    - promotion of astronomy-related careers.

- Enhance the teaching and research interest in astronomy in universities through:
    - promotion and encouragement of post-graduate studies;
    - encouragement and support of physics/astronomy related student bodies;
    - equipping universities with the necessary infrastructure and resources.

- Increase the awareness and knowledge of science amongst the public through:
    - public resource development and distribution;
    - astronomy communication capacity building and implementation;
    - public programmes and events;
    - astronomy in the media.

- Support and encourage an African network through:
    - sourcing and sharing of astronomy and education related resources;
    - human resource development;
    - close liaison with Pan-African organisations such as NEPAD and African Union.

Structure

It is recommended that the African network remain an online and dynamic structure with the Pan-African body keeping informed and in contact through e-mail and a website for Africa. Within each country however, a driver (single point of contact) along with a team that comprises the steering committee for that country is required.

Guiding principles

- Encourage collaboration both nationally and internationally.
- Support and enhance rather than reinvent programmes.
- Ensure adequate monitoring, evaluation and quality assurance.
- Development and support of human resources.
- Ensure sustainability at every stage.

Envisaged road map

It was thought that a road map of activities before, during and after IYA2009 would serve as useful guidelines. This road map would obviously evolve rapidly but would basically entail the following:

In the time preceding 2009 there will have to be activities carried out in preparation that include:

- establishing networks;

- consolidating astronomical resources and best practices;
- surveying and listing activities;
- sourcing funding for 2009.

Activities during IYA2009 will be varied and essentially cover four geographical categories: global (i.e. Cornerstones or other), regional (e.g. across Africa), national (within individual countries) and local (specific to towns or villages).

In order to ensure that the impact of IYA2009 has a high degree of sustainability, the following activities need to be carried out in the time shortly thereafter:

- Global Consolidation of Astronomy Resources;
- Regular Astronomy Club/Society Activities;
- Regular Communication with the Astronomy in Africa Network;
- Universe Awareness Programme;
- African Hands on Universe;
- Astronomy in the Media;
- Astronomy in the Classroom;
- African Collaborations.

Funding

Although funding will be sought from as many sources as possible it is envisaged that the bulk should be provided by the national governments of each individual country. However, an active African network will serve as a motivation for the provision of funding by any potential external funders.

3. The countries behind the plan

An important point to mention is the number of African countries that have participated in the development process of the plan so far through established points of contact. The table below lists the countries involved at the time of CAP2007 and the individual contact points.

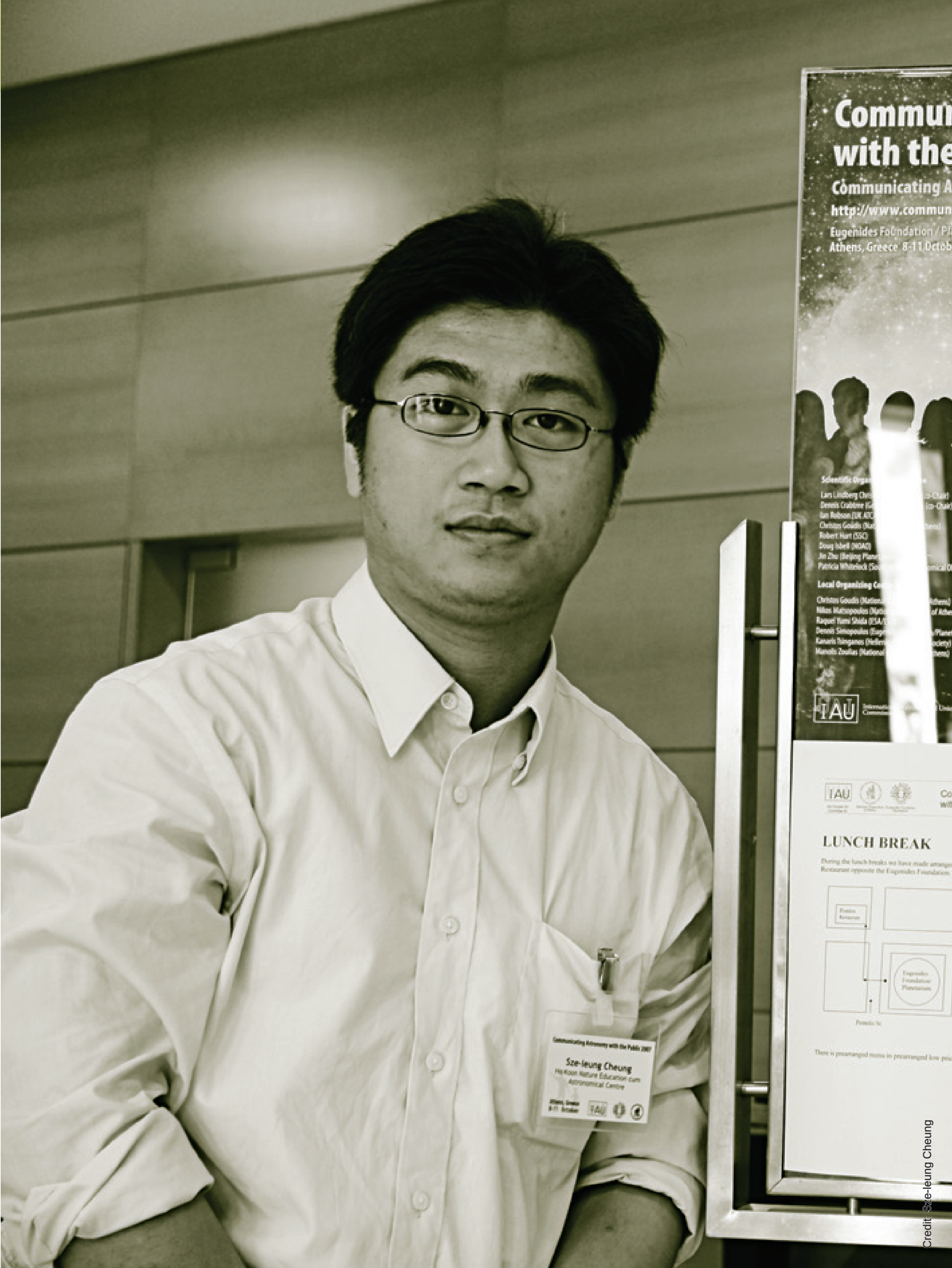
#	Country	Contact Point
1	Uganda	Simon Anguma
2	Sudan	Tahani Shatir
3	Kenya	Paul Baki
4	Ethiopia	Sultan Mohammed
5	Gabon	Patrice Okouma
6	Mozambique	Claudio Moises Paulo
7	Lesotho	Mpho Sek'hosana-Nyenye
8	Swaziland	SS Mkhonta
9	Namibia	Riaan Steenkamp
10	Nigeria	Pius Okeke

11	Angola	Jaime Vilinga
12	Rwanda	Pheneas Nkundabakura
13	Zambia	Adrian Habanyama
14	Zimbabwe	Raban Chikwanha
15	Congo	Floris Javerdin
16	Algeria	Jamal Mimouni
17	Tanzania	Noorali Jiwaji
18	Tunisia	Foued Anane
19	Morocco	Hamid Touma
20	Malawi	Zuze Dulanya
21	South Africa	Kevin Govender

Conclusion

This plan for IYA2009 in Africa will evolve and adapt as more input is found and more country-specific programmes are put into place. However, it is seen in the interim as a basis and a guideline against which African countries can design their own respective programmes. By having a plan that is specific to this region we can focus our activities towards a common theme and also use it to rally the support of regional and Pan African organisations such as the African Union. Input is still welcome and an ever-growing *Astronomy in Africa* e-mail list is used to coordinate activities.

The contact e-mail address for IYA2009 and Astronomy in Africa is:
africa@astronomy2009.org.za



Credit: Sze-leung Cheung

Canadian planning for the International Year of Astronomy 2009

Jim Hesser[1], Cheryl Bartlett[2], and the IYA Canada Committee[3]
[1] NRC-HIA, (jim.hesser@nrc.gc.ca)
[2] Cape Breton University (Cheryl_Bartlett@cbu.ca)

Abstract

Professional and amateur astronomers in Canada are working together to strengthen — and form new — partnerships with the formal and informal education communities, as well as Aboriginal, arts and cultural organisations: "*To offer an engaging astronomy experience to every person in Canada, and to cultivate partnerships that sustain public interest in astronomy.*" Our ideas have much in common with those of other IYA nations, especially our US neighbour with whom we enjoy close liaisons through the AAS, but we do seek to exploit unique Canadian opportunities.

Philosophy

Our efforts are characterised by:

- Strong focus on achieving impact lasting well beyond 2009 in the majority of programmes undertaken.
- Providing activities that are accessible in both French and English.
- Leveraging and strengthening existing efforts and avoiding "reinventing the wheel".
- Leadership by volunteers: as of yet there are no paid staff dedicated to IYA, as much as they are needed.
- Encouragement of individual, grassroots initiatives.
- A goal of increasing awareness among young people of science and technology career opportunities.

Broad themes

Our specific programme ideas can be grouped under three broad themes with strong emphasis on connecting with young people:

- *Reconnecting With the Sky*: star parties, material for educators and kids, visiting dark sky sites and creating new ones, etc.
- *Canadians at the Frontiers*: national planetarium shows, national lectures by outstanding researchers who are also gifted public speakers.
- *Astronomy in Society*: first nations and Inuit traditional knowledge, astronomy in Canada's multicultural society, collaborations with arts and entertainment organisations.

---

[3] Ruth-Anne Chicoine (CSA), Jeffery Crelenstein (The Impact Group), Jayanne English (CASCA & U. Manitoba), Peter Jedicke (RASC & Fanshawe College), Rémi Lacasse (FAAQ), Pierre Lacombe (FAAQ & Planétarium de Montréal), Robert Lamontagne (CASCA & U. de Montréal), Phil Langill (U. Calgary), Lindsay Marshall (CBU), Bob McDonald (broadcast journalist), John Percy (CASCA & U. Toronto), Scott Young (RASC & The Manitoba Museum), Andy Woodsworth (NSERC)

Teams across Canada are preparing funding proposals to implement specific programmes, including:

- A proposal led by the RASC for >1M Canadians to enjoy "Galileo moments", and to promote astronomy as widely as possible with help from their centres and other outreach programmes (Guides, Cubs, Scouts), with associated handouts and resources.
- Creation and distribution of a student astronomy kit including the Galileoscope.
- A focus on Aboriginal knowledge of the heavens.
- Creation and promotion of dark sky sites across Canada.
- Planetarium and science centre productions including *Galileo Live* with actors and new material proposed for Canada's 5 major planetariums.
- Heavenly arts and entertainment collaborations being explored at local and national levels.
- A fully scripted four-hour mini-series connecting astronomy with history, art, and literature, as well as promoting the end-to-end value to society of "dark skies" and re-connection with the night sky is under review by broadcasters.
- Postal stamp and commemorative coin proposals are awaiting decisions in 2008.

Partners

- Canadian Astronomical Society (CASCA)
- Royal Astronomical Society of Canada (RASC)
- Fédération des Astronomes Amateurs du Québec (FAAQ)

Collaborators

- Planetarium and science centre communities
- National science reporter for the CBC
- Canada's Aboriginal communities
- National Research Council (NRC)
- Canadian Space Agency (CSA)

Two examples of encouraging early success

1. Collaborations with Canadian arts communities

- Two national musical organisations are commissioning major new works based upon Galileo and astronomy.
- Youth concerts on themes of Galileo, astronomy and music written by Victoria Symphony Music Director Tania Miller to be performed in Victoria, Vancouver, Toronto.
- Symphonies across Canada are encouraged to perform Holst's *The Planets* and Estacio's *Solaris* accompanied by astronomical imagery.

All such programming offers rich opportunities for sky viewing in collaboration with amateur and professional astronomers.

2. Canadian Aboriginal participation

From their home on the east coast, where the light of each new day is first received and then journeys westward across our country, Cape Breton University's Integrative Science Programme and the Mi'kmaq College Institute are leading efforts to reach out to all Canada's Aboriginal peoples to invite collective participation in IYA2009 celebrations. They have formally engaged with their local Membertou First Nation and the Unama'ki Institute of Natural Resources to create the essential basis for national outreach and planning with Canada's diverse First Nations communities.

Under the Integrative Science approach (see Figure 1) Aboriginal and western stories of our interactions with and within nature are being captured. As we reach out across the country to encourage Aboriginal participation in IYA celebrations, we envision three major thrusts:

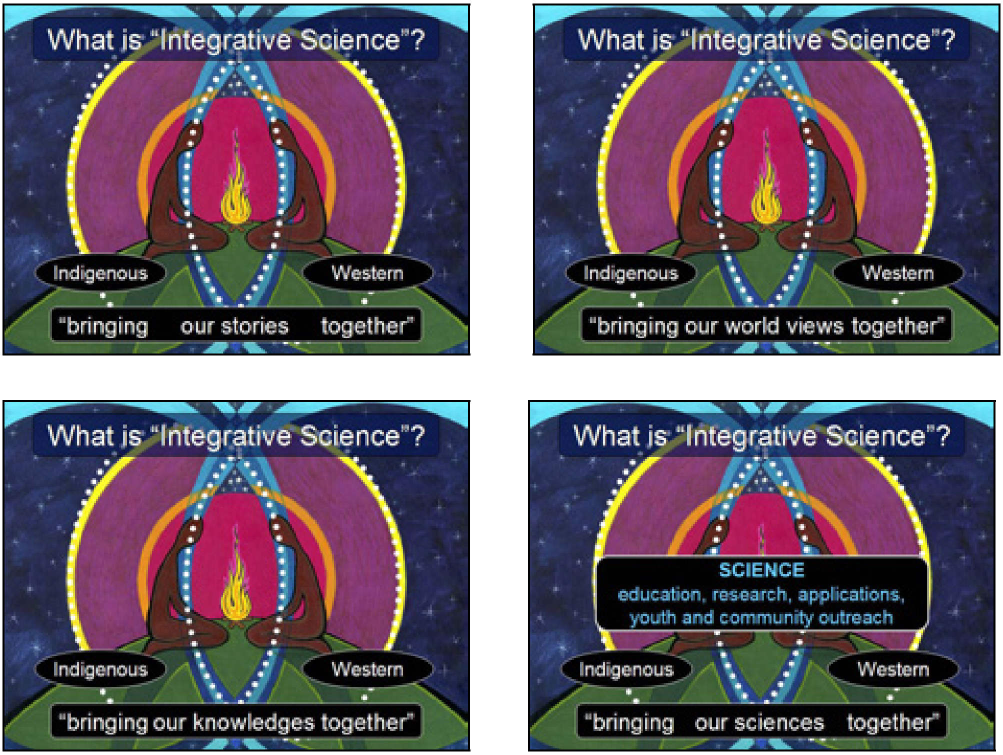
a) Collective compilation of night sky stories from across Canada, with respect to one or more particular constellations,
b) Collective encouragement of dark sky preserves across Canada, and
c) Highlighting educational opportunities and pathways for young Aboriginals interested in science through strong participatory opportunities locally and within the K–12 school systems in Aboriginal communities across Canada.

The encouraging lesson to date is how appealing IYA2009 opportunities are proving to be to new partners and collaborators, and how modest initiatives by individuals pursuing personal interests can create far-reaching impact. Our progress may be tracked online[2].

Acknowledgements

We thank Michael Peddle (NRC-HIA) for his invaluable creative assistance with our poster and presentation for CAP2007, John McDonald (RASC Victoria Centre) for permission to use his photograph of the 2007 Saskatchewan Star Party in our poster, and Basma Kavanagh (CBU) for creation of Figure 1 and other materials we displayed in Athens.

[2] www.astronomy2009.ca or www.astronomie2009.ca



Cape Breton University

Figure 1 – Illustration by artist Basma Kavanagh of the principles of respectful dialogue that underpin integrative science education at Cape Breton University. Developed in close collaboration with Elders, the programme provides an environment in which Aboriginal youth have the opportunity to view the natural world through traditional and Western scientific eyes.

The International Year of Astronomy 2009 in Russia

Oleg Malkov
Institute of Astronomy, Moscow (malkov@inasan.ru)

Abstract

The International Year of Astronomy (IYA2009) will be a great event in the scientific and cultural life of all nations. IYA2009 activities will be on several levels, but the majority of IYA2009 events will take place locally and nationally. To prepare for these activities, National Nodes have been formed in each country. These nodes establish collaborations between professional and amateur astronomers, science centres and science communicators. The activity of the Russian National Node is described here.

IYA2009 in Russia

The National Committee of Russian Astronomers (NCRA) is responsible for the organisation of IYA2009 events in Russia. NCRA works in close cooperation with the Scientific Council for Astronomy (SCA) of the Russian Academy of Sciences and with the Euro-Asian Astronomical Society.

A list of planned actions currently includes:

- Organisation of a debate by the Scientific Council for Astronomy and Ministry of Science and Education with the mass media.
- Support of the *Hands on Universe* programme and organisation of a similar national project (simple telescopes, centres of collective use etc.).
- Organisation of astronomical exhibitions, TV-programmes, round table discussions on topics such as *Astronomy as an Element of Culture*.
- Observations of the total solar eclipse (Siberia, Russia) on 1 August 2008.
- Organisation and support of Russian astronomical conferences to strengthen and promote widespread access by the public to new knowledge.

A preliminary list of Russian conferences is as follows:

- Winter schools *Physics of the Cosmos* (February 2008 and February 2009, Ural State University);
- Ultraviolet Universe (May 2009, Moscow);
- Prospects for Russian ground-based and space astronomy (inauguration of Kislovodsk observatory, autumn 2009);
- 100th anniversary of the Tunguska Impact (2008);
- First Radioastron space mission results (2009);
- All-Russian Astronomical Conference (2010).

Our current (2007) activity includes the following items:

- Budgeting and attracting sponsors and partners.
- Lobbying for IYA2009 UN approval.
- Giving a presentation on IYA2009 at the All-Russian Astronomical Conference (Kazan, 17–22 September 2007).
- Constructing the National IYA2009 website[1].
- Forming the National Node.

Members of the National Node are currently:

- Head: A. Boyarchuk (NCRA head);
- Secretary: O. Malkov (NCRA scientific secretary);
- Head of Scientific Council for Astronomy (N. Kardashev);
- Directors of main astronomical institutions:
    - Institute of Astronomy Russ. Acad. Sci (B. Shustov);
    - Sternberg Astronomical Institute MSU (A. Cherepashchuk);
    - Special Astrophysical Observatory (Y. Balega);
    - Director of Moscow City Palace of Youth Creativity (D. Monakhov);
- Government representatives:
    - Administration of the President of Russian Federation (E. Popova);
    - Ministry of Science and Education (A. Barabanov);
- Sponsor representatives:
    - Pentar corporation / MEADE company (A. Svetlov);
    - Novosibirsk Instrument Factory (S. Maslikov).

Acknowledgements

We are grateful to the Pentar[2] corporation, the MEADE company[3] and the Novosibirsk Instrument Factory[4] for their support of IYA2009 activities. My visit to the CAP2007 conference was partially supported by the conference organisers.

[1] www.astronomy2009.ru
[2] www.pentar.ru
[3] www.meade.ru
[4] npz.optics.ru

Astronomy Outreach in Greece and the prospects for the IYA2009

Nicolas Matsopoulos[1] & Manolis Zoulias[2]
[1] National Observatory of Athens (matsop@astro.noa.gr)
[2] Academy of Athens / Research Center for Astronomy & IYA2009 Greece Secretariat

Abstract

We present a short overview of astronomy outreach activities in Greece and the profiles of the organisations involved. Furthermore, we present the capabilities and potential of these organisations for their involvement in IYA2009.

Introduction

Until the last decade of the 20th century astronomy had remained a purely academic subject since the modern Greek state was established in 1827. Although the National Observatory of Athens was established in 1842 and the Department of Astronomy has been active since the foundation of Athens University in 1837, there was no major interest in disseminating astronomy to the public. A few early attempts, such as the Astronomical Society of Greece in 1926 in Corfu and the Greek Astronomical Society in 1957 in Athens, had no major social impact in the then international or national political conditions. However the public has always been fascinated by the "mysteries of the Universe".

In the early 1990s, social conditions in Greece were more favourable than ever for developing public interest in astronomy because:

- Greece had not faced warfare or severe external threats for more than forty years.
- Democracy was secured after the fall of the military regime in 1974.
- Private wealth had increased dramatically.
- Greece became a full member of the European Union, a fact that opened the market for astronomical equipment and allowed the free flow of information.

The development of information technology along with the rise of the internet era and the operation of privately owned radio stations and, most importantly, television media also gave a boost to public interest in astronomy, providing tools and media to communicate science with visual and hands-on methods as never before.

Thus, today we face a tremendous increase in public interest in astronomy in Greece, which has triggered the establishment of outreach organisations, which will be presented below.

Outreach organisations and facilities

Planetariums

- Eugenides Planetarium (350,000 visitors per year). This planetarium belongs to the Eugenides Foundation, which has provided valuable education services to Greek society since the early fifties. Under its huge dome (25 metres) there are projectors for fulldome video and film shows and a Digistar planetarium projector.
- Planetarium at the Technological Museum at Thessaloniki (80,000 visitors per year). The science museum at Thessaloniki operates a planetarium with 75 seats and is equipped with an RSA projector.

Visitor Centres (VC)

- Penteli Observatory. The National Observatory of Athens has operated an active Visitor Centre at Penteli Observatory since 1994. An old 25-inch refractor and various smaller telescopes for solar and stellar observations are used for public viewing and training students and amateur astronomers. The facility also has a lecture hall with 130 seats. The VC is open from Monday to Friday for elementary and secondary schools during the academic year and six nights per month for the public. It also organises seminars at various levels on a regular basis.
- Kryonerion Observatory. The site is 120 km south of Athens and belongs to the National Observatory of Athens. It is equipped with a 48-inch Cassegrain. The site is open for the public one night per month during the summer. It also provides support to amateur astronomers.
- Skinakas Observatory. The observatory belongs to the University of Crete. It has various research optical telescopes — the largest being a 50-inch Ritchey–Chretien reflector. The site is open to the public every weekend during the summer.
- University of Athens Observatory. The laboratory of Astrophysics of the University of Athens operates a 16-inch robotic telescope on its campus. The telescope is open to the public one night per month while public lectures are given regularly.
- University of Thessaloniki Observatory. The Department of Astronomy maintains some small telescopes that are regularly open to the public on the university campus. The department has significant outreach activity in the mass media.

Public Observatories

- Larisa Observatory. This public observatory was established in 1984 in Larisa, a major city in central Greece. It belongs to the municipality of Larisa and it has important local outreach activities.
- Zagori Observatory. This small observatory is in a small village 54 km from the major city of Ioannina, Epirus in the northwest of the country. It is a private institution established in 2005. It is open to the public during the summer, and organises schools and seminars for amateurs on a regular basis.

Amateur astronomy

There are now 12 amateur astronomy societies all over the country with about 3000 active members in total. Their distribution covers almost the entire country. An analysis of the profile of Greek amateur astronomy societies by Dimopoulos and Matsopoulos (2007) shows that they concentrate mostly on outreach and informal education activities, by organising numerous seminars, lectures, open nights, star parties and sidewalk activities. They also maintain highly informative websites and publish bulletins and magazines with educational content. They act as the major task force for astronomy dissemination in Greek society.

Another study of the profile of the Greek amateur astronomer by Matsopoulos (2007) shows that most are young (56.2%<40 years old), male (75%) and well-educated (48.3% have a university degree and another 25% are students). These results show that these amateurs have the capacity to provide high quality public outreach and informal education.

Although the scientific contribution of all these amateurs is nominal, there are two emerging groups where they are engaged in real science, making scientific observations of variable stars and other astronomical phenomena. These two groups are acting as catalysts between the amateurs and the scientific community by providing hands-on scientific activities and disseminating scientific methodology.

Prospects for IYA2009

Although there are discussions between all those mentioned above, to plan and arrange simultaneous activities all over the country during the International Year of Astronomy (IYA), no decisions or fixed arrangements have been made as yet. But, in a business as usual approach, we can assume that both institutions and amateurs will accept the challenge and arrange numerous open nights for the public, sidewalk activities, star parties, lectures, special planetarium shows, inserts in major newspapers and presentations to the mass media during the IYA2009.

References

- Dimopoulos K., Matsopoulos N. (2007), Greek Amateur Astronomy as Agent of Informal Education. Proceedings of the 4th Hellenic Conference on *The Cultural Component of Science in Education* (University of Patras (in Greek)
- Matsopoulos N. (2007), Astronomy in Modern Greece (1700-2000). GSRT-NOA. Athens 2007. (in Greek)
- Matsopoulos N. (2007), The Profile of the Greek Amateur Astronomy. MA Thesis. Greek Open University. Patras (in Greek)


Credit: Sze-leung Cheung

IYA2009 — UK activities

Ian Robson
UK ATC, Royal Observatory Edinburgh.(eir@roe.ac.uk)

Abstract

This presentation describes the organisational structure of IYA2009 activities within the UK and the progress in funding ideas and the planning of the ideas and events themselves.

1. Organisation

The top-level organisation is carried out under the auspices of the Royal Astronomical Society (RAS). The web page[1] has been in existence for some six months. There is a Steering Committee overseeing activities comprising members from the following organisations: the RAS, the Federation of Astronomical Societies (FAS), the British Astronomical Association (BAA), the Society for Popular Astronomy (SPA), National Astronomy Week (NAW), the Royal Observatory Greenwich (ROG), the Association for Astronomy Education (AAE), the Institute of Physics (IoP), Astronomy Now, Ecsite, the Society for the History of Astronomy (SHA), the Science and Technology Facilities Council (STFC), the Faulkes Telescope (now Las Cumbres) and representatives from the Scouts and Guides. I chair the Steering Committee. There is also an Executive Committee that represents the major funding bodies and this is represented by the RAS, STFC and the IoP. I also chair the Executive Committee.

2. Work to date and funding

Three Steering Committee meetings have been held, which have mainly concentrated on the non-professional astronomy pool and fleshing out “ideas” that can be taken forward for more detailed planning and potential execution. Currently the Steering Committee is being grouped into theme areas and a single contact appointed to coordinate the activity within the theme and feedback to myself and the UK Coordinator.

IYA2009UK itself was effectively launched at the National Astronomy Meeting in April 2007 at the University of Central Lancashire as part of the one day outreach parallel session. I gave a presentation and also announced the new web page, which came online that day. Since then we have had articles on IYA published in a range of journals. This will be expanded greatly in 2008, hopefully following the United Nations endorsement of IYA2009.

[1] www.astronomy2009.co.uk

Everyone realises that funding is a critical issue and in the UK we have been extremely fortunate in finding support from established astronomy organisations, principally the RAS and STFC. The latter provided funding to help support the International Coordinator (Pedro) and recently, the RAS, STFC and the IoP have pledged 150k EUR for a full-time UK coordinator. This was extremely important and I hope will set an example for other countries to emulate. We are expecting to interview in late November and are seeking to appoint from January 2008. The post will continue until April 2010, to include the important post-event evaluation.

Funding will also be sought from the RAS and STFC to support specific IYA2009UK initiatives. These are expected to be awarded through standard peer review processes, but we are hoping for significant sums for this, of order hundreds of thousands of euros. So far we have made little attempt at seeking funding from other sources, but this will ramp up in early 2008.

3. Specific UK events in the planning phase

A number of events have now been earmarked as IYA2009 specific. Other events that occur on an annual basis will be approached to gain an IYA special flavour.

Moonweek 2009. This will be the annual National Astronomy Week, renamed. It will take place during the week of 21–26 July and will commemorate a number of events; namely the 40th anniversary of the Apollo landing (21st), the longest total solar eclipse of the century (22nd) and the weekend will feature Thomas Harriot celebrations at Syon House, Kew (26th). To my chagrin, this latter gentleman was unknown to me until some six months ago, and I suspect the same is true for many in the audience. However, his claim to fame is that he observed the Moon through a telescope and made a very crude map some time before Galileo, but unlike the great scientist, he failed to publish! In fact he seems to have been quite a character, and for a time was jailed on suspicion of being involved in the plot to blow up Parliament — just Google[2] him to get the rest of his story.

We have also agreed to hold two Astronomy Weeks during the year. These will focus on having as many members of the public as possible look through a telescope, mainly using the network of amateur astronomers. We have selected the weeks of 29 March and 29 October, ensuring that we have the first quarter Moon and Saturn and Jupiter respectively — although neither is a prime viewing object in 2009. We have gone for "weeks" rather than a day to maximise opportunity in case of poor weather and to include both weekends and weekdays. This will also allow solar viewing during the day for schools. We anticipate that these weeks will be used as a springboard for many other events.

In terms of annual UK meetings, the following will be targeted for an IYA theme in 2009: ASTROFEST in January; the Association of Science Education meeting also in January, National Science Week (British Association for the Advancement of Science in March), Science Festival Week (BAA

---

[2] see for example, http://www.britannica.com/eb/article-9039337/Thomas-Harriot

in September) and the National Astronomy Meeting in March, which in 2009 will be held at the University of Hertfordshire and is a joint JENAM meeting.

4. UK ideas

There are a host of ideas that have not yet matured to the detailed planning phase, but will undoubtedly take place. Organisation of these will be tasked for 2008. These ideas include star parties organised by astronomical societies etc, special events held by Visitor Centres and Planetariums, the possibility for extremely cheap "do-it-yourself" cardboard "give-away" telescopes for the public and issued from Visitor Centres and Planetariums (but with very limited astronomical capability), donation of "reasonable" telescopes to selected schools (requiring significant external funding), taking telescopes into schools for night-time and solar observing along with the use of real-time solar web-feeds, an attempt to obtain really cheap solar projection kits (out of cardboard) to distribute to schools (and hope that the Sun responds with some sunspots!). There are also ideas about making a radio or TV documentary about Thomas Harriot, special visits to "Stately Homes", along with concerts of Holst's *The Planets*. At the Royal Observatory Edinburgh we are looking to take selected items from the world famous (and arguably best) collection of astronomical texts on a "world tour" (anyone interested please contact me). Competitions and prizes for many of these activities will undoubtedly take place.

We are very keen to use the IYA to provide specific resources for local astronomical society members to use for communicating astronomy with the public, as these provide the greatest numerical resource within the country. This might include such things as "how to give a talk" (we'll point to David Malin's contribution for this conference of course), the suggested use of PowerPoints, "what works and what doesn't", web material, posters, coffee mugs with the IYA logo, etc.

Given the UK's extremely strong record in astronomy research and the use of robotic telescopes for education, we are also keen to see this coordinated through the IYA, maybe with competitions and prizes as part of the theme. Astronomy lectures on tour given by gifted speakers is another possibility and there is already good progress on a special newsletter for 9–16 year olds (called Starlight) to be issued once a term. We are also very eager to be involved with the touring astronomical image show, at all of the three levels as just described yesterday at this conference.

Other ideas include attempting to place astronomy pull-outs in one of the UK's major newspapers, and producing information sheets available to the public and schools. This would also be on the web and, as well as very specific astronomical topics, might include such things as "what astronomers did for us", "astronomy and navigation", "a guide to UK astronomical archaeological sites", "observatories". There is also encouragement for planning night visits by the public to Stonehenge to see the stars, moonrise and other events.

A key theme that is emerging in discussions is the focus on light pollution issues in general. Therefore, it is certain that the UK will want to contribute to the DarkSkies initiatives and Globe at Night. There is a thought that we could designate a "Dark Sky Park", but this may not be so easy in the UK.

Regarding education, this is a very strong point within the UK and we will undoubtedly participate in the Cornerstone Projects through such aspects as UNAWE, Hands on Universe, etc. In Scotland we have already gone through the *Continuing Professional Development* and *Teach the Teachers* for astronomy in the curriculum, but undertaking this for England and Wales will be much harder due to the scale and bureaucracy of the educational machine. Nevertheless, this is something that I hope the UK Coordinator will be able to drive to a successful conclusion.

In all of the things we are planning we need to remember the heritage factor; what will the IYA have left for the next generation, what platform has it provided on which future expansion can be built?

IYA2009 in Chile

Patricio Rojo
Universidad de Chile (pato@das.uchile.cl)

Abstract

The organisational structure of the Chilean node for IYA2009 is introduced and ideas for activities in 2009 are described.

Background

The clear and dry skies of the northern desert have made Chile a favourite place for the construction of state-of-the-art observatories for professional astronomical research. During the last 10 years many universities have created several new faculty positions in the field, greatly increasing the number of students pursuing graduate studies in astronomy. Nonetheless, the awareness of the general population regarding the impressive natural resource of Chilean skies and their knowledge of current astronomical discoveries remains relatively low. The International Year of Astronomy 2009, or Año Internacional de la Astronomía 2009, (IYA2009), is therefore an excellent opportunity to improve the astronomy awareness of all, youngsters and adults throughout Chile.

Participation and organisation

Contacts from the main Chilean astronomical institutions are responsible for organising IYA2009 in Chile. Currently the group is consists of 24 volunteers, including representatives of seven universities (U. de Chile, U. Valparaiso, U. Concepci´on, U. Cat´olica, U. Santiago, U. La Serena, and U. Cat´olica del Norte), four professional observatories (ESO, NOAO, Gemini, and ALMA), professional and amateur societies (SOCHIAS and ACHAYA), and other organisations related to astronomy (PROED, CADIAS, OPCC). The Chilean node is organised into three working groups: one administrative, and the other two preparing activities that focus on either society or education. The Chilean IYA2009 web page[1] is currently under construction, but has not yet been enabled for public view. Internally, the node has a private wiki to help with the coordination.

Activities

Plans are being made to join global activities such as UNAWE, the Globe at Night and Sidewalk Astronomy events. In addition following national activities are currently under consideration by the education and social working groups.

[1] http://astronomia2009.cl

Education Working Group

- Astronomical Conferences
    - Establish a national conference for middle- and high-school students. The idea is to try to build the infrastructure necessary for an annual national conference from 2008 with scientific presentations (not bibliographical) selected from pre-submitted applications.
    - Develop a seal of approval from IYA2009 Chile with clear and explicit guidelines to give the seal to individuals (project quality requirements) or regional conferences (logistic requirements) with access to IYA2009 if possible.
    - Amateur Conference: Latin-America wide.
    - Professional Conference: (Regional) History of Astronomy.
- Activities package to be distributed to:
    - Scout camps;
    - Star Parties;
    - School teachers.
- Public Talks and Workshops
- Study the possibility of making a proposal for the school-curriculum: astronomy is in the current curriculum, but is not always taught properly (or at all).

Society Working Group

- Open Space Projects
    - Exhibition of images prepared by the Universe from Earth working group.
    - Sculptures and paintings to be requested from local artists and displayed in public places.
    - Astro Day Chile: A coordinated publicity event showcasing science and engineering from professional observatories in public places.
- Itinerant exhibitions
    - Bus with astronomy posters and images.
    - Inflatable planetariums (3 in Chile).
- Open competitions with specific goals and prizes for different age ranges.
    - For youngsters: photographs, paintings or essays.
    - For university students: more specialised projects.
- Collectible albums of cards with astronomical images and associated information in an album for children.
- Libraries
    - Compile a list of recommended books.
    - Buy telescopes for libraries, and provide basic training on how to use them. Libraries will then loan the telescopes to schools.
- Open doors
    - Coordination between amateur, institutional, and professional observatories and planetariums for events on specific days, with dark sky events organised in co-operation with local communities.
- Media
    - Radio and TV recordings distributed freely on other broadcasting stations.
    - Production of original TV series.

Astronomy and public outreach in Serbia (1934-2009)

Natasa Stanic
Public Observatory and Planetarium – Astronomical Society “Rudjer Boskovic” (stanic.natasa@gmail.com)

Abstract

The astronomical community in Serbia has grown significantly over the last few decades, despite the departure overseas of much home-grown talent. Serbia celebrates three important anniversaries in 2007 — 150 years since the birth of Milan Nedeljkovic, who introduced the first astronomical subjects to the Faculty of Mathematics in 1884, and founded the Astronomical Observatory in Belgrade in 1887; 120 years of the Belgrade Astronomical Observatory and 75 years since the construction of the complex of buildings and telescopes at the Astronomical Observatory in Belgrade. The Astronomy Department at the Faculty of Mathematics in Belgrade has produced many excellent scientists working today at telescopes (Arecibo, Sidney, VLA, Hawaii etc.) and universities (California, Toronto, Sidney, Illinois, MIT etc.) around the world. Since 2005, students have also been able to study astronomy at the University of Novi Sad, Serbia (Faculty of Physics). Today there are more than 20 amateur astronomical societies in Serbia, two magazines of popular astronomy, one Youth Science Centre (Petnica), two Public Observatories and two Planetariums.

If the social and media network formed in October 2007 can deliver even the minimum of the expected results, six million people in Serbia should easily be familiar with IYA2009 goals, related Cornerstone Projects and particular goals in Serbia for 2009.

Astronomical community in Serbia

The astronomical community in Serbia has never worked on a project such as IYA2009 before and it presents a great challenge for professional astronomers, amateur astronomers and science communicators. This is a fantastic opportunity to establish a strong network of astronomical organisations as well as a social and media network that will be a useful base for all activities and programmes in the future and not only in 2009. Public outreach programmes in Serbia (for example, programmes at the Astronomical Society “Rudjer Boskovic” and in other astronomical societies) should be considered as serious as hard science at the Astronomical Observatory in Belgrade or at the Faculty of Mathematics (Astronomy Department) and Physics. Needless to say, if public outreach works well, many more students will choose to study astronomy and astrophysics, and the Astronomical Observatory will have many more excellent scientists, giving us a base to work from on future projects as a member of International Astronomical Union.

The National Committee for Astronomy (NCA) is made up of the most eminent astronomers in Serbia (Prof. Olga Atanackovic-Vukmanovic, president, Prof. Nada Pejovic, Dr Zorica Cvetkovic, Dr Gojko Djurasevic and Prof. Ilija Savic), and has set up a National Node (NN) that includes, besides all the members of the NCA, the Director of the Astronomical Observatory, Belgrade, Dr Zoran Knezevic, the head of the Astronomy Department at the Faculty of Mathematics (University of Belgrade), Dr Dejan Urosevic, Coordinator of the Astronomy Programme at Petnica Science Centre, Nikola Bozic and Director of Public Observatory and Planetarium, MSc Natasa Stanic (NN chair and SPoC in Serbia).

Astronomical organisations in Serbia

- National Committee for Astronomy
- Astronomical Society “Rudjer Boskovic”[1]
- Serbian Astronomical Society[2]
- Astronomical Observatory, Belgrade[3]
- Faculty of Mathematics, Astronomy Department, University of Belgrade[4]
- Faculty of Geography, University of Belgrade[5]
- Faculty of Physics, University of Novi Sad[6]
- Petnica Science Centre, Petnica[7]
- Astronomical Magazine[8]
- Astronomical Society (and Planetarium) Novi Sad, Novi Sad[9]
- “Vladimir Mandic-Manda” –Astronomy group, Valjevo[10]
- Astronimical Society “Belerofront”, Kragujevac
- Astronomical Society “Milutin Milankovic”, Zrenjanin
- Astronomical Society “LIRA”, Novi Sad[11]
- Astronomical Society “Andromeda”, Knjazevac
- Astronomical Society “Loznica”, Loznica[12]
- Astronomical Society “Magellan Cloud”, Prokuplje
- Astronomical Society “Alfa”, Nis
- Society for Natural Sciences “GEA”, Vrsac
- Centre for Radio Astronomy “Tesla”, Belgrade
- Society for Radio Astronomy, Bor
- Astronomical Society “OMEGA”, Gymnasium Becej, Becej
- Primary School “Vasa Zivkovic”, Pancevo

---

1 http://www.adrb.org
2 http://www.das.org.yu
3 http://www.aob.bg.ac.yu
4 http://www.matf.bg.ac.yu
5 http://www.gef.bg.ac.yu
6 http://www.if.ns.ac.yu
7 http://www.psc.ac.yu
8 http://www.astronomija.co.yu
9 http://www.adnos.edu.yu; http://www.members.tripod.com/adnos/planetarijum
10 http://www/astrova.cjb.net
11 http://www.astronomija.co.yu/lira
12 http://www.ad-loznica.org.yu

Social networking for IYA2009

- University of Art, Belgrade[13]
- Mathematical Gymnasium, Belgrade
- Secondary School of Design, Belgrade
- Primary School “Knez Sima Markovic”, Barajevo, Belgrade
- Primary School “Sveti Sava”, Belgrade
- Student’s Dormitory “Jelica Milovanovic”, Belgrade
- Science Fiction Society “Lazar Komarcic”, Belgrade
- Ecological Society of Serbia, Belgrade
- Association of Serbian Artists, Belgrade
- Children’s Cultural Center, Belgrade
- Cultural Centre of Belgrade, Belgrade
- The British Council, Belgrade

Media network for IYA2009

- Broadcasting Programme “One step to science” (once a week), the First Programme of Radio Belgrade;
- Broadcasting Programme “Respectful Children” (once a week), the First Programme of Radio Belgrade;
- Broadcasting Programme “Digital Icons” (once a week), the Second Programme of Radio Belgrade;
- Broadcasting Programme “Premeditation Radio” (daily programme), Radio Studio B;
- Broadcasting Programme “Words and pictures” (daily programme), Radio Studio B;
- Broadcasting Programme “On Saturday with you” (once a week), Radio Novi Sad;
- Broadcasting Programme “Good Morning” (daily programme), YU Radio;
- TV Programme “Kontext 21” (once a week), Scientific Editorial Team, Radio Television of Serbia;
- TV Metropolis: “Star Detectives” (once a week) and “The Morning Start” (twice a week);
- TV Programme “The City News”, TV Studio B;
- TV Programme “Searching for...”, Pink Kids Programme, TV PINK;
- TV Pancevo, Local TV;
- TV Knjazevac, Local TV;
- TV Vrsac, Local TV.

Magazines and books for the popularisation of astronomy

There are two astronomical magazines in Serbia: “VASIONA” (first published in 1953 by the Astronomical Society “Rudjer Boskovic” in Belgrade) and “ASTRONOMIJA” (first published 2003 by Studio SPREMO, Novi Sad)[14]. These two magazines will be significant promoters of IYA2009 preparations and activities, as well as several new special editions that will appear in 2009 (picture book collections for children, books of popular astronomy for the general public etc.).

[13] http://www.arts.bg.ac.yu
[14] http://www.astronomija.co.yu

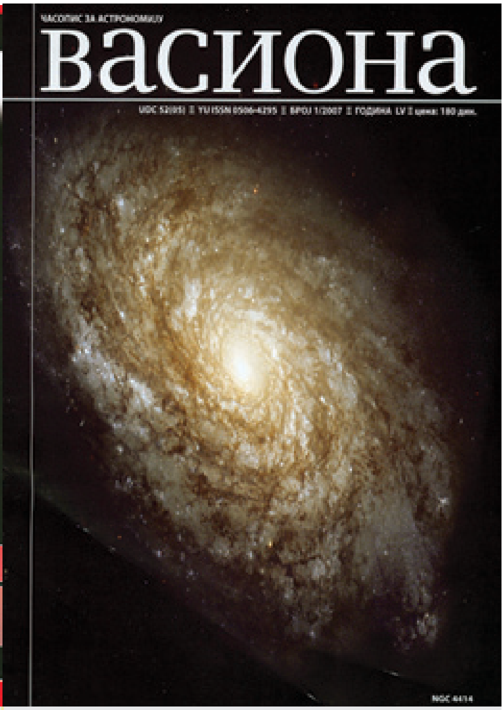
Vision and goals of IYA2009 in Serbia

Visions and goals have been established by the National Node and National Committee for Astronomy (September 2007):

- New planetarium projector (fulldome, lasers and additional equipment) for the Planetarium in Belgrade (Astronomical Society "Rudjer Boskovic" initiative), including possibly a new building.
- Establishing astronomy as an official subject in secondary schools and gymnasiums (Serbian Astronomical Society initiative).
- Opening the new telescope (65 cm) at the Observational Station of the Astronomical Observatory Belgrade on the mountain Vidojevica. Building for the New Observational Station and for the telescope is already complete.
- New Public Observatory in Prokuplje (the Astronomical Society "Magellanic Cloud", Prokuplje).

ASTRONOMIJA magazine

Figure 1 – ASTRONOMIJA magazine.



VASIONA magazine

Figure 2 – VASIONA magazine

Star Detectives – a weekly TV show on TV Metropolis

This is the first Serbian language TV show about astronomy. The show goes out weekly, lasts 30 minutes and presents the latest astronomy news, important internet addresses, institutions and planetariums. Each show has a guest who is an eminent astronomer, writer, philosopher or artist. The guest will discuss the topic where he or she makes the greatest contribution to astronomy research, inspiration or art. Since the author of the show is also the IYA2009 SPoC, it will be the main vehicle for IYA2009 promotion in Serbia — including visions, goals, global Cornerstone Projects as well as main goals for 2009 (established by National Node). Interviews from the CAP2007 Conference (30 interviews with CAP2007 participants, including those with the IAU President, Catherine Cesarsky, the President of the IAU Commission 55, Ian Robson, IYA2009 Secretary, Pedro Russo, Director of the Planetarium in Athens, Dionysios Simopoulos and the author of *The Planets* movies, Jose Francisco Salgado) will be included in the show.

Photo by Ivan Stanic

Figure 3 – Public Observatory, Belgrade

Credit: Sze-leung Cheung

The International Year of Astronomy 2009 in the Netherlands

G. Verdoes Kleijn[1], P. Barthel[1] & M. Baan[2]
[1] Kapteyn Astronomical Institute (verdoes@astro.rug.nl, pdb@astro.rug.nl)
[2] NOVA Information Center (mbaan@science.uva.nl)

Abstract

We briefly discuss public outreach and education ideas for IYA2009 at the national level and a project at the Kapteyn Astronomical Institute that focuses on the infrared Universe and also takes place in 2009.

The Dutch national effort

A national website[1] has been established. The Dutch slogan for IYA2009 will be "*Het heelal, ontdek het zelf!*" and the logo is shown in Figure 1.
An incomplete list of the current ideas for activities in IYA2009 includes:

- educational projects with Galileoscopes in classrooms;
- a book on the history of Dutch astronomy;
- travel guide for astronomy related landmarks;
- commemorative postage stamps;
- a conference commemorating the invention of the telescope by Hans Lippershey;
- an "astro-forecast" following the weather forecast on national television.

The programme for 2009, which should be finalised late 2007, will probably be based on only a subset of the many ideas.

Discover the Invisible Universe at Kapteyn Astronomical Institute

A group of staff and students from the Kapteyn Astronomical Institute at Groningen University have taken the opportunity offered by IYA2009 to promote basic knowledge about infrared astronomy in schools and among the general public. This will be done in collaboration with public outreach and communication officers at the university. The project slogan is *Discover the Invisible Universe*. The focus on infrared astronomy stems from two facts:

(i) the Kapteyn Astronomical Institute has a long tradition in infrared astronomy, and
(ii) 2009 will mark a new era for infrared astronomy with the launch of the Herschel and the Planck telescopes.

[1] http://www.jaarvandesterrenkunde.nl

The two ESA telescopes will be launched together around mid-2008. Herschel, named after the discoverer of infrared light, will study the far infrared Universe from stars to distant galaxies. It contains the Heterodyne Instrument for the Far Infrared (HIFI) which was developed in Groningen by the Netherlands Institute for Space Research (SRON). Planck will focus on observations of the Cosmic Microwave Background.

Key elements of the outreach project will be:

- Public events in Dutch cities and visits to schools using the Discovery Truck – a mobile laboratory[2] belonging to the University of Groningen (see Figure 2). The truck will be used for classes, public lectures, hands-on experiments and demonstrations of infrared astronomy and technology hosted by an impersonator of the 18th century astronomer William Herschel. In addition a mobile planetarium and a 7-m air balloon in the shape of the Herschel telescope will be used during the events.
- A national infrared photo competition for secondary school pupils in collaboration with professional photographers which will be linked to:
    - A Miss and Mister Infrared-Universe election for secondary school pupils.
- An educational/informative website entitled the "Invisible Universe" in Dutch. The website will be based on the CoolCosmos site[3] which will be extended to a wider wavelength range. Dutch educational material on infrared astronomy will also be produced as part of the ESA/ESO astro-exercise series[4]. The website and educational materials may be extended at a later stage to other invisible wavelength ranges, such as the radio, given the Dutch-led LOFAR project (a novel low frequency radio array).
- Concerts with chamber music composed by the astronomer William Herschel himself.
- The efforts for the Invisible Universe in the International Year of Astronomy will be transformed into a permanent web-based knowledge base for astronomy in the invisible part of the electromagnetic spectrum after 2009. The material will be aimed at primary and secondary school levels.

Figure 1 –Dutch version of the logo for the International Year of Astronomy

Movico

Figure 2 – The Discovery Truck is a mobile laboratory belonging the University of Groningen for public outreach and education .

[2] http://www.rug.nl/fwn/nieuws/pr/rugdiscovery/index
[3] http://coolcosmos.ipac.caltech.edu
[4] http://www.astroex.org
[5] http://www.rug.nl/fwn/nieuws/pr/rugdiscovery/index

IYA2009 in mainland China

Jin Zhu and Tongtong Wu
Beijing Planetarium (jinzhu@bjp.org.cn)

Abstract

The preliminary ideas and schemes of the Chinese Astronomy Society (Nanjing) for IYA2009 are presented.

Introduction

IYA2009 activities in mainland China are led by the Chinese Astronomy Society (Nanjing), which comprises the three professional research observatories (National Astronomical Observatories, Purple Mountain Observatory, and Shanghai Observatory) of the Chinese Academy of Sciences, institutions and universities with astronomy or astronomy-related research interests, as well as educational astronomy organisations such as the Beijing Planetarium. The Popularisation Working Committee of the Chinese Astronomy Society, located at the Beijing Planetarium, will be mainly responsible for organising and proposing the preliminary plan for IYA2009 in China.

The Planetarium Committee of the Chinese Association of Natural Science Museums was approved by the State Ministry of Civil Affairs on 7 June 2007. The Planetarium Committee is also located at the Beijing Planetarium, with about 40 institution members, mostly planetariums inside middle schools or city science and technology centres, planetarium-related companies etc. and will contribute to the organisation of IYA2009 activities in mainland China.

Current considerations for IYA2009 activities in mainland China

The current considerations for regional IYA activities include events connected with the total solar eclipse on 22 July 2009; the Astronomy Week around 30 October; the Astronomy Festival for amateurs in July and August; planetarium shows and exhibitions on IYA2009; and producing and distributing telescope kits. Some special efforts directed towards IYA2009 are contained in the following four proposals:

1. To make astronomy a formal course in the middle school curriculum. We hope that this could be achieved in one or two cities in China at least.
2. To have more professional astronomers involved in CAP activities. We are considering some convenient ways to interest all professional astronomers in CAP activities, such as giving public lectures, TV or radio interviews, writing articles for newspapers or magazines on astronomy, or just introducing briefly recent progress in their fields via a website.
3. To encourage amateur astronomers who are involved in popularising astronomy.

4. To investigate the ways to cooperate with different media (TV, newspaper, radio, portals etc.). These considerations are still under discussion and will be revised and improved later.

The partial phase of the solar eclipse on 22 July 2009 will be visible across the whole country, and several very populous cities along the Yangtze River including Chengdu, Chongqing, Wuhan, Hefei, Hangzhou, Suzhou, and Shanghai are inside the total eclipse area. Detailed discussions on activities connected with this event are under way. Organisations for observations of 2009 event should not be difficult considering the convenient facilities in these cities, but the weather conditions may not be so good in this area at that time. The weather conditions for the total solar eclipse in northwest China on 1 August 2008 are likely to be better, although the duration of the total eclipse (maximum about 2 minutes) is not as long as the 2009 case (approximately 5 minutes), and there is almost no big city along the total eclipse area.

A nationwide sidewalk astronomy activity named *Watching the Moon in the Golden Autumn* is being organised jointly by the Popularisation Working Committee of the Chinese Astronomy Society, the Planetarium Committee of the Chinese Association of Natural Science Museums, the Beijing Planetarium, the Amateur Astronomer magazine, and SOHU.com Inc. for the period 19–30 October 2007. Hundreds of amateur astronomers and astronomical clubs are expected to provide their telescopes freely to hundreds of thousands people for moon observations. The launch of the first Chinese moon probe “Chang’e-1” also takes place during this period. Experiences from this activity will be helpful to the preparations for IYA2009.

Planetariums will be very good places for some IYA activities. It seems that there are already some countries preparing to include some planetarium shows for regional activities. It might be interesting to have a “Planetarium Festival” during IYA2009.

The website for IYA2009 mainland China[1] will be fully revised during the coming months.

References

- Wu T.T. (2007), Activity Scheme for IYA2009 in mainland China, undergraduate thesis, Beijing Normal University

[1] www.astronomy2009.org.cn

Credit: Robert Gendler, Jim Misti, Steve Mazlin 2006

Session 6
Social Impact

A colourful orb decorates the region surrounding the bright star Rho Ophiuchi. Probably no other region provides such an impressive spectacle of colourful glowing gases juxtaposed with converging dark rivers of thick dust. The colourful clouds surrounding Rho Ophiuchi represent the visible counterpart of a much larger, but invisible molecular cloud permeating the region and known as the Ophiuchus cloud.

Social impact of the Shaw Prize in Astronomy

Sze-leung Cheung
Ho Koon Nature Education cum Astronomical Centre (csl@hokoon.edu.hk)

Abstract

The Shaw Prize in Astronomy, first awarded in 2004, is an international prize that is unofficially known as the Nobel Prize in the East. This annual prize carries a monetary award of US$1 million, and honours distinguished astronomers for their significant achievements in astronomy. The Nobel Prize is well known for its profound impact in the public domain; it lays down the milestones of human progress. Similarly, the Shaw Prize hopes to have a profound social impact in the public perception of astronomy. This prize is very recent, but communicating astronomy with the public by the means of astronomical milestones could make a significant social impact. This social impact and possible ways of communicating the prize are investigated.

Introduction

Communicating astronomy to the general public is a no easy task, especially in the modern age of information explosion, when attracting the public's interest and attention is not easy. Establishing the Shaw Prize in Astronomy is a very good opportunity to create a platform to attract people's attention and inspire future generations.

The Pearl of the Orient

Hong Kong, where the Shaw Prize Foundation is based, is a modern and international city, and a very special city in terms of economics and political history. Hong Kong is small but dense, with a population of around seven million living on an area of less than 2000 km^2.

Starry nights are often used to cultivate people's interest in the Universe and stimulate the imagination. However, in highly modernised cities, such as Hong Kong, light pollution is usually very serious, and using the night sky as a means to let people get in touch with astronomy is not feasible. Many people in Hong Kong have never seen the Milky Way, so other more effective ways are needed.

For Hong Kong and China, the term, "Astronomy Popularisation" is used for work related to disseminating astronomy to a broader range of citizens with no prior knowledge or experience in astronomy; while the term "Astronomy Communication" means giving a deeper and more up-to-date understanding of astronomy to the people. In other words, the scope of astronomy popularisation is horizontal while astronomy communication is vertical.

Nowadays, astronomy news is updated rapidly, but mainly in English, and most books in other languages are not quite up-to-date. Generally, there is a lag time for a piece of new information to reach new recipients if they are not English-speaking. The problem of a language barrier exists in many countries and it is a major problem in astronomy communication. In Hong Kong, although English is one of the official languages and students learn English from primary school on, English is not the mother tongue and this has proved to be a major obstacle for astronomy communication in Hong Kong.

In addition, in highly commercialised cities like Hong Kong, capitalism makes it difficult for astronomy to get in touch with the general public. So both astronomy communication and astronomy popularisation are not easy.

What is the Shaw Prize?

Sir Run Run Shaw(1907–), a leader in the media industry in Hong Kong, established the Shaw Prize in 2002. According to the Shaw Prize press release[1] issued when the prize was established on 15 November 2002:

The Prize honours individuals, regardless of race, nationality, and religious belief, who have achieved significant breakthrough in academic and scientific research or application, and whose work has resulted in a positive and profound impact on humankind.

The Shaw Prize currently consists of three annual awards: the Prize in Astronomy, the Prize in Life Science and Medicine, and the Prize in Mathematical Sciences. Each prize carries a monetary award of US$1 million. The adjudication process will begin next summer, and the first prize presentation will be held in mid 2004.

There are a number of scientific prizes in different fields of science. The Nobel Prize is undoubtedly the most famous, and another prestigious example is the Fields Medal in mathematics. Since there are a number of similarities between the Nobel Prize and the Shaw Prize, the media have dubbed the Shaw Prize “the Nobel Prize of the East”.

The Nobel Prize in Physics is only occasionally awarded to astronomers, so the annual Shaw Prize can truly represent the remarkable discoveries in astronomy and inspire coming generations.

Here is the list of the Shaw Laureates in astronomy[2]:

2004	P. James E. Peebles	for his groundbreaking contribution to cosmology. He laid the foundations for almost all modern investigations in cosmology, both theoretical and observational, transforming a highly speculative field into a precision science.
2005	Geoffrey Marcy and Michel Mayor	for finding and characterising the orbits and masses of the first planets around other stars, thereby revolutionising our understanding of the processes that form planets and planetary systems.

[1] http://www.shawprize.org/en/events/establishment/release.html
[2] http://www.shawprize.org/en/laureates/index.html

2006	Saul Perlmutter, Adam Riess and Brian Schmidt	for discovering that the expansion rate of the Universe is accelerating, implying in the simplest interpretation that the energy density of space is non-vanishing even in the absence of any matter and radiation.
2007	Peter Goldreich	in recognition of his lifetime achievements in theoretical astrophysics and planetary sciences.

The Shaw Prize as a brand

Revolutionary discoveries often mean complex concepts for the general public. The important discoveries and concepts honoured by the award are often new to most of the general public, while textbooks and normal school syllabus haven't yet caught up with these remarkable new milestones.

Under the brand name of the Shaw Prize, these concepts can easily reach the public, which acts as an effective tool for communicating and popularising astronomy.

The Shaw Laureates as icons

In Hong Kong, it is not uncommon that when you ask people what stars are, they will answer with the name of a pop singer. Although it is often meant as a joke, this illustrates that for many people, stars refer to singers instead of stars in the Universe, that the publlic are more aware of the entertainment media than science. Nowadays, when the entertainment media industry is so influential and plays a dominant role in society, the idols of many people are often singers and movie stars. The need for a scientific idol is important as it helps to catch public attention, and thus to popularise science. A very good example is the storm raised by Professor Stephen Hawking when he visited Hong Kong in 2006. It was major headline news in all the media for an entire week and hot discussions continued for a whole month. Two thousand people were invited to attend his public lecture, while a hundred thousand people watched the live broadcast. In that week it was not hard to spot people holding *A Brief History of Time*, Stephen Hawking's famous book, on every corner in Hong Kong. To many people great scientists like Newton and Einstein are heroes, but they are too remote in time. A real and living scientific idol, like Hawking, can make a dramatic social impact, attract public and media attention, and force society to discuss and rethink the value of science and related questions. Therefore, forming scientific idols is another powerful tool for communicating and popularising astronomy.

The Shaw laureates are already icons for many astronomy lovers. Just as the Nobel Prize winners do, so the Shaw laureates give a public Shaw Prize lecture, attracting an audience of hundreds of students and the general public.

Social impact

Since the prize was established coverage has increased in Hong Kong. There are hundreds of newspaper articles, dozens of publications, TV programmes, forum discussions, blogs, web pages and even features in government news[3] as well. The Ho Koon Nature Education cum Astronomical Centre has organised several public lectures on topics relevant to the Shaw Prize, using the brand name of the "Shaw Prize", and the lectures have attracted many people each time.

Television Broadcasts Limited, the major TV broadcasting company in Hong Kong, is owned by Sir Run Run Shaw. It is not only the major TV channel in Hong Kong, but also the southeast China. It is the largest producer of Chinese language television in the world, and its programmes are accessible to more than 30 million people every day across the world[4].

TV documentaries about the Shaw Prize have been produced annually by Television Broadcasts Limited. The documentaries were broadcast in peak hours, reaching many people.

Since the prize is still young, the social impact of the prize in the world in general is not as large as in Hong Kong, but, there have been some press releases about the prize:

- *Planet hunter Geoffrey Marcy shares $1 million Shaw Prize in astronomy*, UC Berkley Press Release[5];
- *Caltech Astrophysicist Peter Goldreich Wins $1 Million International Shaw Prize*, Caltech News[6];
- *Dark Energy Co-Discoverer Adam Riess Shares Shaw Prize in Astronomy for 2006*, STScI News Release[7];
- *Prize a sure thing for ANU astronomer*, ANU media release[8].

These press releases were issued by the home institutes of the Shaw laureates.

Communicating astronomy by the Shaw Prize

The Shaw Prize presents a very good opportunity and tool for popularising and communicating astronomy. Although the prize is still young, using the brand name of the Nobel Prize of the East, it can draw people's focus and act as a powerful tool for communication.

The Ho Koon Nature Education cum Astronomical Centre is considering producing the following materials to optimise the Shaw Prize as a communication tool.

- The Shaw Prize Education Homepage;
- Ask the Shaw Astronomers Corner;
- Hand-out booklets;
- DVD.

International cooperation is welcome for optimising the value and impact of the Shaw Prize across the whole world.

---

[3] http://www.hketony.gov.hk/ny/e-newsletter/06june/ShawPrize.htm
[4] http://www.tvb.com/affairs/faq/tvbgroup/tvb_e.html
[5] http://www.berkeley.edu/news/media/releases/2005/09/01_shaw.shtml
[6] http://mr.caltech.edu/media/Press_Releases/PR13004.html
[7] http://hubblesite.org/newscenter/archive/releases/2006/27/full/
[8] http://www.mso.anu.edu.au/news/media_releases/media_release_060622.php

Conclusion

People love important discoveries, admire idols, and listen to their stories. The establishment of the Shaw Prize is a great opportunity for people around the world to get to know these scientific idols and the astronomy behind the scientists. The astronomy concepts behind the award are often too new or too difficult to reach the general public by other means, but the Shaw Prize can act as a powerful tool for communicating new ideas. The Shaw Prize is not only a prestigious award for astronomers, but also a powerful tool for astronomy communicators.

The Shaw Prize Foundation

Figure 1 – The face of the medal of the Shaw Prize displays a portrait of Sir Run Run Shaw, next to which are the words and Chinese characters for the "The Shaw Prize".

Credit: Sze-leung Cheung

Socio-economic impact of astronomy in South Africa

Kevin Govender
South African Astronomical Observatory / Southern African Large Telescope (kg@saao.ac.za)

Abstract

In South Africa, a country where almost half the population lives in poverty, we have built the multi -million dollar Southern African Large Telescope, we have begun on the even more expensive Karoo Array Telescope, and we are one of the two finalists bidding to host the multi-billion dollar Square Kilometre Array! In trying to communicate astronomy to the public, how do we justify such spending to a family in a rural area living in poverty? This presentation will expand on efforts in South Africa, specifically the SALT Collateral Benefits Programme, which are trying to answer these seemingly difficult questions. The socio-economic impact of astronomy on societies, especially those in the vicinity of these large telescope projects, will be investigated, with examples and experiences being shared, especially from the sparsely populated Northern Cape Province of South Africa.

Introduction

In 1998, the South African government approved the construction of the Southern African Large Telescope (SALT) in Sutherland, Northern Cape Province. The South African government agreed to contribute 50% of the capital construction costs with the remaining 50% sourced from international partners. The idea behind SALT was to enable South Africa to remain internationally competitive in astronomy well into the 21st century. Furthermore, such a facility was intended to provide both South African and international scientists with a capability that can explore the depths of the Universe and expand the frontiers of knowledge.

The SALT Collateral Benefits Programme (SCBP) was designed to maximise benefits from the investment of public funds in the construction and operation of SALT. During the construction period the focus was on job creation in the local area (building of infrastructure such as roads and buildings). Since the inauguration of SALT in November 2005, we have moved from the construction to the operational era, and the SCBP has evolved towards the current state.

There are now three main focus areas to this programme:

1. Education in Mathematics, Science, Engineering and Technology: to supply the country and the continent with well-trained and motivated professionals in substantially increased numbers.
2. Science Communication and Awareness: to effectively engage with the public in order to disseminate relevant information in the fields of astronomy and space science.

3. Socio-Economic Development: in order to contribute to a better quality of life for all people, especially the disadvantaged.

Each of these areas will be briefly discussed, followed by a listing and short description of activities carried out in 2007.

1. Education in mathematics, science, engineering and technology:

Fundamental to the socio-economic development of any region is education. The biggest impact that SALT and astronomy has had on the people in South Africa has probably been in education. SALT is an icon that is known by virtually every learner in the country – it is even a part of the school curriculum at various levels. What it means to a young South African is that there are great opportunities in this country in the fields of science and technology. The SCBP uses this icon to inspire learners towards careers in this field. We also use astronomy and SALT as a tool for teaching concepts in mathematics and science at school level. Some of the educational activities in 2007 include:

- **Scifest 2007:** Annual National Science Festival attended by tens of thousands of learners – SCBP runs learner and educator workshops as well as stargazing for the public.
- **National Science Week 2007:** Annual event on the science outreach calendar – activities carried out in Cape Town and Sutherland, promoting science awareness with a focus on astronomy.
- **Astronomy Month 2007:** Another annual event celebrated nationally.
- **Space Week 2007:** Linked to the international “World Space Week”, we teamed up with the space science community for a space camp for learners from across the country.
- **Astronomy Quiz 2007:** Second annual event involving four rounds of quizzes for Grade 6 learners from across the country. SCBP co-ordinated both the Western Cape and Northern Cape quizzes.
- **Women’s Day 2007:** Government sponsored activities targeted at role modelling for female learners.
- **UCT, PSP, SUN Educator Workshops:** Educator development workshops, in partnership with educator-training institutions, aimed at equipping them with the skills to take astronomy to the classroom.
- **SABC Careers Fair:** SCBP participated in the Cape Town leg of this exhibition (targeted at learners) on behalf of the astronomy community in SA – materials were sent to us from other astronomy facilities for exhibition.
- **Astronomy Art Competition 2007:** Targeted at very young learners and reaching out mainly to schools in the Northern Cape.
- **Workshadow:** Learners are given the opportunity to “shadow” SAAO staff from a variety of career fields.
- **Science Clubs:** National effort to establish and network science and astronomy clubs from schools across the country.
- **Resource Development:** Constant improvement and development of astronomy resources for use by educators and in schools in general.

- **Outreach:** Schools and community visits to demonstrate the use of telescopes and the basics of astronomy and SALT (either ad hoc or by request).
- **Universe Awareness Programme (UNAWE):** Astronomy outreach targeted at very young children especially in rural areas. This has been focused so far on the children aged 3 and older in the Northern Cape (involves games, demonstrations, videos, etc.).
- **Scholarships:** School level and university level scholarships awarded to deserving students in the field of astronomy.

2. Science communication and awareness

Public understanding of science and technology, especially in the rural Northern Cape area where SALT is located, is generally very low. In terms of the social aspects, there has always been a feeling amongst the Northern Cape communities that the people working at SALT were in a very different class from them — that the people of the local towns were only good enough to do the “unskilled” or “low-skilled” work while the “outsiders” did all the important science. This has always been a challenge in developing the relationship between the observatory and the poorer communities. The SCBP organises events and activities to try to address this problem and to enable a greater interaction with the community. Stargazing events are accompanied by talks by astronomers/engineers as well as open discussions about the community’s belief systems as well as the science being done at the observatory. Free observatory/SALT tours are also offered (transport provided at no cost) for people in Sutherland. All this has greatly improved public opinion about science and astronomy and helps to address one of the major problems in rural South Africa – a lack of self-confidence amongst the poor. Examples of some activities in Sutherland and across South Africa:

- **Astronomical Events (Eclipse, comet):** Lunar eclipse and comets (McNaught, Holmes) were used to bring astronomy to people’s attention.
- **Stargazing:** Specific events, held especially in the Northern Cape, where the community is invited to look through telescopes.
- **Sasol TechnoX:** Annual science outreach festival that sees tens of thousands of learners pass through.
- **Science Unlimited:** Another annual science outreach festival in a different part of the country.
- **Hobby X:** Partnership with the Cape Centre of the Astronomical Society of Southern Africa to exhibit SAAO/SALT/astronomy information at this annual exhibition.
- **Namakwa Festival:** Annual festival held in Springbok (Northern Cape) — attended by large number of public – SCBP provides an exhibition and telescopes for night sky viewing.
- **Free community tours:** The people of the town of Sutherland are offered free tours to the SAAO facility on a regular basis.
- **Open Nights:** Second Saturday of every month is “open night” for the public — astronomers from SAAO are assigned for open night duty.
- **What’s up:** Monthly description of the night skies produced by astronomer Dave Laney. Accompanied by star charts from the Iziko Planetarium.
- **Tour programme:** Extensive day and night tour programme in Sutherland and an ad hoc tour programme (by appointment) in Cape Town.

- **Indigenous Astronomy:** Activity to collect and document indigenous stories and myths about the African skies. Partnership with the Iziko Planetarium and the Unizul Science Centre.
- **Resource Development:** Public resources such as posters, information sheets and souvenirs are constantly being developed.
- **Visitor Centre Developments:** Constant improvement to exhibits and displays on a minimal budget.

3. Socio-economic development

This focus area, although probably the most important to people on the ground in poorer communities, is also the most difficult to address directly. The SCBP is constantly involved in discussions with the communities on activities and programmes that will help to uplift the socio-economic status of the area. The difficulty comes in drawing the line between what we can do from the observatory side and what the local municipality is mandated to do from the national government. It is important to work closely with other government structures and so the SCBP must stay informed about the politics and developments in the local municipality (which can sometimes become very complicated). Having said that, the biggest impact on the community since the inauguration of SALT has certainly been in the field of tourism. In the first year after inauguration the number of visitors to the small town of Sutherland shot up to 13,000 visitors per annum. This has resulted in a rapid increase in the number of guest-houses, coffee shops and tourism related businesses such as the Arts and Crafts project for the unemployed. SALT has been involved in a number of socio-economic development projects on various levels, from being a partner in funding proposals to actual implementation. These projects include:

- **Community Meetings:** In partnership with the municipality, regular meetings were held during 2007 to keep the community constantly informed about SALT developments and to explore ways of SALT to play a role in the socio-economic development of the community.
- **DVD Evenings:** Targeted mainly at the youth, a "homemade bioscope" aimed at keeping young people away from the taverns. Usually preceded by a talk on astronomy or social issues such as AIDS.
- **Heritage Weekend Festival:** Planned during the community meetings, this festival was aimed at celebrating the Karoo heritage during the Heritage Weekend in September. SCBP provided the telescopes and activities for celebrating the astronomical heritage and clear skies.
- **Indaba expo:** In partnership with the Karoo-Hoogland Municipality, this was an exhibition to attract more tourists to the Northern Cape.
- **Christmas, New Year events:** Separate events for very young children and teenagers respectively during Christmas and New Year (since 2006). All events have strong astronomy themes and include stargazing, talks on astronomy and videos. Also music and dancing when the attention to astronomy wanes.
- **Youth Day events:** Held in the towns of Fraserburg and Sutherland and included the screening of the popular South African youth day movie "Sarafina" as well as stargazing and astronomy Q&A sessions.
- **Wall Painting:** Only implemented in the town of Williston so far, this project entailed young

and old being provided with paint to express themselves on a long empty wall. SCBP involvement was registered in the form of drawings of SALT and starlore images.

- **Community Tour guides:** Young unemployed people from Sutherland have been trained to escort visitors up to the telescopes and around the town.
- **Tarring of roads:** Various proposals, motivations and recommendations made (in partnership with the municipality) to the provincial government for the tarring of the roads between Sutherland, Fraserburg and Williston.
- **Protection of Paleo Surface:** Proposals have been drawn up in conjunction with the municipality over the protection of a rock surface in Fraserburg that is of paleontological interest.
- **Arts and Crafts programme:** Joint proposals with the municipality to the Department of Arts and Crafts for funding of an Arts and Crafts Programme. Goods are marketed at the SAAO in Sutherland.

Conclusion

It is clear from the broad range of activities given in the examples above that a lot of people are being reached with activities that contribute to the socio-economic development of communities in South Africa. The model used by the SCBP can readily be adapted and applied to any other observatory or research facility across the world. The challenge to implementing such a programme, with the target audience being spread across schools, general public and poorer communities, will probably lie primarily in finding the staff and the funding.

The focus of the SCBP in terms of socio-economic development has generally been on the area surrounding the observatory in the Northern Cape province of South Africa. However, being a major player in astronomy both nationally and across Africa, the SAAO and SALT have a responsibility to spread the impact of astronomy much further. This has already begun to happen in many ways in anticipation of the International Year of Astronomy 2009.


Credit: Sze-leung Cheung

ASTRONET Panel E — Education, recruitment/training & public outreach

Robert Hill[1], Rosa Maria Ros[2], Robert Fosbury[3], Lars Lindberg Christensen[4], Leonarda Fucili[5], Dirk Lorenzen[6], Jose Carlos del Toro Iniesta[7], Claus Madsen[8], Andy Newsam[9], Alan Pickwick[10] & Veselka Radeva[11]

[1] Northern Ireland Space Office (rob@spaceconnections.net)
[2] Technical University of Catania (ros@mat.upc.edu)
[3] ESA/ST-ECF (rfosbury@eso.org)
[4] ESA/Hubble (lars@eso.org)
[5] SSIS, Universities of Lazio (l.fucili@itaca.com)
[6] German Public Radio (DLorenzen@compuserve.com)
[7] ESA (jti@iaa.es)
[8] ESO (cmadsen@eso.org)
[9] Liverpool Telescope/John Moore University (amn@astro.livjm.ac.uk)
[10] Manchester Grammar School/EAAE Secretary (Alan_C_Pickwick@btinternet.com)
[11] Astronomical Observatory and Planetarium (radevi@mnet.bg)

Abstract

ASTRONET was created by a group of European funding agencies in order to establish a comprehensive long-term plan for the development of European astronomy. The objective of this effort is to consolidate and reinforce the world-leading position that European astronomy has attained at the beginning of this 21st century. This presentation concentrates on the work of Panel E.

Introduction

Panel E is concerned with the relationship of our subject with society, from teaching in schools, training in universities, recruitment into astronomy related jobs to the process of communicating astronomy to the public. It also considers the relationship between cutting-edge research infrastructures with the industries that help build them, hopefully to the benefit of the overall economy of the continent. The panel members, both collectively and divided into several specific Task Groups, have investigated these issues and are generating a series of principal recommendations that are addressed to both national and European organisations. The panel members were assembled to represent a broad, Europe-wide experience in the fields of primary and secondary school education, university education and research, the relationship between astronomy and industry, the activities of planetariums and science museums, European public communication, outreach and science journalism and finally, in astronomical research using major observational facilities to promote astronomy to general audience.

ASTRONET Panel E have been requested to prepare a report highlighting their principal recommendations that arise as a result of the data gathering process and under the terms of reference stated below. This report is addressed to an audience that is expected to ultimately include: the ASTRONET Infrastructure Roadmap Working Group; funding agencies throughout Europe; politicians with responsibility for science and education (and possibly technology as well); university directorates and science faculties; professional astronomers and organisations and individuals responsible for training school teachers.

The terms of reference provided by the ASTRONET Board to Panel E were to:

- Assemble information on initiatives to utilise astronomy and astrophysics to enhance school age education and assess their impact.
- Assemble information on postgraduate recruitment and training in Europe, including numbers of students in different areas (both science and technology development if possible).
- Assemble information on primary sources of publicity for our subject area and assess their impact (via international comparison if appropriate).
- Assess where greater cooperation, additional resources (including human resources) and/or better practise would significantly enhance the above areas in Europe.
- Highlight any areas of industrial relevance (particularly in training aspects).
- Compile a report (guideline for inclusion in the final report is ten pages plus figures) and any other relevant background information, to be passed to the working group.

To most efficiently achieve these aims, the full panel divided into Task Groups which focussed on data gathering and assessment in the areas of:

1. School education.
2. University education and research.
3. Science museums and planetariums.
4. Relationships with industry and on.
5. Public communication and outreach.

The five Task Groups were able to use knowledge of their field of interest and their existing contacts to produce a sufficiently detailed picture to expose and investigate many of the issues and problems that had been identified during the Panel's early deliberations. Each of the Task Groups made personal contacts and performed (mostly) web-based searches for existing relevant material and opinions with particular emphasis being placed on well-justified and quantitative data to support conclusions. In addition to existing material, the groups made selective distributions of questionnaires to follow up and expand on certain points.

Initial findings

Task Group 1: Primary and secondary schools

There are multiple motivations for teaching astronomy in schools, ranging from the scientific to the cultural. Of importance to our deliberations is that of using it as a vehicle for introducing the idea of a noble and grand scientific endeavour to the young mind.

The panel recognised a number of problems that beset the widespread and effective utilisation of astronomy in this. The principal one is the lack of specific training given to the teachers who would carry out this task. Strongly related to this is the place (or absence) of astronomy in the school curricula in the different European countries. The presence of astronomy in the curriculum would do much to ensure the availability of teacher training in the subject.

The actual status of astronomy teaching in European schools is different from country to country. In general, astronomy appears in a few lessons associated with another course. Very little astronomy is taught in primary schools and it normally appears as part of environmental or general science. In secondary schools, astronomy generally appears as part of geography or physics. In the majority of European countries there are optional courses on astronomy for students aged around 16 or 17. In the other cases, astronomy appears only within a few lessons over the entire secondary schooling. Teachers do not usually have a specialist education in astronomical topics. In general they use the same school books as their students in order to prepare their classes. When teachers do not have the opportunity to participate in training courses, they tend to prepare their classes about astronomy using course books that are old-fashioned and fail to convey the excitement generated by modern topics that are the subjects of active research. Young people are very interested in real, living science but are uninspired by much of the “school science” that appears to them as a historical relic. Modern topics, such as exoplanets and black holes, give teachers the opportunity to experiment with other forms of “teaching” such as joint study or collaboration.

Task Group 2: Training and recruitment

Task Group 2 was established to assess the question of postgraduate training and recruitment in astronomy in Europe. The panel identified the following specific questions:

- Are there enough young scientists now and for the future?
- Does astronomy attract students generally into science, technology, engineering and mathematics (STEM)?
- What are the career prospects and are they known?
- What are the wider benefits of training astronomers?
- Does sufficient funding go to support the excellent (peer-selected) projects — and does it go quickly enough to make these projects competitive worldwide?

Given the high level of interest amongst potential STEM graduates, it might be surmised that astronomy is in the fortunate position of being able to choose from a pool of graduates with a size in excess of its needs. As expected, at all stages (first degree, PhD, post-fellowship) the fraction of people staying in academic research rises. Nevertheless, at all stages some leave academic research for other fields (industry, education etc.). While there may be a variety of reasons why an individual chooses a particular career path, with job availability only being one aspect, these results imply that there is no obvious shortage of qualified people for the jobs in astronomy currently available.

It is widely accepted that astronomy attracts potential students towards the physical sciences, but there is little directly available evidence to back this up. However, a survey carried out by the Institute of Physics (2001) of the views of physics undergraduates showed that “fascination in astronomy/space” was a major motivating factor for students, even many who were not taking a directly astronomy or astrophysics related degree. In recent years a number of universities have attempted to make use of this attraction to halt a decline in recruitment onto physics degrees by starting or significantly expanding their astronomy groups or departments. The Bologna process is a Europe-wide initiative set-up with the aim of harmonising graduate and postgraduate education across Europe. One of the aims of the Bologna Process is to make it easier for students to study for part of their degree at a separate institution. This will mean that those universities without astronomy groups will also be able to offer astronomy degrees by collaborating with another institution, which in turn this may lead to an increase in the number of astronomy (and physics) graduates.

Task Group 3: Science museums and planetariums

The opinions of the museum and planetarium operators were polled with a questionnaire sent via existing network and contacts. This list includes various government funded organisations, non-governmental bodies and privately funded science outreach operations throughout Europe. From a total of 32 responses, the following general conclusions emerged:

- There is a lack of formal links with the European agencies involved with astronomy and space. Less than a tenth of respondents indicated that they had any link or direct communication with the agencies in Europe.
- The majority of respondents would welcome a central repository of visual material relating to astronomy and space. They are especially interested in images and videos.
- The relationship between planetariums and local amateur astronomical societies is common and should be better understood and utilised. Established relationships with professional astronomers are less common.
- Problems with curriculum integration and the sustainability of formal programmes clearly exist.

The responses exposed a richly diverse programme covering many aspects of classical and modern astronomy and there is some evidence that this has a direct effect on bringing pupils into science subjects in secondary school, although more tracking is required to verify this effect. Many of the facilities questioned offer a formal astronomy education package linked to the curriculum in their respective regions and it may be that the impact that these centres have on student choice should be further explored. The planetariums and science centres in Europe are the natural conduits through which the flow of astronomical information is disseminated to the wider public.

Task Group 4: Relationships with industry

There has always been a close coupling between frontier scientific research and cutting-edge industrial development. The two activities feed off one another. At least in astronomy, however, it is difficult to get an overview of the process and to distil from this an idea about “best practice” methodologies.

From the responses, it is clear that the situation varies from country to country. Regionally, individual authorities or government agencies may host some data on individual projects and the industrial transfer to non-astronomy sectors. Also, individual groups or companies highlight how their own R&D has been successfully transferred outward and some websites and examples are given in the individual responses. However, it does not appear that many countries have a mechanism within their astronomical community to identify industrial relevance/transfer to other actors or communities as an integral component of their R&D. Or it may be that individual companies, research groups, other actors, do not display or promote any results of this kind in their main scientific literature or websites. Further, due to copyright or possible intellectual property issues many actors may not publicise their work due to restrictions. As a result, even after successful transfer to other sectors, a follow-up public access programme to successful transfer may be overlooked. On the questions of the impact and successful commercial transfer on a regional or EC-wide level, there is strong evidence — even from this extremely limited sample — that there is no central bank or repository easily found or accessible to promote this culture. But note that ESO highlights and promotes its technology transfer.

Task Group 5: Public communication and outreach

In addition to using the substantial hands-on public communication experience within TG5, the group has distributed its own questionnaire to over 40 of the major players in Europe (TG5Q, 2007) and also analysed the relevant answers in AFQ (2007). A vigorous activity in science public communication and outreach in Europe is an absolutely essential investment in the future health of the subject and, indeed, the economic and cultural life of the continent. Differences in attitude between scientists in the US and in Europe are often stark. The Panel has identified a real need to bolster public awareness of astronomy (and science in general) and to convince the scientists of its importance and to equip at least some of them with the knowledge and tools to participate actively in the process.

There is a strong need for syndication of the existing astronomy communication resources to increase their visibility and to collaborate better between the European main actors in the astronomy communication field.

One of the consequences of the Europe/US asymmetry in communication which is seen over and over again is that European journalists most frequently quote US sources. One response in TG5Q (2007) states: *European science often appears as second class in the press, even in fields where Europe is leading. The basic communication-cultural differences between the US and Europe are to blame*. There may be several reasons for this. Perhaps part of the reason is merely habit with journalists and editors? After all, the media know what they are getting from the US. Perhaps American science stories are more digestible and of a higher standard? Or there are more of them and they are simply more accessible and visible? Most likely all of the above apply, and the best strategy to improve the situation is to consistently produce interesting and high quality communication products in Europe.

What, from a modern point-of-view, can only be described as the underdeveloped communication culture and identity that prevails in European academia is undoubtedly rooted in its history and linked to the way scientific research has traditionally secured its financial support. European scientists have not been so strongly forced to justify their spending on research. The claim that Europe has a weak, or in some parts even absent, public communication culture, is strongly supported by literature and personal experience. As an example Banda (2005) states: *Despite several initiatives in recent years to improve Europe's performance, parts of the research community still do not believe that effective proactive media relations is a priority*.

Proper spending on public communication should not be seen as a “cost” but as an “investment” for the future. Returns on this investment may be high. The consequences of not making the investment may be disastrous!

Timescale

Consideration of individual panel reports by the Working Group	**October/November 2007**
Meeting of the Working Group and (ASTRONET) agencies	**January/February 2008**
Release of draft road map to the community	**Spring 2008**
Roadmap Symposium Liverpool, UK	**16–19 June**
Publication of final version of the Roadmap	**End of September 2008**

References:

- Institute of Physics No Authors (2001), “Survey of Undergraduate and Postgraduate Views”, Institute of Physics, March 2001
- Technology Transfer at ESO: http://www.eso.org/org/tec/TechTrans/
- Washington Charter: http://www.communicatingastronomy.org/
- TG5Q: ASTRONET Task Group 5 Questionnaire, 2007
- AFQ: ASTRONET Facility Questionnaire, 2007
- Banda E. (2005), “Communiqué — A road map for the establishment of a European research media service”, 2005

Humanising astronomy

Sarah Levin
Universe Awareness (UNAWE), Leiden Observatory (levin@strw.leidenuniv.nl)[1]

Abstract

Universe Awareness (UNAWE) is an international programme that aims to expose underprivileged children (in the age group 4–10) to the inspirational aspects of astronomy. We are currently at the stage of developing materials that will be utilised in a diverse range of environments.

This paper explores UNAWE's particular approach to developing tools which includes not only indigenous and folkloric astronomical knowledge, but also the culture of transmission of such knowledge.

A specific understanding and explanation of the Universe, the Sun, Moon and stars is present in every culture and can be found contained in its history, legends and belief systems. By consciously embracing different ways of knowing the Universe and not uniquely the rational model, UNAWE places the humanising potential of astronomy at the centre of its purpose.

Whilst inspiring curiosity, pride and a sense of ownership in one's own cultural identity, such an approach also exposes children to the diversity of other peoples and their cultures as well as the unifying aspects of our common scientific heritage. The means of creating and delivering the astronomy programme are as relevant to the desired educational outcomes as the content. The challenge in the design of materials is to communicate this stimulating message to the very young. Respect for alternative values systems, the need for dialogue and community participation, and where possible the production of materials using local resources is emphasised.

This paper touches recent experiences liaising with communities in India, South Africa, Tunisia, Venezuela and Colombia.

The limitations of current scientific outreach

Modern astronomy plays a unique role in conveying the excitement of science to the general public. Whilst other scientific disciplines are struggling to attract students, the popular interest in astronomy continues to rise. This is due in part to the extraordinary images and discoveries that are conveyed almost on a daily basis from orbiting satellites and telescopes peering into deep space. Public access to that information has re-contextualised astronomy from being an expensive and symbolic endeavour pertaining to an intellectual elite, to becoming a driving force of modern science to which the public willingly commits resources, funding and their interest. Nowadays most major astrophysical research projects invest time and services in the communication of their research. Astronomy outreach programmes are numerous and diverse, however the majority of those programmes focus mainly on science education to reach the general public or children coming from a middle-class background and possessing a certain level of education. Fortunately in recent years, astronomical outreach has increased in developing countries.

Universe Awareness (UNAWE) is an international programme that exposes young, disadvantaged children aged between 4 and 10 years to the inspirational aspects of modern astronomy. By conveying a feeling for the scale and beauty of the Universe, the main goal of UNAWE is to give young children a broader perspective on their place in the Universe than the one they acquire from their immediate environment. UNAWE aims also to awaken children's curiosity in science and stimulate internationalism and tolerance. Included in this exposure is the placement of their culture in context with that of other cultures. The specific environmental circumstances such as the local ethno-astronomical heritage, the regional folklore, scientific tradition, and the geographical location, all inform our personal understanding of the sky; Norris (2007) notes that one child's belt of the warrior Orion is to an indigenous Australian child a canoe, or is to an astronomer a new-born star in a molecular cloud.

The benefits of early childhood care and education

UNAWE specifically targets very young disadvantaged children in the earliest years of mental cognition and the formation of their personal and social value system. The reasons for this are reflected in the current trends amongst policy makers in the international development community set out by Weikart (2000). It is now clear that early childhood care and education offer the best chance to bettering the lot of poor and marginalised children. Early intervention increases retention and improves a child's chances of continuing basic education. Significantly, the positive effect of early childhood education extends into the wider society, as interaction with very young children inevitably leads to adults being educated and supported in the process as well, as reported in Dias de Graca (2006)

Astronomy and very young children

Whilst the efficacy of early childhood care and education is not in question, it is important to consider if the concepts of the Universe and astronomy in general are beyond the capacity of children at this age. When we invite children to astronomy, the very fact that we are offering them the "mega" world beyond experience – not just the world under a microscope or the macro world that they could potentially travel to – presents a spectrum way beyond empiricism or observation as children know them. We introduce them to infinity, ask them to absorb concepts whose theories continue to change, and accept as fact extremes in speed, temperature and scale that are unimaginable. UNAWE talks about the Universe as defined by the educational researcher Vasiliki Spiliotopoulou (2005):

The Universe is everything you see, you know, or you can imagine exists around us, as far as you can possibly think.

How does UNAWE invite young children to this great concept of exploring the beautiful Universe?

The process of knowledge acquisition

To begin with, there are generally accepted developmental stages through which children pass through on their way to acquiring understanding of the world. These stages, first proposed by the Swiss developmental psychologist Jean Piaget, (Piaget, 1963), are sequential, not culturally specific and reflect fundamental qualitative modes of thinking. Broadly speaking, they cover the process from first experiencing the world through the senses, to the use of mental representation in symbols, words and pictures, to the application of logic and finally the ability to think in abstracts and draw conclusions.

For our purposes, Piaget's second stage, the so-called "pre-operational stage" of mental operation is the focus. Since the Piaget defined age group of 2-7 is considered – even by child development professionals — only an approximation, UNAWE's targeted age of 4-10 still pertains to being relevant.

Initial knowledge

Spelke (1994) asserts that young children are not open blank slates upon which we can simply imprint the theory of choice. A four year old does not instantly accept either the rational and scientifically proven model of the Universe, nor one that has the world resting on the back of four whales. Young children are not without some innate, naïve, and observed understandings of the physical world, i.e. the Earth is flat, unsupported objects fall down, the sky contains objects that move: clouds, sun, moon. Turning once again to Piaget, young children should actually be equipped to have the tools of epistemological observation to begin making sense of, for example, planetary phenomena. The earliest games we play with children and the earliest lexical constructions we build with them are to do with the appearance and disappearance of objects – games that should prepare them to perceive that there are several alternative possibilities as to how something disappears; objects can be occluded, can move behind or in front. From the earliest age then, children are learning, but within a so-called "different way of knowing" and most importantly, through play. Whilst still on the theme of planetary phenomena, one such example of a different way of knowing is the common perception of a "birthday". Every year children celebrate the fact that another year has passed since their birth. However, we do not congratulate them by saying, "Happy-you-just-did-a-complete-orbit-around-the-Sun-day". In a very "humanised" fashion, children absorb the concept of time's passage and our measurement of that process.

UNAWE in action

Since its inception in 2005, UNAWE pilot projects have taken place in countries all over the world. We are present in Spain, Chile, Colombia, Venezuela, South Africa, Germany, the Netherlands, Tunisia, Italy, India and Indonesia, working with existing complementary organisations and/or teachers and individuals in those organisations to build a network of professionals and volunteers.

India

Our work in India, both with the Tamil Nadu Science Forum and PRATHAM – *Mumbai Education Initiative Direct Program* – reflects the way in which the local environments set the agenda and content of national UNAWE programmes. TNSF and PRATHAM are grassroots movements run by local, dedicated volunteers and professional activists and consist of literacy, science, hygiene, HIV/AIDS education and awareness campaigns, teacher training, and the education and rehabilitation of child labourers. The children reached by these organisations through local community groups or on the street, never make it to the venues of formal education. As a result, the materials are transmitted via traditional street theatre and music or through low literacy activities accessible to parents and children alike.

Tunisia

At the other end of the scale is the entirely formalised educational approach adopted by UNAWE Tunisia. In collaboration with the Science City in Tunis, and supported by the Ministry of Education and Training, and the Ministry of Women, Family and Elderly Affairs, a pre-existing astronomy programme has now been modified and opened to younger children. There is also a network of nationwide youth clubs operating in isolated areas that have no regular access to such resources. These remote destinations are the focus of the Science Caravan; a convoy of portable laboratories and exhibitions, of which the “astrobus” is a significant part.

South Africa

The Department of Science and Technology has demonstrated a commitment to bringing an understanding of the Universe into the homes and lives of ordinary people of South Africa and in promoting indigenous role models to key positions in science and technology, from population groups that historically had no access. Through the National Research and Development Strategy, astronomy research and researchers in the country are actively being promoted and endorsed.

UNAWE South Africa uses as one of its teaching materials, *The Crocodile who swallowed the Sun* from the South African Agency for Science and Technology Advancement. This book of beautifully illustrated stories based on ethno-astronomy gathered from the entire continent, also includes facts and the latest images from deep space reflecting both traditional and current scientific understanding.

Whether UNAWE exists in a structured, government supported environment as in Venezuela or one motivated by passionate amateur astronomers as in Colombia, the principles remain the same. The aim of UNAWE is not to create scientists, or lay the foundations for budding astronomers, it is to inspire those very young children with the beauty and awe of their physical world within its celestial perspective and the potential beyond. Fantasy and myth, story, fun and games are the means of transmitting a very profound intent: the sky belongs to us all. No matter what our culture, there is commonality in our quest for understanding the mysteries of the Universe.

References

- Dias da Graca, P. (2006), Early childhood education: in the limelight at last. IIEP/UNESCO Newsletter Vol.XXIV,#1, Jan–Mar 2006
- Norris, R. (2007) Australian Aboriginal Astronomy, http://www.atnf.csiro.au/research/AboriginalAstronomy/Examples/djulpan.htm
- Piaget, J. (1963), The Origins of Intelligence in Children, (tr.) Margaret Cook, W.W. Norton and Co., New York

- Spelke, E. Initial knowledge: Six suggestions, In: Cognition 50, p 431-445. (Reprinted in: J. Mehler and S. Franck (eds.) Cognition on Cognition, Cambridge, MA: MIT Press, pp. 433-448)
- Spiliotopoulou, V. (2005), Models of the Universe: Children's experiences and evidence from the history of Science. General
- International History, Philosophy, Sociology & Science Teaching Conference, University of Leeds, UK p 4
- Thagard, P. (1992), Conceptual Revolutions. Princeton University Press, Princeton
- Vosniadou S., Brewer W.F (1994), Mental Models of the Day and Night, Cognitive Science 18:142-159
- Weikart, D.P (2000), Early childhood education: need and opportunity.
- IIEP/UNESCO. Fundamentals of Educational Planning No.56


Credit: Sze-leung Cheung

The importance of the public talk

David Malin
Anglo-Australian Observatory, RMIT University (david@davidmalin.com)

Abstract

Many of the IYA2009 activities that were discussed at this meeting involve the internet, podcasting, television, radio or other technology-driven methods of spreading the word about astronomy to the wider world. These are essential ways of reaching our audience 24 hours a day and the IYA2009 project could not happen without them. But they are sometimes rather impersonal ways of communicating. We are so used to this that we forget that the quick and easy transmission of information without personal contact is a relatively new possibility. We have evolved as social creatures, and what I want to champion here is a social activity that involves a live audience and an even livelier performer.

Introduction

The public talk is a special kind of theatre that usually involves only one performer, and like all live performances, if it is done well it is remembered with pleasure for years afterwards. This legacy is important because the public talk audience is self-selected and motivated enough to turn up in person, often as a family group. They are ready and willing to be informed, educated and entertained, and these ingredients must be part of any public presentation about science or astronomy.

You may well ask why, in these days of mass communication, when it is easy to direct your message to millions with seemingly little effort, you bother with audiences of a few hundred. The answer is here, in this conference room. The words, images and ideas that have been exchanged at this meeting could have easily be collected by the organisers and transmitted to all the interested parties. But none of us would sit down for days with a DVD or explore a website to share in the richness of this occasion, and we would have lost the opportunity for dialogue and discussion.

Instead we chose to travel across the world at some expense and inconvenience to listen to the presentations in person. Of course we also come to conferences to meet collaborators and friends, and to enjoy interesting cities such as Athens. But the main reason we come is to listen to the talks. We respond strongly and positively to the kind of direct personal interaction where some individual stands before an assembled audience and talks with authority and a sense of purpose. We have been exposed to this kind of communication for tens of thousands of generations. It makes us feel part of a group, one of the tribe, with an intimate connection to the speaker and to the spoken word. And we all love good story tellers.

Our ancestors knew how culturally cohesive this was, and much effort went into constructing theatres and auditoriums we find all over the ancient world. Many survive and the tradition of aural presentation continues to thrive. So story-telling is old fashioned. But is it effective? There is good evidence that it is. People remember the occasion and the content. They remember the performer as a real person, with a personality, new ideas, a sense of humour, a good turn of phrase, and, if they are an astronomer, questionable dress sense.

In the same way that the performers in live theatre or a live musical imprint themselves on our memories more effectively than movie actors on the silver screen, in a public talk about science the audience can make a personal connection with a scientist. Scientists in general and astronomers in particular are a relatively rare species, sometimes nocturnal, and many people will never have met one in person. They may thus appear to be remote, perhaps eccentric and probably incapable of normal social interaction. A successful public talk removes these negative perceptions.

In my view it is important for every country that is serious about the intent of IYA2009 to arrange a series of public talks, using their nation's most capable astronomy or science communicators. It is useful if these people are "a name" or perhaps a distinguished scientist; but their most important function is to connect with the audience, to be human, warm and approachable as they enthuse about their vocation. However, talk alone is rarely enough and I want to outline the essential ingredients for a successful public event, and to mention why these events work and why they sometimes fail.

The preliminaries

Ideally the speaker should be well known, however, it is equally important that the talk has an intriguing and attractive title. *Things to See and Do in the Dark* is more likely to attract an audience than *Looking at the Sky at Night*, no matter how well known the speaker. The talk should be advertised locally and often, starting a few weeks in advance. Local newspapers and radio are effective, and it is good if the speaker is available for radio and TV interviews, but appropriate e-mail exploders (to amateur astronomy clubs, for example) also work well. The advertising should define the audience with phrases such as "non-technical", "entertaining", "suitable for families", "richly illustrated" and the like, and if youngsters are expected the starting time should not be too late.

The venue and the data projector

The venue should obviously be readily accessible to the intended audience; in a city centre rather than a remote university campus, for example. The setting should be theatre-like, with good acoustics, comfortable seats and completely controllable lighting. However, it does not have to be a theatre; a public hall or university auditorium can often work well if it can be darkened.

Assuming that the talk includes some projected illustrations, it is very useful to be able to illuminate the auditorium and speaker with subdued light in such a way that the screen is in darkness, so that the images are shown to best effect. However, total, cinema-like darkness is to be avoided since the speaker then becomes disconnected from the audience, a disembodied voice rather than a visible presence. In my experience it is always good to have the screen set forward in the proscenium so the speaker can stand in the projected image occasionally, briefly pointing out some feature, actively engaging with the visual component of the talk.

I show lots of photographs in my talks, so the quality of the data projector is very important to me. It should be tested and if necessary adjusted well in advance of the talk. And adjustment usually is necessary. Unfortunately, it is not uncommon to find worn out projectors that are incapable of adequate brightness, contrast or dynamic range for astronomical images and it's good to let it be known well in advance of the talk that this is a critical issue.

I include a setup slide in all my PowerPoint files that has full dynamic range grey-scales, a spectrum and some colour patches in it. It is an invaluable aid in checking that any available data projector is adjusted so that the subtle shadow and highlight detail that I strive for in my images appears on the screen. The test file is downloadable[1] as a JPEG or PowerPoint and instructions for its use are in the notes to the PowerPoint slide. All of this technology must be unobtrusive and it is very unprofessional to be involved in the projector setup or microphone tests as the audience is filing in. Don't forget that a public talk is a show, not a seminar, and the presenter is, for a while, the public face of the astronomy community.

The presenter

In general the speaker must be confident, interesting and enthusiastic, and speak clearly, ideally without notes, avoiding unexplained technical phrases and insider jargon. Other things to avoid are colloquialisms, slang and cultural references that might mean nothing to the audience, even if the audience nominally speaks the same language as the presenter. I am thinking of British/USA/Australian differences here; even more care is needed if the all or part of audience does not have the presenter's language as its native tongue. This does not mean that the talk should be stilted or stuffy, indeed a few jokes or at least a gentle sense of humour is a great asset, but cultural sensitivities are just that, sensitive, and should not be ignored.

Public talks to foreign language audiences with simultaneous translation can work, though some jokes might not translate, and it is difficult to time the appropriate turn of phrase or idea to the appearance of an image on the screen. As in all performances, timing is important. Public talks with sequential translation are much less satisfactory for both audience and speaker and the content has to be reduced or the allotted time increased to allow for the translation. Forget about the jokes.

[1] file: http://www.aao.gov.au/images/captions/greyscale.html

The content

This is of course entirely up to the presenter, but in general the length of the talk itself should not exceed 50 minutes, especially if there are many children. The style and structure of a talk similarly varies enormously from person to person, but it should usually start with a clear sense of direction, and embody a strong story, with interesting facts and anecdotes scattered throughout before arriving at distinct conclusion. The structure should be seamless, so if your latest discovery is included at the last minute it should appear as part of the narrative rather than a jarring aside. The standard teaching dictum of starting with the familiar before moving to the unknown is good advice, especially in astronomy. It is also useful to leave some aspects of the topic obviously incomplete to encourage questions after the talk itself.

I tend to show images during the last part of a talk, the first 10 minutes or so is simply talking to the audience, developing a theme and outlining the context of what is to follow. I have been to hour-long public talks where no visuals have been used at all, and they can be very successful if you have a presenter who can think in paragraphs and speak in complete sentences, but in astronomy a well-illustrated presentation is both expected and effective. However, it is not essential to do anything elaborate. The most effective television I have seen in recent years is the work of Ken Burns. His programmes about the American Civil War and about Mark Twain were very moving. They are strong stories sparingly told with still black and white images as the backdrop. Essentially they were an old fashioned slide show, but beautifully done – and memorable.

The stories

As astronomers we have an almost endless range of wonderful and inspirational stories to tell. They may be about our intimate connection to the stars in general and to the Sun in particular. The narrative might describe some tortuous path to understanding the nature of stars, galaxies, quasars, pulsars or black holes, tales littered with interesting characters, lateral thinking, missed opportunities and cloudy nights on remote mountain tops. We can mingle the ancient legends of the stars with our modern understanding of them, emphasising the long history and cultural nature of astronomy. In 2009 we will no doubt claim that modern science began when Galileo turned his telescope to the stars 400 years ago.

We can also hint at the possibility of intelligent life elsewhere in the Universe. Even thinking of this obliges us to view life on this planet in a different and enlightening way. The astronomer's perception of the Earth as a planet is intriguing to people who have never considered it before, and along with light pollution it is a subject that links directly to the current hot topic of global warming.

Unlike almost every other pure science, astronomy is largely observational or theoretical, and has few commercial links and, apart from the Solar System, little possibility of direct experimentation with the objects of interest. Again, few non-scientists will have realised this and will be surprised that we can acquire so information much by observing so little light. Astronomy also addresses the biggest questions, of origins and destiny and has many (perhaps too many) unsolved mysteries.

The aftermath

The most important part of a public talk is active public involvement, especially the dialogue at the end. It is essential to allow time for audience questions, to encourage them, to enjoy them and to be seen to enjoy them. The house lights should be up at this time because this is when the audience connects directly with the speaker and when the speaker's personality comes to the fore. At this time it is good to step down from the platform into the auditorium and if possible move among the audience, actively looking for questions.

This has two advantages. Firstly the speaker has direct eye contact with individual audience members. If there is a question nervously loitering there it will come out. Secondly, the speaker has the microphone, so repeats the question for the benefit of everyone, paraphrasing it while formulating an answer. In my view, microphones for the audience in public talks should be discouraged if possible. They tend to inhibit questions, especially from youngsters, though in some large auditoriums they may be necessary (microphones, not children). Finally, depending on the venue and the occasion (and the budget), coffee, finger food and drinks in the foyer of the hall allow further mingling and discussion with the audience.

With good organisation and planning, a suitable venue, an interesting topic and a strong speaker, a public talk can leave a lasting positive impression about astronomy and astronomers. A successful talk also benefits science and its practitioners in general and underlines the nature of astronomy as a cultural activity with implications for both everyday life and life itself.

Credit: Sze-leung Cheung

Science communication and the European Union — options for funding!

Enikö Patkós
European Organisation for Astronomical Research in the Southern Hemisphere (epatkos@eso.org)

Abstract
Science communication is a relatively new, but definitely emerging field, often in critical need of funding options for its innovative projects. Besides the national funding agencies, the European Union (EU) also offers some options for funding. However, finding these EU grants for science communication projects is not an easy task. This paper aims to help those seeking funding by summarising information about the EU's main programmes that are potentially useable for science communication projects.

Introduction
In general people do not associate the European Union (EU) with exciting science communication. But there are some signs suggesting that this picture is changing. One of these signs is that the EU recently launched a site on YouTube[1], an unquestionable signal of openness towards the newest technological communication achievements. Another interesting example is the ATHENA-web site, which aims to become the central portal for European science communication videos. The ATHENAweb site[2] is financed from EU grants. This latter project demonstrates how the EU manages science communication projects by providing indirect funding for projects through open, competitive calls for tenders.

Science communicators often complain that it is not easy to find EU funding resources for their activities. This cannot be denied. The structure of EU policies is rather complex, and science communication funding can be tracked inside different policy fields. In order to find the relevant funding options, there are two possible routes to follow: the EU's research policy, and the EU's policy supporting new technological achievements.

1. Science communication in the EU's research policy field

1.1 Basic information
The 7th Research and Development Framework Programme[3] (FP7) is the EU's main instrument to provide funding for European research and technological development projects. FP7 will run for

1 http://www.youtube.com/eutube
2 http://www.athenaweb.org/
3 http://cordis.europa.eu/fp7/home_en.html

seven years (until 2013), with an overall budget of 50,521 MEUR. FP7 is divided into four Specific Programmes (SP):

1. Cooperation (32,413 MEUR);
2. Ideas (7,510 MEUR);
3. People (4,750 MEUR);
4. Capacities (4,097 MEUR).

Each Specific Programme contains several themes. To find funding options for astronomy communication projects one has to consult the Capacities Specific Programme‘s Science in Society[4] (SiS) theme for open Calls. The SiS theme has an overall budget of 330 MEUR for the seven years.

Astronomy science communicators often work in international teams connecting people from different countries and continents. For these cross-continental projects, besides the Capacities SP's Science in Society theme, the International Cooperation[5] (INCO) theme of the Capacities SP also offers funding possibilities. INCO runs with an overall budget of 180 MEUR for the seven years.

1.2 Eligibility rules

All FP7 projects need a European dimension. In other words, only consortia of partners from different countries can apply (with some exceptions described in the call for tenders). This means in practice that the consortium has to consist of at least three legal entities coming from different EU Member States or Associated Countries. However, these rules vary from call to call. Always check the call's rule for the relevant information. Activities that can be better carried out at national or regional level, i.e. without co-operation across borders, will not be eligible under the Framework Programme. The following list provides the basic categories of eligible countries:

- EU Member States (27);
- Countries associated to FP7 (Iceland, Liechtenstein, Norway, Switzerland, Israel, Turkey, Croatia, Serbia);
- Third countries (non-EU and non-associated);
- Countries with S&T agreement (Argentina, Australia, Brazil, Canada, China, Chile, Egypt, India, Mexico, Morocco, Russia, South Africa, Tunisia, Ukraine, USA).

1.3 Information sources

FP7 has a complex set of participation rules. All these are available on the main website of the programme[6]. Updated information about open calls can be found on the “Find a Call” page[7] of the FP7 website.

In order to provide additional help for applicants, the EU, in collaboration with its Member States and Associated States, established the system of National Contact Points (NCP); a network of professional EU FP7 officers. The list of these people can be found on the “Get support” page[8] of the FP7 website.

---

4 http://cordis.europa.eu/fp7/capacities/science-society_en.html
5 http://cordis.europa.eu/fp7/capacities/international-cooperation_en.html
6 http://cordis.europa.eu/fp7/home_en.html
7 http://cordis.europa.eu/fp7/dc/index.cfm
8 http://cordis.europa.eu/fp7/get-support_en.html

1.4 Calls for the attention of science communicators

There are some calls to be published in 2008 that could support science communication projects:

- 5.2.1[9] Gender and research (IYA2009 relevance);
- 5.3.1.1 The provisions of reliable and timely scientific information for the press and media;
- 5.3.1.2 Training actions to bridge the gap between the media and the scientific community;
- 5.3.1.3 Encouraging a European dimension at science events targeting the public (IYA2009 relevance);
- 5.3.1.4 Promoting science by audiovisual means in European co-production and the circulation of science programmes.

1.5 Some practical advice

- Always contact the NCP in your country for help.
- Choose your project partners carefully; only invite partners who you think will comply with the obligations.
- The consortium coordinator should always be experienced in EU project management.

2. EU grants for new technological achievements

Nowadays science communication, in particular in the field of astronomy, relies on, and contributes to, the evolution of new technological developments such as new internet-based applications and audiovisual tools. There are two major EU grant programmes that provide support for these types of projects:

- eContentPlus;
- MEDIA 2007.

2.1 The eContentPlus programme

2.1.1 Basic information

The aim of this multi-annual programme is to make digital content in Europe more accessible, usable and exploitable. The programme addresses areas that have public interest and which would not develop (or would develop at a slower pace) if left to market forces[10].

The projects financed under this scheme have to be based on a proven state-of-the-art technical solution, so this grant cannot be used for technological innovation, but for innovation in organisation and in deployment.

2.1.2 Eligibility rules

The Work Programme of the grant defines so-called target areas, where the programme aims to maximise impact:

- Geographic information;
- Educational content;
- Digital libraries;

---

[9] Call identification number

[10] eContentPlus — A multi-annual Community programme to make digital content in Europe more accessible, usable and exploitable (2005-2008); Work Programme 2007, page 3.

- Reinforcing cooperation between digital content stakeholders.

For the purpose of the programme, the following definitions apply:

- Geographic information: any data that directly refers to a specific location or geographical area.
- Educational content: digital content that can be used for learning in different context both in formal and informal education.
- Digital libraries: organised collections of digital content made available for the public by cultural and scientific institutions and private content holders in the EU Member States and the other participating countries of the programme[11].

There are three project types that are eligible for funding:

- Targeted projects (TP);
- Thematic Network (TN);
- Best Practice Networks (BPN).

Targeted projects are open for the areas "educational content" and "digital libraries". Projects should aim to solve specific, known problems by pooling the resources of interested and affected participants in a consortium.

Thematic Networks are open for the area of "reinforcing cooperation between digital content stakeholders". The aim of bringing the stakeholders together is to define best practices, building consensus in order to better coordinate the availability and usability of digital content.

Lastly, the Best Practice Networks are designed to serve the areas "geographic information", "educational content" and "digital libraries". The expected outcome of these formations is to promote the adoption of standards and specifications that could enable users to access and use the digital content of certain areas. This type of activity would implement the "Thematic Networks" in practice.

A common eligibility criterion of all the three types of activity is the requirement to have a European dimension to the activity.

2.1.3 Practical information

The current eContentPlus programme runs until the end of 2008. The last calls will be published during the course of 2008. The new eContentPlus multi-annual programme will be published before 2009. For more detailed information the main website of the programme can be consulted[12].

2.2 MEDIA 2007

The series of four MEDIA programmes have provided support for the European audiovisual industry since 1991, helping to make successful movies such as *Breaking the waves*, *Goodbye*

---

[11] For all areas, the following countries are eligible for funding: 27 EU Member States and Norway, Iceland and Lichtenstein, Croatia, Turkey, Former Yugoslav Republic of Macedonia. Other countries can also participate in consortiums, but without financial support from the EU. The up-to-date information about the participating countries can be found on http://ec.europa.eu/econtentplus

[12] http://ec.europa.eu/econtentplus

Lenin, *Secrets and Lies* and the *Le Fabuleux destin d'amelie Poulain*, just to list some. Science movies are still missing from this list, although the possibility is also open to them!
MEDIA 2007 is the successor to the former MEDIA programmes, covering the years from 2007-2013, providing the European audiovisual industry with an overall budget of 755 MEUR.

The programme supports different activities of the pre- and post-production phases of film-making:

- Training (scriptwriting techniques, digital technologies, economic and financial management);
- Development;
- Distribution;
- Promotion and festivals;
- Horizontal actions and pilot projects.

Calls are submitted on a yearly basis. Most of the calls for 2007 are closed by now, so interested applicants will have to wait until 2008. The time can be used for learning more about the programme, for which the best source is the webpage of MEDIA 2007[13].

Conclusions

EU-offered grants for science communication projects are not the easiest way to get funding, but they have the clear advantage of being favourable towards international consortia, which is an element often missing in national grants. EU projects require hard work at all levels. Project preparation, application, management and reporting are demanding, but it pays back well in the case of a successful project. Professional help for EU projects is also available in every EU country both from public bodies and also from the private sector. EU relevant websites provide all the information one needs and should be browsed briefly before approaching the EU professionals.

[13] http://ec.europa.eu/information_society/media/overview/index_en.htm

Credit: Lars Holm Nielsen

The Communicating Astronomy with the Public journal — A study from the IAU DIVISION XII Commission 55 CAPjournal Working Group

Pedro Russo[1,2] & Lars Lindberg Christensen[2,1] on behalf of the IAU Commission 55 CAPjournal Working Group

[1] International Astronomical Union (prusso@eso.org)

[2] ESA/Hubble (lars@eso.org)

Abstract

The public communication of astronomy provides an important link between the scientific astronomical community and society, giving visibility to scientific success stories and supporting both formal and informal science education. While the principal task of an astronomer is to expand our knowledge, disseminating new knowledge to a wider audience than just the scientific community is becoming increasingly important. This is the main task of public astronomy communication: to bring astronomy to society.

Here we present the results of a study from the IAU DIVISION XII Commission 55 Communicating Astronomy with the Public Journal (*CAPjournal*) Working Group for establishing a partly peer-reviewed journal called *Communicating Astronomy with the Public*. The first issue of the journal was released in October 2007 and the journal will be published quarterly in full colour and online. This project is vital for the intra-community exchange of information. *CAPjournal* will make it possible to learn from others in the same profession and with the same needs, as well as give authors a chance to present their information, experience and knowledge in a coherent and meaningful fashion.

Introduction

The CAPjournal Working Group[1] under IAU DIVISION XII Commission 55[2] was created in 2006, following an idea to create a new journal on Communicating Astronomy with the public. This Working Group has made excellent progress and now has widespread support for the initiative, including that from the editors of Astronomy Education Review. Further information can be found at the Working Group's web page and the *CAPjournal* web page[3].

The IAU DIVISION XII Commission 55 Communicating Astronomy with the Public Journal Working Group prepared a study assessing the feasibility of the *CAPjournal*. The conclusions were inescapable. The present situation of public astronomy communication shows a clear need for a peer-reviewed publication addressing the specific needs of the public astronomy communication community.

[1] http://www.communicatingastronomy.org/journal
[2] http://www.communicatingastronomy.org
[3] http://www.capjournal.org

Public communication of astronomy is a fast growing field of science communication, notably in Europe, but China and India may be the next emerging science communication “markets” as publishers are experiencing a flood of science coming from there. Latin America may also be a candidate for development in this field. The next few years will be extremely important for astronomy communication and education. The year 2009 will be the International Year of Astronomy, and will be a unique platform to inform the public about the latest discoveries in astronomy as well as emphasising the essential role of astronomy in science, education and culture.

Several agencies, research institutes, astronomy departments and observatories around the world have press officers and communication specialists. Science centres and planetariums have an important role to play in informal astronomy education, often producing high quality educational materials. However, as the astronomy communication community expands globally it becomes increasingly important to establish a community of science communication experts. The four *Communicating Astronomy with the Public* conferences have been very successful in raising the profile of astronomy, but a permanent forum where professional expertise and know-how can be presented and preserved for posterity is needed.

Publishing in the global marketplace

Academic publishing in a professional field is an important form of information exchange and discussion. The publishing business is changing rapidly in response to market forces arising from intense globalisation and the overwhelming popularity of the internet, bringing significant benefits (despite some severe disadvantages) to publishers. This changing landscape must be factored into the planning of a new journal. Changes in society drive new markets and as a consequence publishers need to devise new business models. The new environment is here to stay, and publishers who embrace the changes in technology and target group behaviour are the ones who will benefit the most.

There is pressure, especially from the scientific community, to allow broader access to scientific information in general. This is the main driver for the “open access” movement. However one time-honoured principle stands: peer-review continues to provide the stamp of quality for scholarly articles. This principle will be upheld by the *CAPjournal*.

Among the perceptible changes in the publishing industry are:

- Globalisation means that publishing can be moved to larger scales with cost-savings as a consequence. One example is the use of more outsourcing (typesetting, printing, services etc).
- Publishing houses are merging to form larger and larger companies that can embrace the globalisation and exploit the mobility of manpower and services. More mergers will happen over the next few years.
- Publishing customers, especially for e-publishing, are becoming larger as libraries form consortia.
- Data management and workflow is — as in many other disciplines — a major issue. Providing access to the right publications at the right time is a must in today’s world.

- Scientists should both write and read more articles.
- Globalisation forces publishers to develop new publishing standards, and modify existing ones to benefit from new technology. This can be seen as moving from the traditional model of "2-dimensional printing" to a contemporary digital "3-dimensional publication" with added value such as cross-references, links to catalogues and full multimedia capability (movies, audio, data from graphs). Today's audience wants products "on-demand", i.e. they want them to be immediately accessible, to be relevant to their needs and in an acceptable format.
- There is pressure, especially from the scientific community, to allow broader access to scientific information in general. This is the foundation of the "open access" movement.
- The production of scientific literature will move closer to the customer. Print-on-demand alleviates the need for storage capacity with the publishers, reducing production time, and enabling a new level of flexibility (including updating, tailoring and more economic production).
- The mere existence of a well-tagged publication in cyberspace will enable a higher level of pull marketing (instigated by the consumer as needed) instead of the traditional push marketing that is increasingly overlooked by a customer swamped with information.
- Involving and sourcing the capabilities, of the community (to rank popular articles for instance) is becoming increasingly necessary.

All these points are important for existing journals, but even more pertinent for new, emerging journals — particularly one that addresses public communication with content that regularly touches on the issues outlined above.

Objectives of the *CAPJournal*

The general purposes of scientific literature include:

- Documenting knowledge.
- Educating peers.
- Providing a basis for discussions.
- Compelling further progress.
- Establishing priorities in a field.
- Furthering careers (through documentation of the excellence of the individual).
- Helping to avoid the duplication of effort.

These objectives have also been adopted by the *CAPjournal*, which aims to publish material from different areas of astronomy communication in a scientific journal format, with open access. As an example, we expect that the journal will prove very useful to those involved in public communication of events surrounding the International Year of Astronomy 2009. The *CAPjournal* also serves as a repository of ideas, projects, activities, exhibitions and other key topics for the national nodes of the IYA2009.

Having a peer-reviewed journal for our field, such as *CAPjournal*, is an important step towards gaining recognition for the astronomy communication trade. To facilitate the information dissemination and recognition of the journal and its content, *CAPjournal* is indexed by the Astrophysics Data System (ADS).

Target group

The target group for the *CAPjournal* includes the following groups:

- public information officers;
- the planetarium community and other informal astronomy educators and communicators;
- the IYA2009 network;
- informal educators;
- science communication researchers;
- amateur astronomers;
- university students;
- the scientific (astronomical) community;
- decision makers.

CAPjournal/IAU

Figure 1 – The cover of the inaugural issue of the *CAPjournal*.

Key features of the *CAPJournal*

The journal will be published quarterly and is divided into nine main sections dedicated to:

1. News;
2. Announcements;
3. Letters to the Editor;
4. Reviews;
5. Research & Applications;
6. Resources;
7. Innovations;
8. Best practices;
9. Opinion.

Most of the sections should be self-explanatory, but the “Research & Applications” section contains peer-reviewed science communication research articles. “Reviews” will cover reviews about astronomy and science communication relevant topics and products such as books, DVDs, television programmes, magazines, websites and more. “Announcements” covers announcements of astronomy and science communication events (conferences, meetings etc.), training events, job postings, training opportunities or courses offered etc.

The full journal issues and individual articles are available on the *CAPjournal* website in PDF format. Submission guidelines, background and further information, with additional options to comment on and discuss the *CAPjournal* articles online are also available. We are happy to announce that the journal is free in both print and online (on the web page, click on “Subscription” to subscribe). We intend to keep the journal free for as long as we can find willing sponsors to pay for the printing costs (all manpower is based on volunteer assistance).

Conclusions

The present situation of public astronomy communication shows a clear need for a specific publication addressing the needs of the public astronomy communication community. We would like to see the astronomy outreach community deeply involved in this journal’s evolution and production and welcome submissions.

Acknowledgements

We would like to acknowledge the European Space Agency’s financial contribution towards the printing costs for the first two issues and the editorial assistance of Will Gater, Terry Mahoney, Anne Rhodes, Amit Kapadia, Francesca Granato, Raquel Shida and Martin Kornmesser.

Credit: Sze-leung Cheung

GLOBE at Night: An update and look ahead to IYA2009

Constance E. Walker[1], **Douglas Isbell**[1] **& Stephen M. Pompea**[1]
[1] National Optical Astronomy Observatory (cwalker@noao.edu)

Abstract

The ongoing loss of a dark night sky as a natural resource for much of the world's population is a growing, serious issue that not only impacts astronomical research, but also human health, ecology, safety, security, economics and energy conservation. "Star hunts" or "star counts" provide "citizen-scientists" with a fun, fast and no-frills way to acquire heightened awareness about light pollution through firsthand observations of the night sky. Over the last two years, the *GLOBE at Night* programme has enabled citizen-scientists around the world to contribute measurements on sky-brightness to a growing global database in two ways: simple unaided-eye observations that anyone can do and quantitative digital measurements through a handheld, well-calibrated sky-brightness meter. As discussed in this article, the *GLOBE at Night* programme will serve as a basis for the IYA2009 global Cornerstone Project on *Dark Skies Awareness*, as well as the central programme for the US IYA2009 *Dark Skies are a Universal Resource* theme.

Introduction: the challenge

We live in a world of urban constellations, unable to see the stellar constellations a moderately dark sky would provide. We should ask ourselves whether this is the legacy that we wish to leave our children. The ongoing loss of a dark night sky as a natural resource for much of the world's population is a growing concern in many countries of the world, as shown by recent "lights out" events in Australia, England, South Korea and the United States. These events and the growing success of various star-counting programmes show that dark-skies education efforts are most effective when they get people physically involved and when they develop a heightened awareness of light pollution as a global problem with a local solution.

A solution

"Star hunts" or "star counts" provide citizen-scientists with a fun, fast and no-frills way to acquire heightened awareness about light pollution through firsthand observations of the night sky. Past programmes have come from Greece, Austria, Canada, the International Dark-Sky Association and a pilot programme between NOAO-North in Tucson and NOAO-South in La Serena, Chile, among others. *GLOBE at Night* has built on these programmes to become an international citizen-science event to observe the night-time sky and learn more about light pollution around the world. *GLOBE at Night* brings together parents, students, and their communities for an engaging and fun science campaign.

GLOBE at Night

In March 2006, the National Optical Astronomy Observatory (NOAO) and the GLOBE project first conducted the *GLOBE at Night* programme to enable “citizen-scientists” around the world to contribute simple unaided-eye observations on sky brightness to a growing global database. Citizen-scientists recorded the brightness of the night sky by matching its appearance toward the constellation Orion with one of seven stellar maps of different limiting magnitude. Observations and their exact locations were submitted online. More than 18,000 people contributed 4,600 observations from 96 countries.

The *GLOBE at Night 2007* programme built upon the success of the inaugural campaign in 2006. The international star-hunting event returned from 8–21 March in two flavours: the classic *GLOBE at Night* activity incorporating unaided-eye observations toward Orion, and a new effort to obtain precise measurements of urban dark skies toward the zenith using digital sky-brightness meters. Both flavours of the programme were designed to heighten awareness about the impact of artificial lighting on local environments, and the ongoing loss of a dark night sky as a natural resource for much of the world population. Participation increased to 8500 observations from 60 countries in the last event. In 2008, the dates for *GLOBE at Night* are 25 February – 8 March.

Five fun, fast, and no-frills steps to the classic GLOBE at Night programme

Participants are introduced to the five steps of the classic *GLOBE at Night* Programme that involve unaided eye observations toward Orion and the comparison of those observations to charts of limiting magnitudes. These steps are featured on the *GLOBE at Night* website[1].

Step #1: *Find your latitude and longitude*. There are tentative plans to build this feature into the *GLOBE at Night* web pages by IYA2009. Until then sources for acquiring latitude and longitude range from using Global Positioning Services (GPS) to inputting your address to a website[7] to zooming in to your location with Google Earth maps to using topological maps. More information can be found online[2].

Step #2: *Find Orion in the night sky*. There are various ways given to find Orion[3]. You can also practice locating Orion by latitude using the interactive facility[4]. Or use an interactive slider to adjust both latitude and limiting magnitude[5]. There is also an online activity for the little citizen-scientists[6].

Find Orion by going outside an hour after sunset (approximately between 7–10 pm local time). Determine the darkest area by moving to where most stars are visible in the sky toward Orion. If you have outside lights, be sure to turn them off. Wait 10 minutes for your eyes to adapt to the dark. Locate Orion in the sky using the tools in the paragraphs above.

---

1 www.globe.gov/globeatnight/observe.html
2 www.globe.gov/globeatnight/observe_latlong.html
3 www.globe.gov/globeatnight/learn_findorion.html
4 http://www.globe.gov/globeatnight/observe_finder.html
5 www.globe.gov/globeatnight/learn_orionsky.html
6 http://www.globe.gov/globeatnight/GaN2007OrionAtFingertips.pdf
7 http://www.maporama.com

Step #3: Match *the night sky to one of the magnitude charts*. Use either the teacher or family packets or the material on-line[7]. Estimate the cloud coverage. Fill out the observation sheet.

Step #4: *Report your observations on-line*[8] anytime between 25 February and 20 March 2008. Try another set of observations from a different location!

Step #5: *Compare your observations to thousands around the world*[9]. Explore, zoom in and examine your data with the GLOBE at Night Map Viewer! *GLOBE at Night* is working to provide comparative data sets such as population density maps and night-time satellite imagery by IYA2009.

The Digital GLOBE at Night programme 2007

The digital *GLOBE at Night* programme was made possible by a small grant from the US National Science Foundation (NSF), which funded the purchase and distribution of 135 low-cost, handheld, well-calibrated sky quality meters (manufactured by Unihedron) called "SQMs". (Repeatability of the device's readings is +/- 0.1 magnitude/square arcsec according to Dr. Patrick Seitzer of U. Michigan.) Along with light-pollution teaching kits developed by NOAO, the meters were distributed to citizen-scientists in 21 US states plus Washington, DC, and in five countries, including Chile, where NOAO has major observatories. About 1,000 measurements were made. Initial results from 2007 show very good consistency, with obvious gradients in brightness from city centre to known dark areas. There was lots of creativity in the way measurements were made, such as via a Moon roof and with the car's GPS unit. The prototype SQM shows great promise.

The citizen-scientists were teachers, their students, astronomers at local and national observatories, International Dark-Sky Association (IDA) members, staff from 19 science centres, members of advocacy groups and guide staff at the national parks.

At many of the sites where the SQMs were delivered, a local coordinator promoted dark-sky education using the educational kits and trained a number of teachers and amateur astronomers in using the meters. For each meter, citizen-scientists were asked to make measurements from different locations in their region and record their measurements online with their latitude and longitude at each location, using either a GPS unit or GIS-related website.

An illustration of the results can be found in an article by C.E. Walker et al. (2007). The SQM data for Tucson is plotted against population density in Figure 1 and against the intensity of night-time lights in Figure 2. There is high correlation between the values of the SQM measurements and those for population density and the intensity of night-time lights. The higher the population density or intensity of night-time lights, the brighter the SQM reading.

[7] http://www.globe.gov/globeatnight/observe_magnitude.html
[8] www.globe.gov/globeatnight/report.html
[9] www.globe.gov/globeatnight/analyze.html

The easy to use SQM

The original Sky Quality Meter (SQM) has an angular field-of-view response of +/-40 degrees (80 degrees total) for a full cut-off at +/-60 degrees (120 degrees total). The new, improved model coming out in December 2008 (SQM-L) has a much narrower angular field-of-view response of +/-15 degrees (30 degrees total) for a full cut-off at +/-30 degrees (60 degrees total). The meter readings are somewhat temperature dependent. It is a good idea to leave the meter outside for 20 minutes before taking reliable measurements, depending on the temperature differential. Once you are ready, point the SQM directly above (at the zenith). The original model of the SQM has the sensor on the same side as the display. In the SQM-L model, the display is on the side and therefore easier to read. The SQM should be held above head level so that shadows or reflections from your body do not interfere with the reading. Avoid using the SQM in areas that are shaded by trees or buildings. For the original model in particular, be at least as far away from a structure as it is high. Pressing and holding the button a second time will display the outside temperature in °C and then °F. Subsequently the model and serial numbers are displayed.

Data input

SQM data can be taken all year. The data input sought for the meters is its serial number, the date and local time, your latitude and longitude and the meter readings. During the *GLOBE at Night* campaign, include the unaided eye observations toward Orion. Optional input includes your name, outside temperature, what percentage of cloud coverage and illuminated Moon you have, and any comments on whether you are near a light, building, or tree, the current sky conditions, etc.

Plans for 2008

We will continue to build on the existing infrastructure of local coordinators and participants in *GLOBE at Night* to create a similar, but extended, US-based classic and digital programme. We will expand our collaboration with the International Dark-Sky Association[10] and a local SQM citizen-science programme called Night Vision[11].

This effort will support ongoing student-teacher teams, as well as new participants, and build a more formal network of *GLOBE at Night* sites and coordinators. Funding permitting, people who commit to the programme will have access to sky-brightness meters as well as a kit with teaching materials on preserving dark skies. Participants will learn how to do the classic observations, use the meters, organise a meaningful campaign in their community, and teach with the kit. Interested participants will be offered the opportunity to continue SQM measurements all year.

NOAO and GLOBE are developing plans for web pages linked to the *Globe at Night* website[12] that will include information about SQMs, allow one to compare classic observations and digital measurements (discussing the importance of both) and instruct how to make an SQM measure-

---

[10] www.darksky.org
[11] www.nightwise.org/nightvision.htm
[12] www.globe.gov/globeatnight

ment with the template provided. It will also provide a selection of different types of SQM measurement programmes – from grid surveys of one's town on one night (repeatable every month), to seasonal surveys, to surveys every hour over a night at one or more location, to surveys of 8 cardinal directions along one's horizon (concurrent with regular SQM measurements). Information on how to report an SQM measurement will also be provided.

Analysis of the maps will include a comparison with other data sets such as last year's SQM data set, the limiting-magnitude unaided-eye observations, population density, regional environmental concerns (e.g., sea turtles in Florida), and satellite data on night-time lights (top view looking down versus the SQM's bottom view looking up).

Plans for 2009 and summary

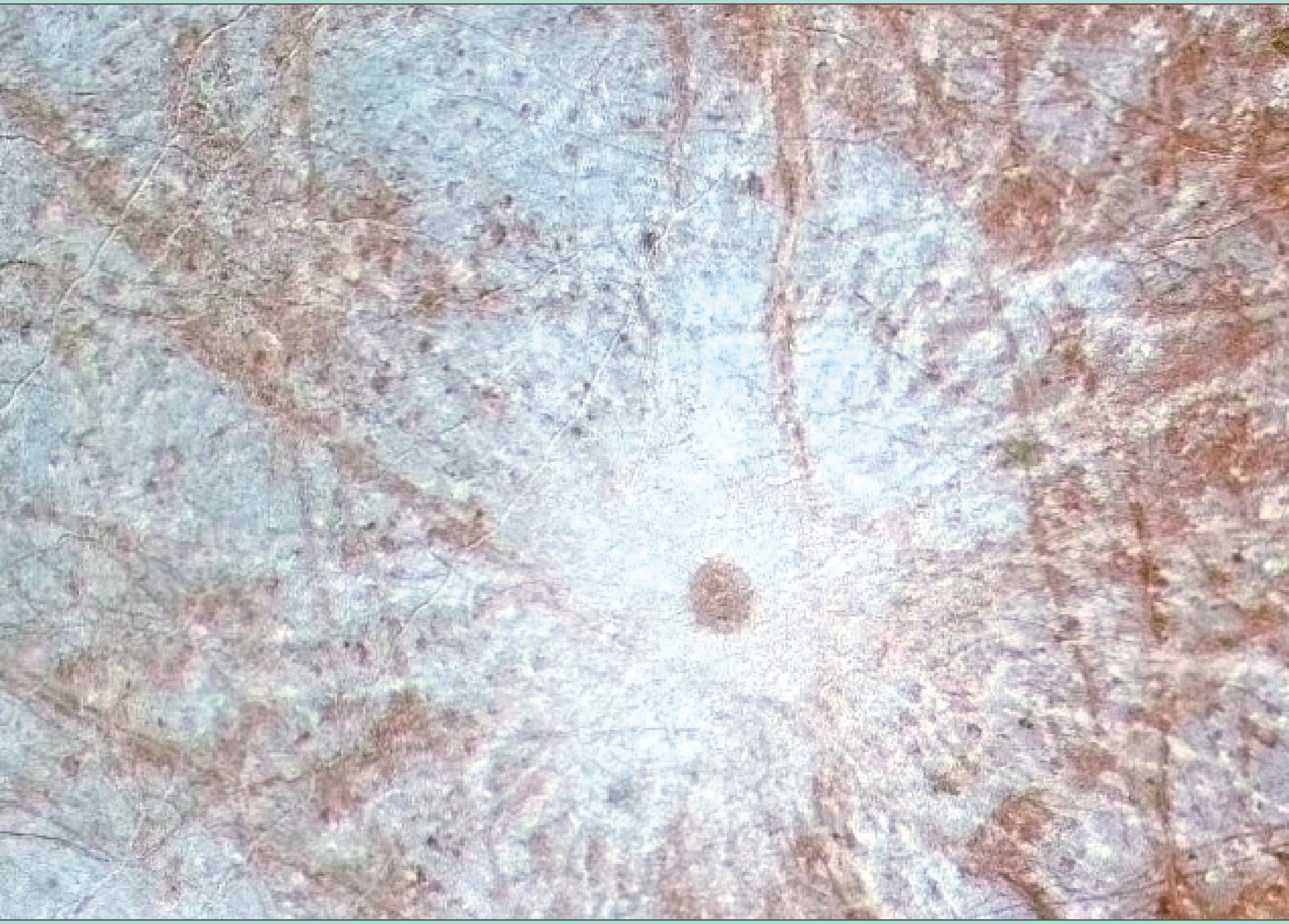
The outcome of the 2008 campaign will provide the basis for a quantitative global effort in 2009 as one of the major US IYA programmes. In addition, the US working group has come up with several related ideas (some existing, some new, some overlapping with other US IYA themes) that may extend to the global Cornerstone Project. The ideas include "Lights Out America; Dark Sky Teaching Sites"; "Astronomy Nights in the Park" (where national parks coordinate a dark sky night); light pollution discussed in documentaries and travelling exhibits (e.g. at libraries), a planetarium show, a video, articles, podcasts, public service announcements and MySpace; an art contest on "What does the night sky mean to you?"; a World Series of Astronomy (a competition for adults and kids to see how many objects in the sky they can identify – the darker the sky, the more objects); a "Return of the Sky" tour (a travelling programme of talks about the dark night sky); "Coming to a Dark Sky Near You" (a short drive to a dark site for a starparty) or Sidewalk Astronomy in cities; a tour of native American storytellers around the country; a booklet or website of poetic quotes about stars and the night sky; and an on-line star map with legends and stories (click on an object and hear stories).

The *GLOBE at Night* programme will also play a major role in the global IYA Cornerstone Project, Dark Skies Awareness. To facilitate the preservation and protection of the world's cultural and natural heritage of dark night skies in places such as urban oases, national parks and astronomical sites, IAU will be collaborating with NOAO, the International Dark-Sky Association and other national and international partners in these dark-sky and environmental education efforts for IYA.

Reference

- Walker C.E., et al. (2007), Dark Skies as a Universal Resource, Citizen-Scientists, and the International Year of Astronomy. ASP Conference proceedings, 2007.

Credit: Jan Warnstam, Jonas Lindqvist



Credit: PIRL / University of Arizona

Session 7
Cutting Edge Technologies

This is an enhanced colour image of the region surrounding the young impact crater Pwyll on Jupiter's moon Europa obtained by NASA's Galileo spacecraft. The 26-kilometre diameter impact crater Pwyll, on the left part of the image, is thought to be one of the youngest features on the surface of Europa. The diameter of the central dark spot – ejecta blasted from beneath Europa's surface – is approximately 40 kilometres, and bright white rays extend for over a thousand kilometres in all directions from the impact site.

Vodcasting for everyone[1]

Lars Lindberg Christensen[1] & Robert L. Hurt[2]
[1] ESA/Hubble (lars@eso.org)
[2] Spitzer Science Center (hurt@ipac.caltech.edu)

Abstract

Video podcasting, or vodcasting, is the latest evolution of the podcast revolution. The market for on-demand content spans the gamut, ranging from portable media players to computers, and increasingly to televisions through home media centres. This new mode of accessing video content is rapidly growing in popularity, particularly among younger audiences. Because it allows a direct link between consumer and content producer, bypassing traditional media networks, it is ideal for EPO efforts. Even modest budgets can yield compelling astronomy vodcasts that will appeal to a large audience. Gateways like the iTunes Music Store and YouTube have created new content markets where none existed before. This paper highlights the key steps for producing a vodcast. The reader will see how to make (or improve) a video podcast for science communication purposes learn about some of the latest developments in this rapidly-evolving field.

Introduction

Up through the 1970s virtually all video content in the United States was produced by one of three networks, and could only be seen during specific time slots. By the 1980s this "TV 1.0" era gave way to a fundamentally new paradigm of flexibility and choice. In the "TV 2.0" era viewers now had dozens, even hundreds, of niche-market networks offering a much broader variety of programming. The advent of the VCR, and more recently the digital video recorder (DVR), has also increased flexibility by "time-shifting" content from its broadcast time to a convenient viewing time.

Widespread broadband internet access is enabling a new revolution, dubbed "TV 3.0." Viewers now have the option of bypassing networks and schedules altogether, instead downloading content on-demand for viewing on their computer, portable media player, or television. There is no longer a network executive and programming schedule standing between the content producer and the audience; it has become a direct relationship!

The instrument of change is the podcast. The "Personal On-Demand broadCAST" is really no more than an online media file posted alongside an XML file (a feed), that is updated as new

[1] Parts of this paper appeared in the proceedings from the 2007 ASP EPO meeting.

content becomes available. Media aggregators (such as iTunes) allow subscriptions to the feed and will automatically download new content to their computers in the background as it becomes available.

While the roots of podcasting are in the audio MP3 format, video has become overwhelmingly common in recent years. The video podcast, or vodcast, has become a competitor for traditional television viewers, thus defining the TV 3.0 revolution.

Why vodcast?

Vodcasting allows producers of compelling content to connect directly to an audience. This opens up incredible opportunities for astronomy outreach. There are a number of compelling reasons science communicators should consider vodcasting.

Astronomy is visual

Of all the sciences astronomy is arguably the most visual and is responsible for some of the most memorable images of our time. Video is a natural medium for astronomy communication because of the readily available image, illustration, and animation resources for production. Astronomy themed vodcast content is highly appealing to audiences and is a natural fit to the medium.

Easy to produce

The standards for online video content are dramatically more forgiving than for broadcast television. The “Do-It-Yourself style” of many of the established vodcasts lowers the technical expectations among the audience, and puts emphasis on the content — the idea and the messages. While a broadcast documentary can cost tens of thousands of dollars or more to produce, effective vodcasts can be made on a shoestring and thus are within reach of even the smallest EPO groups.

It’s the future, not just a fad

The explosion of downloaded content over recent years makes it clear this is an inescapable trend, not just a fad of the moment. It is supported by powerful industries such as Apple, Google, and video community websites such as Veoh and YouTube; vodcasting is not going away anytime soon.

Connect to large audiences

There are increasing numbers of people actively searching for compelling online content. This is particularly true for younger audiences, including children, who are growing up online rather than in front of the TV. Astronomy vodcasts can attract large audiences simply by existing; viewers will find the content without having to be told about it (“pull” as opposed to “push”).

iTunes Music Store

Figure 1 – Who needs convincing? After introducing a high definition format, the Hidden Universe briefly reached the top spot in the US rankings of all podcasts in September, 2007, ahead of major players such as National Geographic, ESPN and HBO. New episodes are routinely downloaded 80,000 times in their first month online.

Vodcasting examples

As examples of vodcasts we will examine the production of two successful video podcast series: *Hidden Universe* and *Hubblecast*.

The *Hidden Universe* of the Spitzer Space Telescope, produced by NASA's Spitzer Science Center, was the first astronomy video podcast. The first episode went online in May 2006, and one year later it became the first astronomy vodcast to also offer a high definition (HD) version. The focus is science, not human interest stories. It uses two show formats: Showcase episodes are mini-documentaries (~5 min) featuring a host, rich visuals, and interviews, and Gallery Explorer episodes (~2 min) that display one or more related images with simple overlay text for background.

The *Hubblecast* is produced by the European Space Agency's Hubble group and started in March 2007. It features the latest news and images from the NASA/ESA Hubble Space Telescope. The host is Dr. Joe Liske a.k.a. "Dr. J" from ESO, who was selected at a screening session from ten other very promising scientists by a panel consisting of several men and women from different backgrounds in a "reality television" casting session. The production time for an episode is roughly five working days. The duration of an episode is five to six minutes. Hubblecast has three channels: SD (Standard Definition), HD (from June 2007) and Full HD (possibly the first Full HD Vodcast in the world). In addition eight other video formats are made available online at spacetelescope.org. Further information about Hubblecast is available in Christensen et al. (2007) and online[2].

Production design & resources

In a vodcast production where manpower is often restricted it is vital to manage resources and make the best of existing assets. These assets include (but are not limited to) images, animations, a host and scientists. In designing a vodcast, one should identify which assets are available and develop a show format to use as much in-hand material as possible. Minimising custom production needs is critical for maintaining a sustainable production.

Images

Astronomy images are abundant and are a key resource for any vodcast. Most of the third party astronomy images on the web are free to use for educational and communication purposes. Even static images can be fantastic for video by adding slow zoom and/or pan effects.

Animations

One or two well-chosen animations, either artistic or derived from science data/simulations, can help communicate a difficult science concept. While they can be time-consuming or expensive to produce, many institutions have broadcast-quality content available online that may eliminate the need for custom work.

Host

A regular host can give a personal touch and can help establish an identity for a vodcast. A host can also provide a visual focus when images or animations are not available to illustrate a point. He or she can even make low resolution content less obvious if it is presented as a "newscaster" style inset. It is critical to cast someone with clear speech patterns and good presentation skills with technical material; it is even better if they can memorise material rather than read from cue cards.

Interviews

Scientists can bring a personal angle to technical results, and can be a great resource for video. By interviewing them several times on the subject it is often possible to get a good, clear "take" that gets across key ideas. Plus, anything covered in an interview does not have to be written

[2] http://www.spacetelescope.org/videos/hubblecast.html

into the script, simplifying production. Note that not all scientists are equally suited to appearing in front of a camera and it is good to screen a potential guest scientist in advance for his or her ability to present the material in a lively and concise way.

Both *Hidden Universe* and *Hubblecast* utilise all of these assets for their productions. Typical end-to-end production times are on the order of a week. However, the Hidden Universe Gallery Explorer format was specifically designed to include only readily available images and animations to provide a rapid-production option (less than a day) to assure timely updates to the feed when a full Showcase production is not possible.

The script

Vodcasting is a very “light” medium; the format is short and it is essential to focus on key facts and make them as engaging as possible. The script can make or break a production. It must encompass both the narrative and the visual content and effectively link them.

The first step is to identify the target audience. Is the product intended for children, laypeople, or the informed public? This determines the number of ideas and the level of background information needed to explain them. Traditional news criteria can help determine the elements that make for interesting stories (see for instance Christensen, 2007).

Adapting pre-existing material, such as a news release, can be a shortcut to researching and writing on a new topic. However, spoken dialogue has a significantly different character from written text, and it is important to rewrite such material carefully so it sounds right to an audience. It is also critical to make adjustments to the content if the source material was intended for a different audience level.

Audiovisual Production

Once the script is ready, the visuals for the vodcast must be assessed. Image and animation segments need to be located online or developed using animation software. This process can start even before audio and video footage has been acquired if the timings for the script are recorded; this can be done with timed read-throughs or even by using text-to-speech software.

Shooting Video

Any production with host or interview segments will need to shoot video. There are many options, ranging from on-location in an office, working in a controlled studio setting, or even using substituted backgrounds by shooting against a green screen.

Real footage is recorded with a camcorder either in-house or with the assistance of a small hired camera team, depending on the budget. Naturally, the better the real footage is, the more “cinema-like” the final result, and so using the best equipment that fits the budget is helpful.

High definition video cameras today start at just a few hundred dollars (US) but the better quality equipment starts in the thousands of dollars.

Background removal & virtual sets

It is not too difficult to create a completely imaginary set for your host or interview subjects. The backdrop can be as simple as an image, an animated background pattern, or even a "virtual set" constructed in image and 3D graphics editing programs.

The technique requires shooting the subject against a distinctively coloured backdrop that can be digitally removed, or "keyed" out. Typically these are bright blue or green screens; green is more commonly used as it is less likely to match common clothing or skin tones. Note that these green screen studio installations need not be permanent, but can be set up in about an hour or so. Common editing applications have tools for removing these backgrounds (see Figure 2).

Shooting green screen footage does place stronger technical requirements on your video equipment. The least expensive digital video cameras will tend to blur out colours, making it difficult to separate the subject from the background cleanly. This leaves an unnatural border that can ruin the effect. It is useful to check online forums to see what results filmmakers have had with specific video equipment before committing to a particular camera.

Recording audio

The audio quality is dramatically better through an external microphone instead of the camera's built-in system. This can include shotgun/boom microphones near the camera or lavaliere microphones that clip onto the shirt (either wired or wireless). Even for narrations without video, using a high quality microphone will make a big difference to how professional the production feels as audio problems are difficult or impossible to fix after the fact.

Anyone speaking on camera or in a voiceover must have good pronunciation and clarity. Very strong accents can be distracting. If a speaker is important to a story but is difficult to understand, try to use them to reinforce established points and not introduce new material.

Music and sound effects

Music and sound effects can dramatically improve the impact of a video. Free sound tracks and effects from the web, as well as copyrighted "pay-per-use" stock music are available for the sound. Many so-called "net labels" exist that have favourable conditions for the use of the music. See Testtube[3] for an example. However, it may be interesting to collaborate with artists who can compose music and sound effects that will fit the specific needs of the project better.

[3] http://testtube.monocromatica.com

Editing

The post-production stage follows the recording of the audio and video. At this point the video footage is screened and the best “takes” chosen and trimmed to remove unwanted parts. The remaining video, animation, and audio assets are assembled. Using the script as a template the project is pieced together in the editing software like a jigsaw puzzle. Video and audio clips are added to the timeline to tell the story. Audio levels are adjusted to be consistent, video colours are corrected, and transitions are added where they improve the storytelling. Finally, extras like music and sound effects are laid into the timeline for the final polish.

Naturally somewhat specialised hardware and software is needed for these tasks, but we are in a much better situation today than just a few years ago. Mac and Windows computers now come standard with incredible computing power and data input/output rates, and basically any new high-end computer can be used for video editing. Key considerations are lots of storage space (7200 rpm drives, internal or Firewire, but not USB). High definition editing is particularly demanding and requires larger monitors and high performance video cards (this technology changes rapidly; it is worth consulting computer experts to find the best current video card options).

There are many powerful options for video editing software today. Industry standards now include suites like Final Cut Studio and Adobe® Premiere®, but even entry-level products like iMovie can produce a solid vodcast.

Robert Hurt

Figure 2 – The different steps of the keying process. The first image shows the unprocessed scene. Then the green colour is replaced with computer graphics and the scene is cleaned up digitally.

Video formats

Today the broadcaster is faced with an almost dizzying array of image sizes and formats. Traditional US (NTSC) and European (PAL) formats have different frame rates and dimensions but share a common aspect ratio (4:3). Now a new set of high definition (HD) formats are becoming the new broadcast standard. They are differentiated by two image sizes (both with widescreen 16:9 aspect ratios) and a variety of frame rates.

Table 1 summarises all of the major video formats. These affect even vodcasters since common production formats mirror those for television broadcast work. Interlacing becomes a key issue in choosing formats; this process is a kind of workaround for limited signal bandwidth in which every other line of an image is sent (a field), and the remaining interlaced field is filled in on the next pass. While this does create a faster-refreshing screen, the resulting interlace artefacts create an unpleasant effect for online viewing and should be avoided for all vodcast work.

What is the best format for vodcasting? There is no easy answer. Standard definition (SD) formats and lower frame rates make for smaller files and faster downloads that are compatible with a wider cross-section of hardware. However, new computers are able to play back and display HD material on the computer screens. Many consumers already have HD or Full HD plasma or LCD screens in their home, and media centres and HD players such as Apple TV are becoming increasingly common. Paradoxically most normal consumers are not able to find much HD content to display on the computers or TVs and this is definitely a niche that can be exploited for science communication purposes.

In the production sense, perhaps the most important difference between SD and HD is the change of aspect ratio (the ratio between the two sides of a video frame) from 4:3 of the traditional SD frames to 16:9 for HD frames. As current video production is moving rapidly towards the widescreen 16:9 aspect ratio, even for SD shows, this is arguably the more forward-looking choice today.

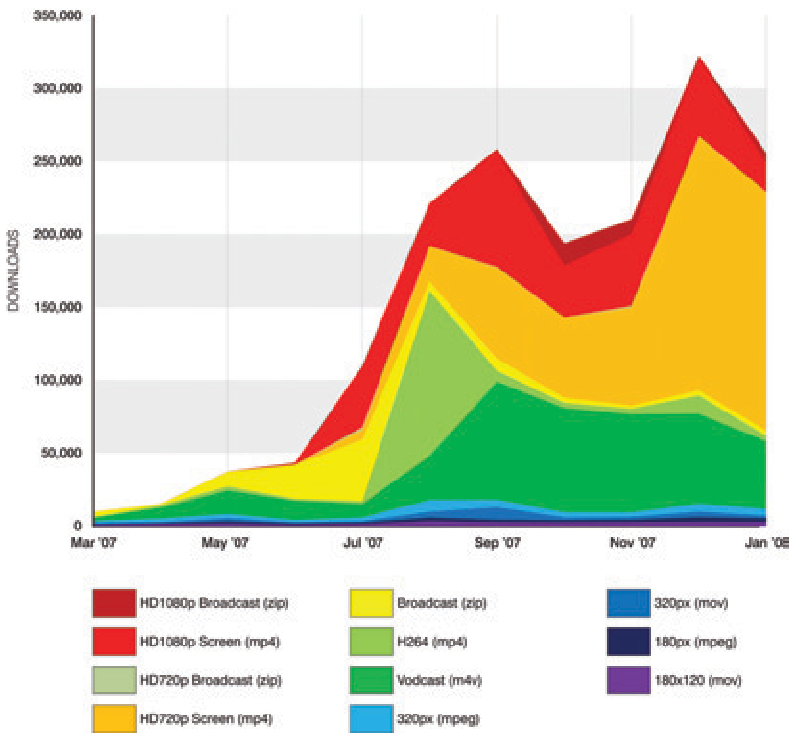
The other consideration is the target hardware platform. For instance, video iPods can handle images up to 640 x 480 at frame rates up to 30 fps. The newer Apple TVs have an added potential to handle 1280 x 720 frames at up to 25 fps. Most new computers can display 1920 x 1080 at up to 25 or 30 fps. Of course once a master video file has been created it is easy to downsample it to lower resolutions using encoding tools.

Final distribution videos are far too large in their raw, uncompressed state to distribute and play, so it is necessary to “encode” them into a compressed format designed for easy playback. One of the best video “codecs” in use now is H.264 (MPEG4 part 10). Within the limits stated above, this format is compatible with iPods, many other portable media players, and computers running Quicktime. However, offering vodcasts in multiple formats can reach audiences with older hardware; common choices are MPEG1 and Sorenson 3 Quicktime. Also posting minimally-compressed high-quality formats makes it easy for broadcasters to include the content in news and documentary programming for television.

Using a good batch compression tool can simplify the creation of media files. It is simple to take a final source file and create multiple versions using different compression codecs and at different image dimensions. Naturally it makes sense to produce a vodcast at the highest desired dimension and frame rate, and downsample to lower qualities as needed. On Macs, Compressor — part of Final Cut Studio — is used by many. On PCs, ProCoder is a good tool to batch compress many

Format	Dimensions [pixels	Interlacing	Field/Frame Rate [fps]
NTSC (broadcast)	640 [720] x 480	Interlaced	60 (fields)
NTSC	640 [720] x 480	Progressive	24, 30
PAL	720 [768] x 576	Progressive	25
HD (720p)	720 [768] x 576	Progressive	24, 25, 30, 50, 60
HD (1080i)	1920 x 1080	Interlaced	50, 60 (fields)
HD (1080p, "Full HD")	1920 x 1080	Progressive	24, 25, 30

Table 1 – Summary of video formats



ESA/Hubble (N. Marques / R. Shida)

Figure 3 – What is the best distribution format? As this download chart for Hubblecast shows, it can be hard to tell! Increasing image resolutions are arranged vertically with the Full HD format on top. HD and Full HD are on the rise and started to dominate in October 2007, especially the formats aimed at on-screen viewing. For Hidden Universe the HD ready format is also extremely popular and has begun to outperform SD, but across all formats the vodcast has seen over a million downloads.

In a time of rapidly advancing technology and consumer interests there is no simple answer to the seemingly simple question: "What is the best format to use for vodcasting?" But with the rapidly increasing market for HD televisions and related hardware, there is already a surprisingly strong trend towards large-format content. Since introducing both 720p and 1080p formats of *Hubble-*

cast, recent months have shown these HD options account for about half of the total downloads. For *Hidden Universe* the 720p format produced an even more dramatic ratings spike; it is downloaded about 10 times more frequently than SD!

Distribution — It's all about the ratings!

The final important step is the distribution and promotion of the video. The primary distribution of vodcasts today is through the iTunes Music Store. As the XML feed is updated with information on new episodes, this information is displayed for casual browsers looking through the podcast section. Video community sites such as YouTube, DailyMotion, blip.tv and veoh can be excellent channels for promoting a vodcast. Download numbers from these pages can be substantial (up to 20-25% of the total).

As with TV, better visibility will give higher ratings. A good name to the vodcast channel, a sexy description and recognisable icon are critical elements in your success. Learn from other vodcasts — what looks interesting and why? Episode titles and descriptions are important since casual browsers often sample an episode before subscribing. Waste nothing in your description; the first few words can be pivotal in capturing a potential subscriber's interest!

Conclusion

With the experiences from the two successful vodcasts Hidden Universe and Hubblecast we feel confident in saying that the vodcasts are here to stay. Delivering content in multiple formats to appease both the desires of instant gratification and of premium viewing quality seems to maximise the potential audience. Our experiences show that being one of the first providers of a new format can pay off, so watch for new trends, platforms and formats!

At the time of writing, 10 episodes of *Hubblecast* and 14 episodes of *Hidden Universe* have been released and both vodcasts have been downloaded close to a million times. The two podcasts are — at least for the time being — regularly ranked among the 10 most-viewed podcasts in the science category in iTunes, and among the Top 100 podcasts in total.

We plan to keep up with the steady stream of exciting vistas of space seen through the eyes of Hubble and Spitzer and presenting the latest science to the young generations as long as the segment of young viewers enjoys our work. Who knows what the next trend will be? Podcasts in 3D-HD? Will there be another even more exciting medium that can help us bring the stars to everyone on Earth? Only the future can tell…

Acknowledgements

The authors would like to acknowledge the two vodcast teams from both *Hidden Universe* and the *Hubblecast*, as well as Will Gater for his editorial contribution to the paper.

References

- Christensen L.L, Kornmesser M., Shida R.Y., Gater W. & Liske J. (2007), The Hubblecast — the world's first full HD video podcast? In Christensen, L., Zoulias, M. & Robson, I. (eds.) Proceedings from Communicating Astronomy with the Public 2007
- Christensen L.L (2007), The Hands-On Guide For Science Communicators, Springer, 2007

The Virtual Astronomy Multimedia Project

Adrienne Gauthier[1], Lars Lindberg Christensen[2], Robert Hurt[3] & Ryan Wyatt[4]
[1] Steward Observatory, University of Arizona(agauthier@as.arizona.edu)
[2] ESA/Hubble (lars@eso.org)
[3] Spitzer Science Center (hurt@ipac.caltech.edu)
[4] California Academy of Sciences (rwyatt@calacademy.org)

Abstract

The Virtual Astronomy Multimedia Project (VAMP) will enable access to, and vastly multiply the use of, astronomy image resources. VAMP will enable future innovative exploitation of all kinds of outreach media by systematically linking resource archives worldwide.

Introduction

In a fast-paced connected world, public astronomy communication must follow the pace of the other players in the electronic information mass market, particularly the gaming and entertainment industries. The problem today is not so much the availability of excellent astronomy multimedia resources for use in education and outreach, but rather suitable access to these materials. Both public and professional sectors need better access to images and videos of stars, galaxies or astronomical phenomena.

Despite the high value of astronomical images there is no standardised way to describe or deliver images in a systematic and simple way in the astronomical outreach community. Each observatory has its own manageable online gallery of images, but each facility has its own way of describing and delivering the images. This makes it difficult for an innovative multimedia project, such as a desktop planetarium program, to integrate the most current images from all the major observatories into their applications. The developer has to make custom tailored software tools to access each observatory's image database. Furthermore, many astronomical images found online in search engines are separated from the original source and the richness of contextual information from the Education and Public Outreach (EPO) description. A vivid example is shown

Google

Figure 1 – Screenshot on the left is the result of typing in “M16” (a.k.a. the Eagle Nebula) into Google. No Eagle Nebula in sight! The screenshot on the right shows how changing the search to a more descriptive “Eagle Nebula” does produce more astronomy images, but only duplicate and low-res image copies not from the original source, and without the descriptive metadata.

in Figure 1. Lastly, the standardisation of metadata and delivery of images is necessary if the astronomical community is to stay afloat in the evolving capabilities of internet technologies and semantic or intelligent search systems.

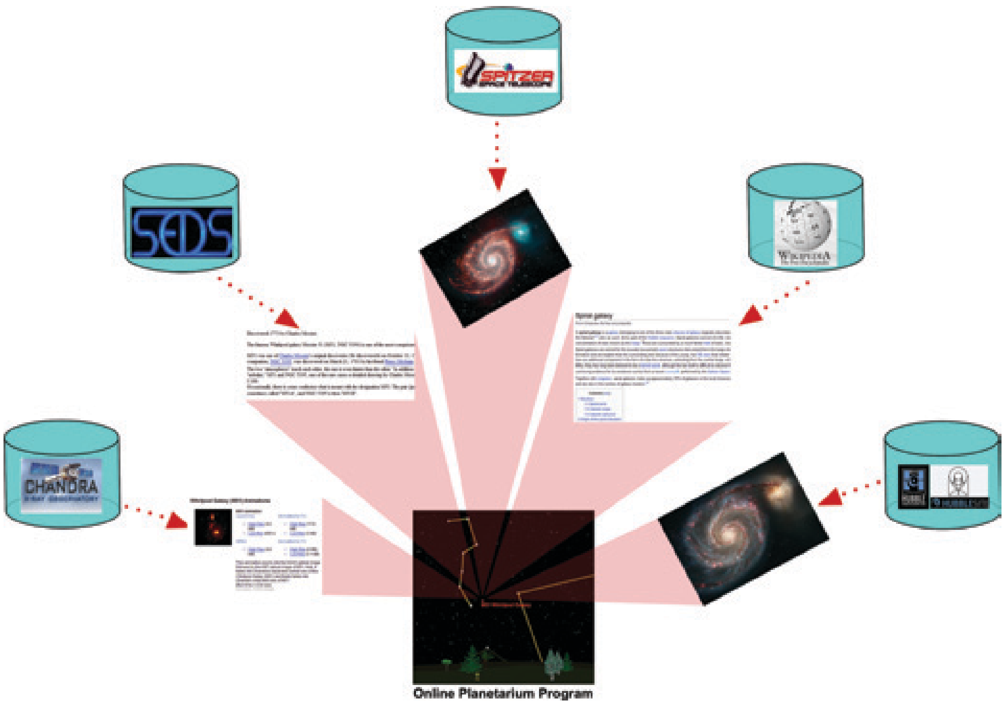
This problem will only intensify over time. Just as most scientific disciplines are currently experiencing a “digital data flood” of exponentially expanding datasets, so too are Education and Outreach multimedia resources multiplying rapidly. More and more “polished”, public-friendly materials are being made available to press, educators, and lay people on the web. Vast quantities of value-added outreach material are already available on the web today, but they are not linked systematically, and it is therefore next to impossible for the press and public to search these resources in a simple manner.

The VAMP solution

The Virtual Astronomy Multimedia Project (VAMP) offers a solution to the astronomical EPO community. We will provide an innovative and powerful portal for accessing the broad cross-section of astronomy visual imagery resources. The vision is for a “one-stop shopping” experience for all levels of end-users who are seeking images that also provide the basic infrastructure upon which a variety of derivative applications serving any number of audiences can be based. Figure 2 illustrates how a proposed “semantic web” application can make use of VAMP and pull metadata and imagery into a web experience guided by the user’s navigation choices and self-learning path. New content (images, movies, articles) are located in the vast World Wide Web by using intelligent searches of resources that are tagged with the Astronomy Visualization Metadata (AVM).

The Astronomy Visualization Metadata (AVM) standard

The AVM is a defined set of metadata fields that includes an exhaustive astronomical object taxonomy and World Coordinate System (WCS) information. This metadata preserves the descriptive context of the imagery that astronomers and communication professionals have laboured hard to create. The standard includes both the metadata schema for describing outreach images



VAMP

Figure 2 – Conceptual diagram of how a “semantic web” application can utilise the AVM to pull in related content for the user navigating their astronomical experience. Images, movies, text, etc. can all be seamlessly and automatically shown to the user if the content providers use the AVM to tag their content. Content comes directly from the provider’s server.

and the method by which the metadata may be embedded within the image file. For data-derived images, full World Coordinate System tags can be used to describe fully the position, orientation, and scale of the image while allowing for a variety of applications requiring the full coordinate context. VAMP database tools can answer queries utilising the full extent of this encapsulated metadata allowing for more powerful search capabilities than any existing today for astronomy. Facilitating the adoption of this standard is a necessary element of VAMP and will ensure that astronomy imagery takes the lead in web convergence technologies.

The scope of AVM is specifically tailored to public-friendly astronomical images, allowing systematic indexing of source material even for complex multi-colour composites from multiple observatories. However, it also encompasses artist’s concepts and diagrams, simulations, and photography. Ultimately it could be extended to cover a broader range of multimedia resources like videos, podcasts, and so forth. The first phase of VAMP will focus on astronomical imagery and will underpin a larger future effort encompassing all multimedia products related to astronomy. Please see Hurt et al. (2007) for more detail on the AVM.

The VAMP middleware

The second essential piece to VAMP is the middleware tool being designed, built, and maintained by the Infrared Science Archive (IRSA) at the Infrared Processing and Analysis Center (IPAC) at

Caltech. Based on the concept of a "virtual observatory", the primary deliverable of VAMP would be a digital library that stores, organises, and delivers metadata on imagery for astronomy and planetary sciences. Distributed databases will store the metadata and online location of each image/media file on the content provider's server. A push/pull communication system between the middleware and observatory servers will manage the influx of metadata to the system.

Back to the users

The third piece to VAMP is the delivery of the image metadata and locations back out to the users. The VAMP service will be open to anyone wishing to receive AVM style metadata and remote image locations via sophisticated search strategies. Those wishing to utilise VAMP will subscribe to a web service that communicates directly with VAMP to deliver the metadata and location of the image/media file directly into their applications. VAMP will provide innovative developers with a tool for simple, standard access to outreach imagery and media from a variety of sources, thus encouraging the creation of the cutting edge applications that today's technological public demands.

Typical VAMP users are:

- A museum professional gathering source material.
- A publisher looking for print-quality images.
- A teacher seeking related images in different wavelengths.
- An innovative website or application that needs to access web-resolution content on-the-fly in response to changing context provided by user interaction/exploration.
- A digital planetarium system that issues a real-time query to locate any high resolution imagery to map into a zoomed-in region of interest. See Kapadia et al. (2007) for a description of the first proof-of-concept for such a system.
- A scientist looking for comparative images at a different wavelength from their own research.

The web service will be a simple search engine that will employ many search strategies: metadata filtering, keyword searches, and "intelligent" (semantic) related content services based on well-designed taxonomies and thesauruses. In addition, VAMP will design and implement a public friendly interface to the database for the "every person" who is in search of EPO products. Figure 3 is a simple conceptual model of the relationships between content providers, VAMP Archive & Service, innovative applications, and users of those applications.

VAMP will play an important role for part of the International Year of Astronomy 2009 and will help enable some aspects of the global Cornerstone Project *The Portal to the Universe*.
Current progress for VAMP includes adoption of the AVM by Spitzer Space Telescope, Hubble Space Telescope (NASA & ESA), Chandra X-ray Observatory, and David Malin of the Anglo-Australian Observatory. The US national observatories (NOAO and NRAO) are currently preparing for adoption. In addition, VAMP has attracted the attention of cutting edge end-user applications. Microsoft's World Wide Telescope has endorsed the VAMP and AVM initiative and is awaiting our first prototype service. We are also working with Stellarium, an open source desktop and plan-

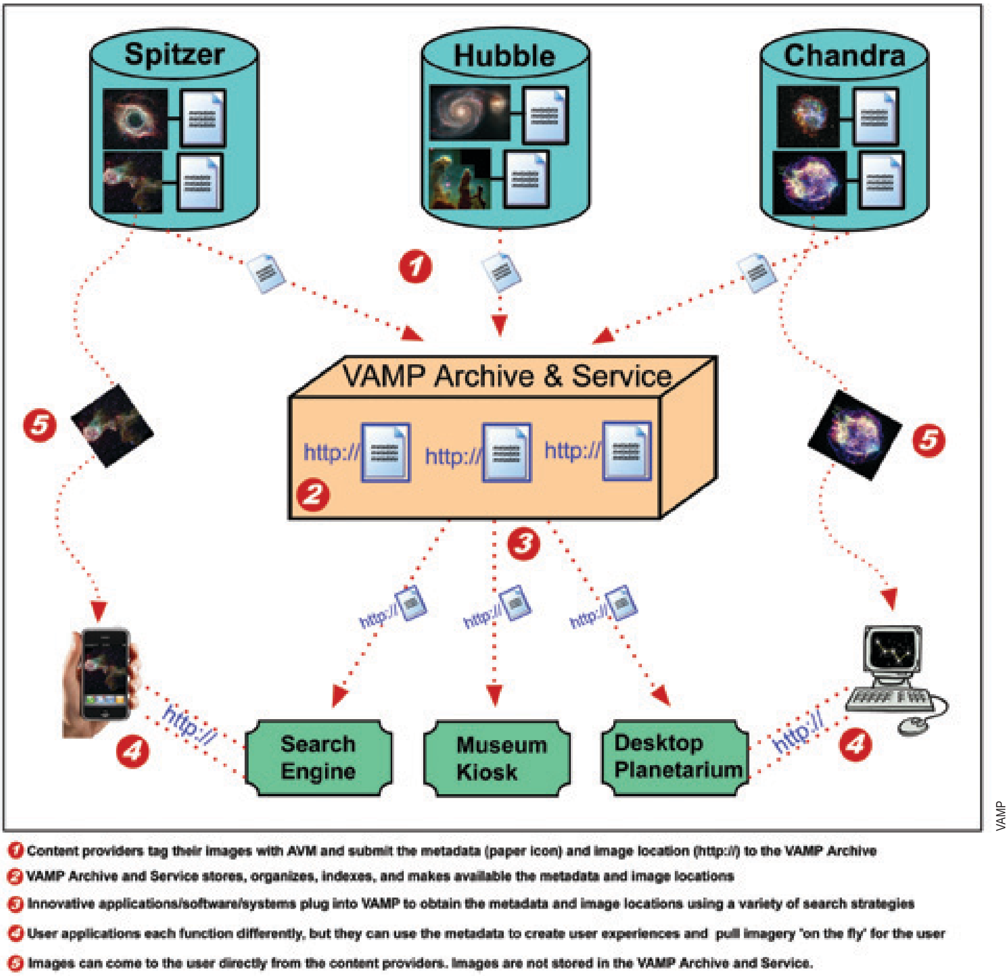


Figure 3 – Conceptual diagram of the relationships between the content providers, VAMP Archive, applications, and end users.

etarium program, by experimenting with their new VirGO module and AVM compliant VOTables to place JPEG images onto their sky grid. Planetariums at California Academy of the Sciences, American Museum of Natural History/Hayden Planetarium, and Denver Museum of Nature and Science have endorsed VAMP and are excited at the opportunities it can present merged with data visualisation programs such as Uniview[1] from Sciss.

[1] http://www.scalingtheuniverse.com/

VAMP is a collaborative project between individuals representing the Spitzer Science Center, ESA/Hubble, California Academy of Sciences, IPAC/IRSA, and Steward Observatory (University of Arizona). VAMP is organised into four work packages:

1. Management managed by Adrienne Gauthier;
2. AVM standard managed by Robert Hurt;
3. Middleware/Core Development managed by Bruce Berriman, and;
4. Prototypes managed by Lars Lindberg Christensen.

If you are interested in collaborating with VAMP or representing your organisation in endorsing the project, please e-mail Adrienne Gauthier, agauthier@as.arizona.edu.

References

- Hurt R.L., Christensen L.L., Gauthier A.J. (2006), Astronomical Outreach Imagery Metadata Tags for the Virtual Observatory Version 1.00, http://www.ivoa.net/Documents/latest/AOIMetadata.html (Sept 2006).
- Hurt R.L., Gauthier A.J., Christensen L.L., Wyatt R. (2007), Sharing Images Intelligently: The Astronomy Visualization Metadata Standard, In Christensen L.L., Zoulias M. & Robson I. (eds.) Proceedings from Communicating Astronomy with the Public 2007.
- Kapadia A., Chéreu F., Christensen L.L., Nielsen L.H., Gauthier A.J. Hurt R.L., Wyatt R. (2007), VAMP in Stellarium/VirGO: A Proof of Concept, In Christensen L.L., Zoulias M. & Robson I. (eds.) Proceedings from Communicating Astronomy with the Public 2007.

VAMP in Stellarium/VirGO: A proof of concept

Amit Kapadia[1], Fabien Chéreau[2], Lars Lindberg Christensen[3], Lars Holm Nielsen[4], Adrienne Gauthier[5], Robert Hurt[6] & Ryan Wyatt[7]

[1] ESA/Hubble (akapadia@eso.org)
[2] ESO (fchereau@eso.org)
[3] ESA/Hubble (lars@eso.org)
[4] ESA/Hubble (lnielsen@eso.org)
[5] Steward Observatory, University of Arizona (gauthier@as.arizona.edu)
[6] Spitzer Science Center (hurt@ipac.caltech.edu)
[7] California Academy of Sciences (rwyatt@calacademy.org)

Abstract

The Virtual Astronomy Multimedia Project (VAMP) and the Astronomy Visualization Metadata (AVM) standard will give observatories and astronomers an easy way to distribute their astronomical visualisation products. The CAP2007 demonstration which is described here is an early, although fully functioning, proof-of-concept for the VAMP project showing the capabilities and functionalities of the AVM.

Our hope is to encourage people to begin applying the AVM standard to their Education and Public Outreach (EPO) images as they witness the spectacular end results that applications like Stellarium, World Wide Telescope, and Sky in Google Earth can bring to the future.

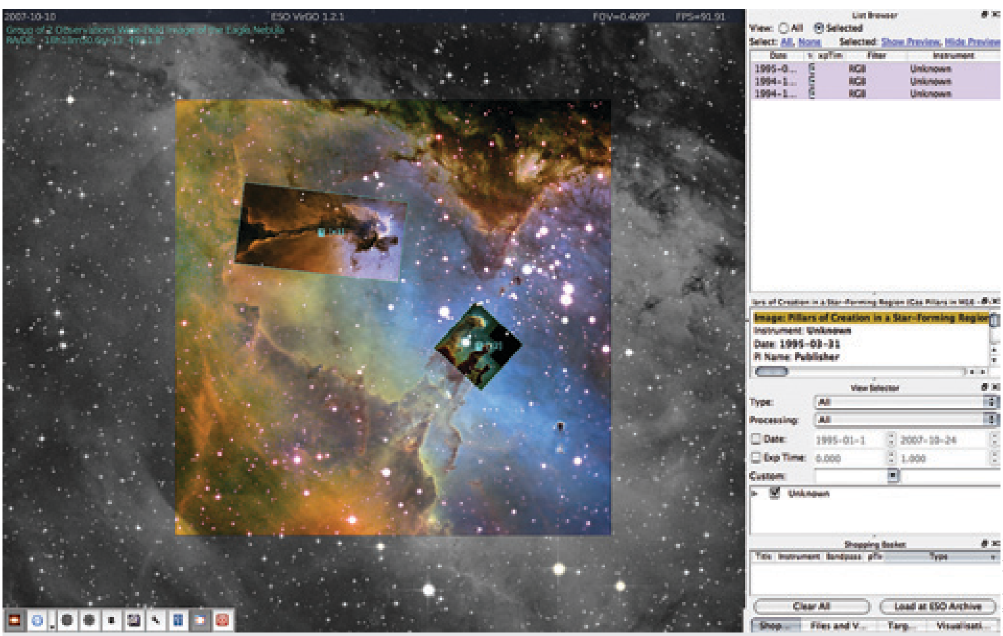
The demonstration tools

A live demonstration was carried out at the CAP2007 as a proof-of-concept for the Virtual Astronomy Multimedia Project (VAMP)[1] and the Astronomy Visualization Metadata (AVM) standard[2] (Hurt et al., 2006). These two concepts are described in detail in Gauthier et al. (2007) and Hurt et al. (2007) elsewhere in this volume.

[1] http://www.virtualastronomy.org
[2] http://virtualastronomy.org/avm_metadata.php

The demonstration used the popular open-source desktop planetarium package called Stellarium[3], alongside the recently developed VirGO[4] plug-in for Stellarium. Stellarium is a free software package which displays the celestial sky based on a catalogue of 600,000 stars. Specific features in Stellarium outline constellations, superimpose constellation art, show Messier objects, track orbits of celestial bodies, etc.

Currently being developed at the European Southern Observatory's (ESO) Virtual Observatory Department, the VirGO plug-in (see Chéreau et al. 2007) mainly creates an innovative method for scientists to tap into data products of the ESO/ST-ECF Science Archive Facility in a visual manner. Features of VirGO include the ability to visually locate ESO datasets, filter through data products, display Digital Sky Survey 2 (DSS2) images on the sky, and even allow other observatories to load their data using a VOTable[5] or FITS[6] images with World Coordinate System (WCS) information in the header. Using these tools as examples of the many different "data visualisation tools" that exist today, the VAMP group was able to import a different type of data – Education and Public Outreach (EPO) JPEG images of various galaxies and nebulae.



Stellarium/VirGO

Figure 1 – Screenshot of Stellarium/VirGO displaying images of the Eagle Nebula aligned using WCS data from AVM tags with DSS2 in the background.

3 http://www.stellarium.org/
4 http://archive.eso.org/cms/virgo
5 http://www.ivoa.net/Documents/latest/VOT.html
6 http://fits.gsfc.nasa.gov/

Astrometry

One of the most important means for bringing astronomical images into their right context are the World Coordinate System (WCS) coordinates used to designate the position of astronomical objects in the sky (the so-called astrometric positions). WCS information is needed to properly align and orient astronomical images on a sky grid. Astronomical images that come directly from a telescope are usually stored in the FITS format. The FITS format usually contains a header with relevant information of a telescope's observation, including WCS information. However, during the processing of the scientific images to EPO images the WCS information is often stripped away as it is seen as irrelevant. Alternatively the original WCS information from the FITS header becomes useless due to post-processing of the image which may change the scale, orientation, cropping, etc. In order to implement emerging tools such as the VirGO module, correct WCS information for the new EPO image (JPEG or TIFF) needs to be resolved.

Astrometry.net[7] is an innovative web-based "black-box" service that resolves WCS information for many astronomical images irrespective of their file format (FITS, JPEG, TIFF). Using a vast library of reference stars, Astrometry.net is able to deliver proper WCS information in the format of a FITS header within minutes. Currently Astrometry.net is in its alpha phase of testing and is the most promising candidate for delivering simple astrometry solution for images to both scientists and EPO people. Many of the images shown during the demonstration at CAP2007 were automatically positioned using WCS information retrieved via Astrometry.net.

Results from this demonstration

At CAP2007, the VAMP team demonstrated the potential of the AVM standard. Astronomical images in JPEG format were imported into Stellarium via the VirGO module and properly aligned on the sky using WCS information pulled from a VOTable translated from an AVM file. This process was semi-automatic in the sense that the alignment on the (digital) sky happened automatically, but someone had to act as the translation layer for the metadata between AVM and VOTable as no automatic tool was built for this prototype demonstration. In the future this import process can be automated for applications that use only VOTables. Once the metadata are inside Stellarium, images are automatically located and pulled into their correct location on the sky grid.

This demonstration showed the capabilities of the AVM standard as a way to access and deliver astronomy visualisation products along with new media. Images can now be downloaded from any server and loaded into such programs, EPO images from different observatories can easily be seen and compared, and contextual information will soon take its place in the presentation.

It is our clear impression that the Stellarium demonstration only marks the beginning. As mentioned in Gauthier et al. (2007) groups at Spitzer Space Telescope, Chandra X-Ray Observatory, and Hubble Space Telescope (NASA and ESA) are tagging their images using the AVM standard. With more metadata-tagged image resources becoming available and better metadata tagging tools produced by the VAMP group, we expect to see several applications emerging soon which

[7] http://www.virtualastronomy.org

natively read AVM, and make better use of the WCS and contextual information (e.g. headline, description, colour mapping, etc.) stored in the metadata. The possibilities for the interconnection and exploitation of these resources are virtually endless.

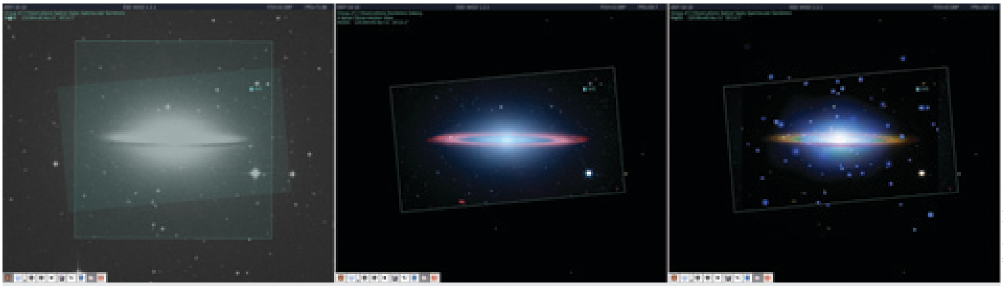

Stellarium/VirGO

Figure 2 – Multi-wavelength images of the Sombrero Galaxy imported into Stellarium. From left to right: DSS2, Spitzer Space Telescope, Chandra X-Ray Observatory.

Future development

The demonstration was naturally a major breakthrough for the VAMP methodology, re-emphasising the strength of a metadata standard + metadata-tagged images + a (visualisation) tool that can exploit these. It is however clear that any type of application using astronomical data will have different ways of dealing with the import and export of the data and their metadata. Currently VirGO strictly imports the VOTable format, thus a translation layer is necessary for a successful import. Future development will focus on further automating the process of import into various software packages. Translation layers will be developed so that AVM will work with many existing tools. Additionally, we hope to make further use of the contextual information stored in AVM tagged images. This included an aesthetic description of each object, as well as categorical filters for viewing, say spiral galaxies.

The latest version of the AVM (Version 1.1) outlines the translation between AVM and VOTable using the equivalent Unified Content Descriptor (UCD) codes. This demonstrates that other software applications will be able to use VAMP and the AVM standard via a translation layer, thus not limiting the use to only AVM native applications. One early adopter of the VAMP technology is Microsoft's World Wide Telescope project.

Conclusion

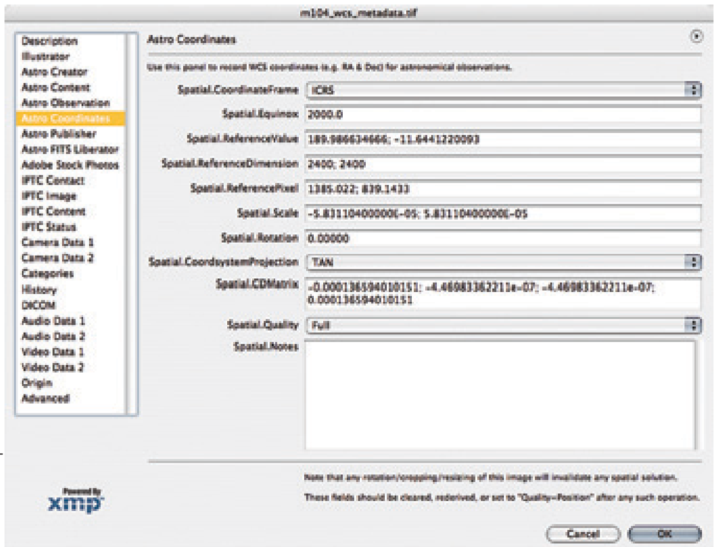
CAP2007 showcased many emerging technologies. Virtually every software package shown at CAP2007 can benefit from VAMP and the AVM standard, including packages which currently employ VOTables. The demonstration showed the abundance of functionality VAMP and AVM will allow. The AVM standard is currently being adopted by the Spitzer Space Telescope team, the Chandra X-Ray Observatory team, and the Hubble Space Telescope teams at STScI and ESA/Hubble.

[8] http://virtualastronomy.org/avm_metadata.php
[9] http://www.ivoa.net/Documents/latest/UCD.html

The VAMP team wants to encourage all observatories and amateur astronomers to adopt this standard. Soon new outlets of distribution will be available for astronomy visualisation products.

Using tools similar to those described above, VAMP and AVM will enable easy distribution of astronomy visualisation products. This demonstration was enabled using the AVM standard, but far richer capabilities are possible than what was shown at CAP2007. In the future, all developed tools and applications supporting VAMP and AVM will be accessible at virtualastronomy.org.

To begin tagging images using the AVM standard, please use the online[10] instructions.



Adobe Photoshop

Figure 3 – Adobe Photoshop panel displaying the WCS tags of AVM

References

- Chereau F. 2007, VirGO: A Visual Brower for the ESO Science Archive Facility, in ASP Conf. Ser. XXX, ADASS XVII, ed. J. Lewis, R. Argyle, P. Bunclark, D. Evans, & E. Gonzalez-Solares (San Francisco: ASP), [F2]
- Gauthier A.J., Christensen L.L., Hurt R.L., Wyatt R., Virtual Astronomy Multimedia Project. In Christensen L.L., Zoulias M. & Robson I. (eds.) Proceedings from Communicating Astronomy with the Public 2007
- Hurt R.L., Christensen L.L., Gauthier A.J., Astronomical Outreach Imagery Metadata Tags for the Virtual Observatory Version 1.00, http://www.ivoa.net/Documents/latest/AOIMetadata.html (Sept 2006).
- Hurt R.L., Gauthier A.J., Christensen L.L., Wyatt R. Sharing Images Intelligently: The Astronomy Visualization Metadata Standard. In Christensen L.L., Zoulias M. & Robson I. (eds.) Proceedings from Communicating Astronomy with the Public 2007.

[10] http://virtualastronomy.org/avm_metadata.php

Credit: Sze-leung Cheung

Maximising the mileage from the Chandra podcasts

Kimberly Kowal Arcand, Megan Watzke
Chandra X-ray Center/Smithsonian Astrophysical Observatory (kkowal@cfa.harvard.edu, mwatzke@cfa.harvard.edu)

Abstract

NASA's Chandra X-ray Observatory captures X-ray images and measures spectra of many high-energy cosmic phenomena. There is a constant challenge to devise new and appropriate means to bring these potentially esoteric science results and concepts in a digestible way to the public. One of the ideas to address this challenge became the Chandra podcast.

Chandra X-ray Observatory Podcast

The Chandra X-ray Center Education & Public Outreach (CXC EPO) group launched the Chandra podcast[1] series in May 2006. As of October 2007, there were 18 episodes in the Chandra podcast library, exactly one episode per month. These productions are short – less than five minutes – visual segments. They are thematic, stand-alone features covering such topics as black holes, supernovas, galaxy clusters, or the Chandra mission. They typically include two voices – the narrator (CXC staff member Megan Watzke) and the "talent" (a Chandra scientist) – plus an audio track.

The thought process behind the podcasts was to create a monthly episode with minimal production costs while recycling existing material from the Chandra website. Using an existing library of visual materials (standard definition animations, motion graphics, astronomical images and illustrations) with newly recorded voice-overs, the CXC EPO group was able to keep costs very low, purchasing basic audio equipment and some additional audio/video software. The CXC EPO group also hoped the podcasts would be somewhat timeless so they could be refurbished and recycled into different products (see **Dissemination: unexpected**).

Approximately six months after the first podcast episode was released, the subscription feed[2] became the most popular page[3] on http://chandra.harvard.edu, attracting approximately 100,000 hits per month. The first Chandra podcast episode went on to win the Pirelli International multimedia award in the category of physics in May 2007. The Pirelli award, established in 1996, is the world's first internet multimedia award aimed at the diffusion of scientific and technological culture worldwide.

[1] Chandra Public Web site: http://chandra.harvard.edu/
[2] Chandra Podcast RSS feed: http://chandra.harvard.edu/resources/podcasts/podcasts.xml
[3] Chandra Podcast index: http://chandra.harvard.edu/resources/podcasts/

Dissemination: expected

In addition to being featured prominently on Chandra's website, Chandra podcasts were quickly disseminated to some of the standard (expected) venues for podcasting. These included the:

- ITunes Music Store (iTMS), in the category of Science: Natural Science;
- YouTube;
- Podfeeds (news aggregators);
- Teacher tube;
- LearnOutLoud;
- NASA.gov;
- Smithsonian web portal[4].

Dissemination: unexpected

Chandra podcasts have been provided in broadcast quality for use on NASA-TV. In addition, the CXC EPO group was contacted by space.com to include a selection of podcasts in the space.com video library. Shortly after inclusion into their library, three out of four video spots on the top space.com page were Chandra podcasts. Despite being hosted on the space.com site, appropriate credits and links were provided to CXC and download statistics from space.com were also forwarded to the CXC EPO group. It was a "win-win" situation for both space.com, which got some free content, and the Chandra mission, which got increased visibility.

Another unforeseen use of the Chandra podcasts came from New Zealand. In spring 2007, PC World (New Zealand) contacted CXC EPO and was given permission to use the podcasts produced to that date as a free give-away CD-ROM with a short blurb featured in the magazine.

In late 2006, the CXC EPO group also recycled the then-current nine-episode podcast library into a DVD-ROM for disseminating to museums and science centres, as well as educators and the general public. The work effort and cost for such a production was extremely low (a couple thousand US$) and CXC EPO was able to get out its first Chandra DVD with minimal effort. Two production runs of 5,000 were quickly depleted. Currently, the CXC EPO is upgrading the quality and material on the Chandra DVD for a version 2.0 with updated materials, higher quality menus and audio/video.

A fourth unexpected use of the Chandra podcasts has been in the classroom. On multiple occasions, teachers and educators approached – unprompted and unsolicited – the CXC EPO group with descriptions of how they were using the podcasts. For example, in a high school setting, one educator played the short segments on a screen as she prepped for her next activity. Other described them as good introductory materials for subject matter they were about to discuss. CXC EPO is currently working on developing podcast classroom activities and discussions, such as ideas for use in the classroom, and having students make their own podcast for submission to NASA's 21st century podcast competition.

---

[4] www.si.edu, Chandra is a NASA mission operated by the Smithsonian Astrophysical Observatory, hence the natural connection to the Smithsonian portal.

Finally, Microsoft Research's World Wide Telescope project also has plans to incorporate elements of the Chandra podcasts into some of its feature tours. Once again, this provides the WWT with some ready-made content, while allowing the Chandra material to reach a potentially large untapped audience.

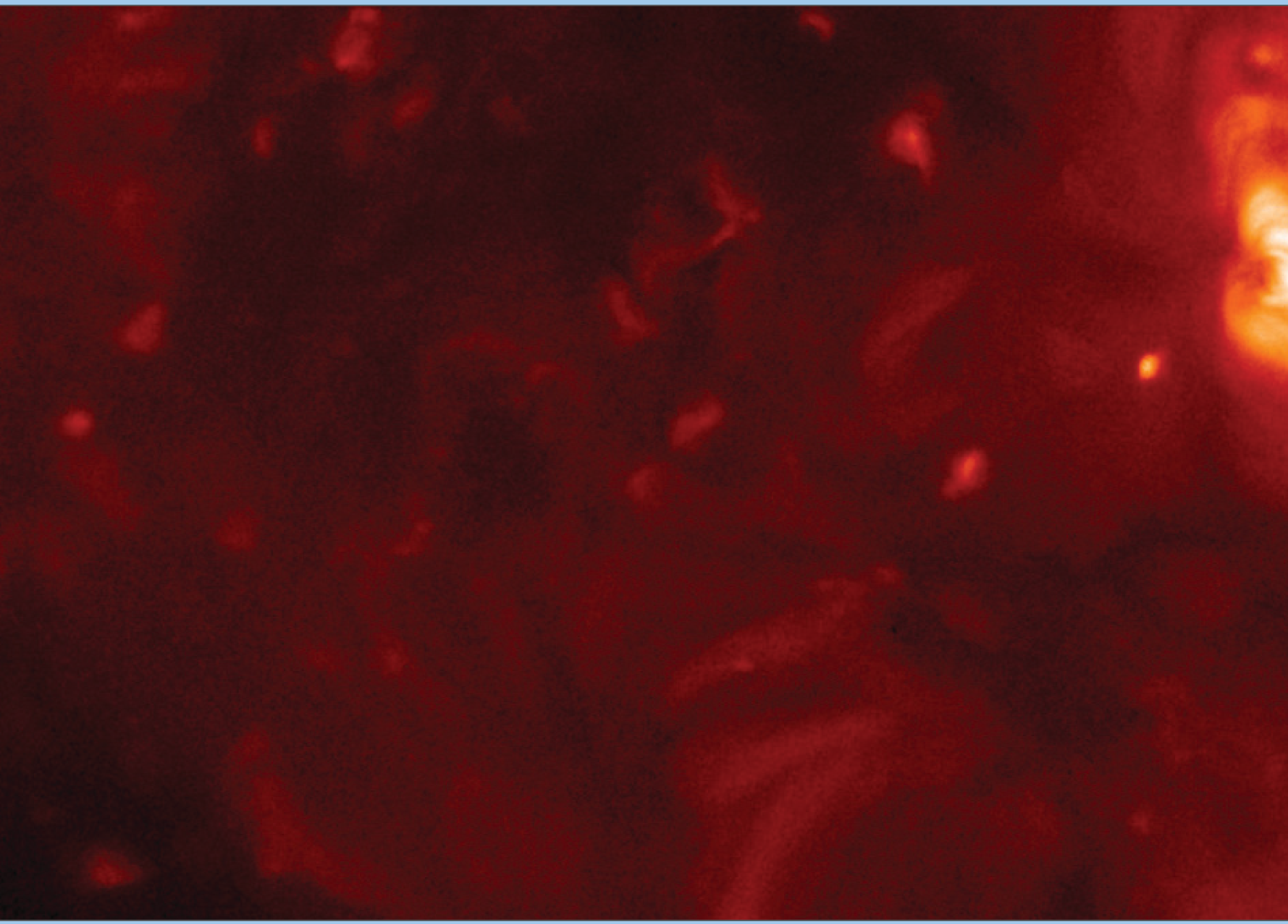
Where next?

Where do podcasts go from here? Can we reach Planetariums/Domes using these same materials or re-package it slightly to suit their needs? Can programmes such as ViewSpace eventually use such audio/visual segments for further dissemination at museums and science centres? Will there be more demand for broadcast use (such as with flix55.com or Smithsonian-on-Demand)?

Where will high definition (HD) lead us? Are HD podcasts going to be the “norm” soon? Can small EPO groups handle the workload of creating HD materials and higher production quality podcasts as easily? What is beyond HD?

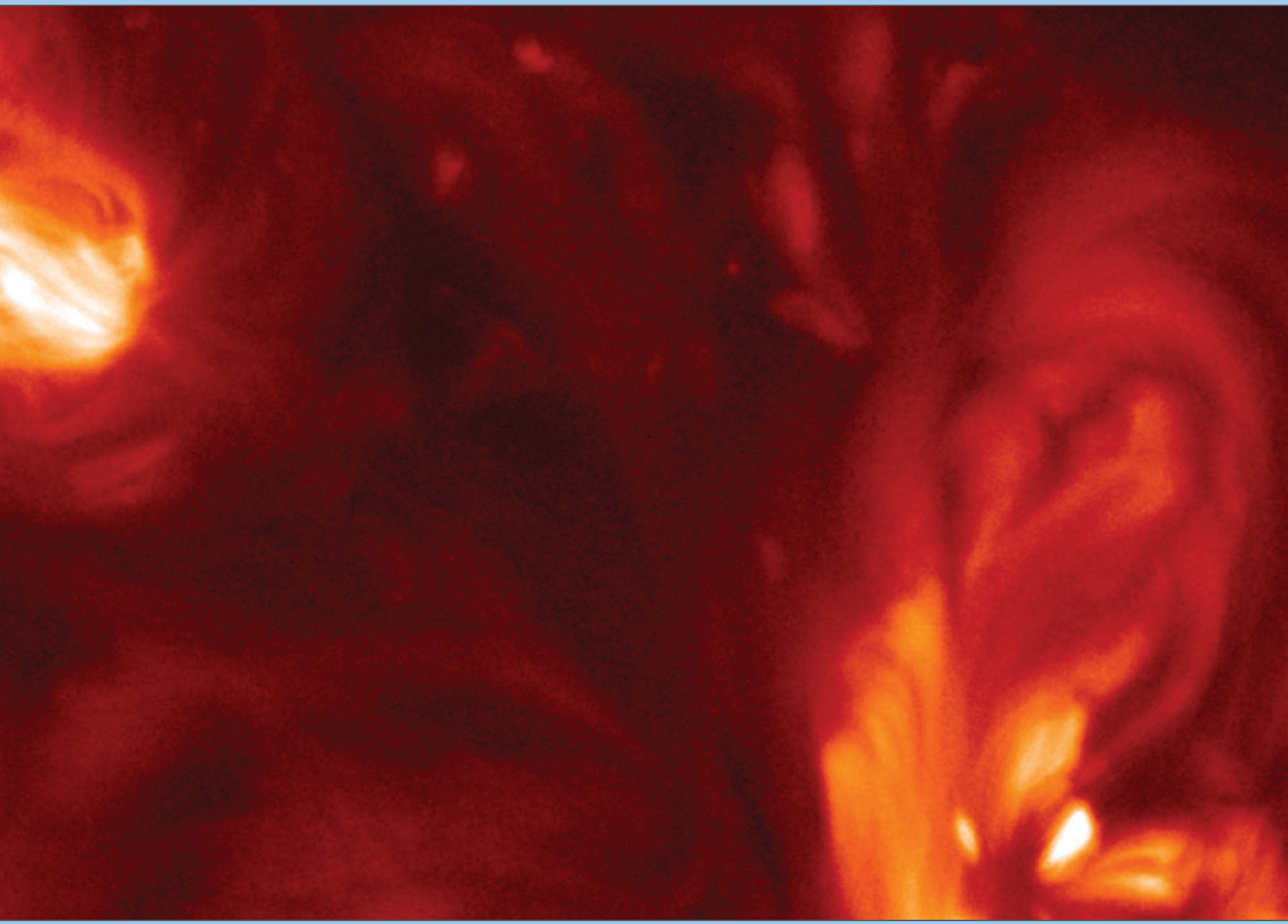
Of course, we in the CXC EPO group do not have the answers to these questions. Instead, we look to our colleagues both in the United States and around the world for examples and suggestions of where to go from here. Perhaps the only the thing we can be certain of is that technology will continue to evolve. We will attempt to keep apace of those changes; so that we can best inform and engage the public about the wonders of astronomy.

Credit: Sze-leung Cheung



Credit: Hinode/ SAO/ NASA/ JAXA/ NAOJ

Session 8
Multimedia, Art and Images



An X-ray jet launches plasma out into the Solar System from the Sun's north polar coronal hole, as seen by JAXA's Hinode X-ray telescope.

Science communication distribution services in astronomy and planetary sciences outreach

Pedro Russo[1,2]
[1] International Astronomical Union (prusso@eso.org)
[2] ESA/Hubble

Abstract

In this paper I will present some of the first efforts to use virtual observatory methods and modern distribution services to enable access to science communication products, and how the use of new approaches, such as Web 2.0 can help to achieve the principal communication objectives more effectively. One notable example will be the upcoming Europlanet Integrated and Distributed Information Service (IDIS) which will offer common and user-friendly access to the data and information (including outreach products) produced by the various types of activities to the European planetary science community.

Introduction

Few can argue against the notion that the internet is becoming an important facilitator of interpersonal communication. Many science communicators are now figuring out the practicalities of the new reality recently described by the New Media Consortium (2007) in a white paper that discussed the evolution of communication: *We are seeing new means of communication, new places to communicate, and new avenues of interaction unfold at a rapid pace.* Services and applications like wikis, weblogs, photosharing and link sharing highlight the social aspects of a Web 2.0 world as reported by O'Reilly (2007). According to a Wikipedia entry, these sites *facilitate creativity, collaboration and sharing between users*. Tim O'Reilly recently reflected on a *major theme of web 2.0 that people haven't yet tweaked to. It's really about data and who owns and controls, or gives the best access to, a class of data.* (Tweney 2007) There are many varieties of data that can be accessed online: books, articles, images, podcasts, videos, etc. Increasingly, science data has also been made available to the public. Projects like Virtual Observatories[1], Skyserver[2], VirGo[3] are not only making data more easily available for scientists, but are placing it directly in the hands of the general public, communication specialists, educators, and students. In this manner, Web 2.0 will play an important role in future astronomy education and public outreach collaboration projects and in the dissemination of outreach products to the public.

---

[1] http://www.ivoa.net
[2] http://skyserver.jhu.edu
[3] http://archive.eso.org/cms/tools-documentation/visual-archive-browser

In addition to established science media organisations and higher research and education institutions, many other individuals and entities act as web publishers and content providers, including scientific societies, science centres, museums, public education initiatives, individual scientists, and even laypeople. The formats offered by internet-based outlets for science communication directed towards the general public include conventional forms of print (text, images, PDF) as well as Web 2.0 methods, e.g. Video-On-Demand, information portals, forums, podcasts, news feeds, audio clips, webcasts etc. These new ways of distributing information have transformed the way people interact with the content of science communicators. Individuals can easily express their opinions on topics or ask questions of the experts directly on science communication websites, blogs, and discussion forums. Online methods such as portals, news feeds also increase the speed of dissemination of information; see Minol et al. (2007). The resulting conclusions are obvious: formal and informal communication within the scientific community is increasingly overlaid with public science communication. In this paper I review the available online tools for science communication, the new challenges to archive and exploit astronomical data, with a special emphasis on the Europlanet Integrated and Distributed Information Service (IDIS), a European service to distribute resources amongst the research community as well as a planned project for the global International Year of Astronomy 2009 programme.

Internet tools

Here follows a general overview of different types of internet tools available for communicators.

Web portals offer comprehensive editorial content, which, as a rule, is composed by professional journalists and contains such items as magazine articles, opinions (columns etc.).
Example:

- www.space.com

Podcasting refers to the production and online subscription-based distribution of media files on the internet (as audio or as video podcast, also known as vodcast).
Example:

- **Hubblecast:** http://www.spacetelescope.org/videos/hubblecast.html
- **Hidden Universe:** http://www.spitzer.caltech.edu/features/hiddenuniverse/index.shtml
- **Planetary Radio:** http://planetary.org/radio/
- **Universe Today:** http://www.universetoday.com/category/podcasts/

A **weblog** is a digital journal. Commonly, a blog is “endless”, i.e. is a long, inversely chronological list of entries. It may be seen as an easily manageable website. It also easily serves as an exchange of information, thoughts and experiences between the blogger (writer) and the reader using “Comments” as the dialogue medium.
Examples:

- **Bad Astronomy:** http://www.badastronomy.com/bablog/
- **Science Blogs:** http://scienceblogs.com/

A **wiki** is a type of collaboration platform that allows many users to easily create, edit and link web pages using server-provided software tools. The users do not need any local software and only low level technology skills. Wikis are often used to create collaborative project websites and sites like Wikipedia have socially created content that rely on community moderation.
Example:

- **OpenWetWare:** http://openwetware.org/

Collaborative news websites with ranking systems that index and evaluate international news or posts.
Examples:

- **DissectMedicine:** http://www.dissectmedicine.com/
- **10x10:** http://www.tenbyten.org/10x10.html

e-print services are places to share pre-publication research, unpublished manuscripts, presentations, posters, white papers, technical papers, supplementary findings, and other scientific documents.
Examples:

- **arXiv e-Prints:** http://arxiv.org/
- **Nature Precedings:** http://precedings.nature.com/

Social bookmarking: Free online reference management, referrals, sharing, and tagging for all researchers, scientists, communicators and educators.
Examples:

- **Connotea:** http://www.connotea.org/
- **delicious:** http://del.icio.us/

Social network services are online social structures made up of individuals or organisations that are tied by one or more specific types of interest.
Examples:

- **Nature Network:** http://network.nature.com/
- **Facebook:** www.facebook.com
- **Second life:** http://secondlife.com/ (see Gauthier, 2007)

Crowdsourcing Markets: Online forums enabling major companies to reward scientific innovation through financial incentives. These types of service typically outsource work to a large group of people, often with “non-traditional” backgrounds, such as amateur astronomers or hobby inventors.
Example:

- **InnoCentive:** http://www.innocentive.com/

Publicly accessible astronomical databases

Online astronomical information can be divided into two largely separate, but complementary domains: scientific publications, now almost all available online, and databases, which in some fields have become more important than ever. The line dividing publications and data is disappearing, see Hannay (2007). As scientific publications have moved online, they have taken on some of the characteristics of databases (searchable, structured and updateable). At the same time, some databases are starting to reproduce some aspects of online tools: (peer-reviewed, archival, citable and searchable). As these datasets become more available to astronomers, market forces will make software that processes and interprets data common, and inevitably more accessible to laypeople. This evolution has already started, but a revolution in this field may be coming in a near future. Tools like Stellarium[4], Uniview[5], FITS Liberator[6], Google Earth[7], etc. are already exploiting real scientific data in an unprecedented way. Standardisation (data formats, metadata standards) will help this task, and different communities are now working on the definition of various standards (see for instance Gauthier et al. (2007)). A secondary driving force for publicly accessible data is the educational benefits of using real science data in the educational settings. Data discovery projects like Skyserver not only make data easily available to educators, but also provide the instructional wrappers to make it useful in the classroom.

Europlanet: Integrated and Distributed Information Service

The European planetary sciences community is working on a long term solution to coordinate an Integrated and Distributed Information Service (IDIS). This service will offer a common and integrated access to data and information produced by the various research and EPO activities to the planetary science community. IDIS will provide a general platform for exchanging and accessing data and information, integrating and linking relevant data, databases, outreach products and other information systems, providing a more unified access to information, especially for European scientists and to the benefit of the dissemination of data produced in Europe. This implies, for instance, that IDIS must be compatible with, and complementary to data services existing in and outside Europe, like the Virtual Observatories (EPN IDIS Green Paper 2007).

The main building blocks of planetary science that will feed into IDIS and be combined, elaborated and presented to the end user are:

- Earth-based observations, including both ground and space telescopes in all spectral domains;
- Planetary data from space missions (remote and in situ observations);
- Planetary models: physical concepts and numerical simulations;
- Laboratory experiments: fundamental processes of interest and experimental simulations;
- Databases and information systems dedicated to given sub-fields;
- Outreach and educational products.

---

[4] http://www.stellarium.org/
[5] http://www.scalingtheuniverse.com/
[6] http://www.spacetelescope.org/projects/fits_liberator/
[7] http://earth.google.com/

The *Portal to the Universe*: An IYA2009 Cornerstone Project

Public astronomy communication has to develop apace with other players in the mass market for electronic information such as the gaming and entertainment industries. The problem today is not so much the availability of excellent astronomy multimedia resources for use in education, outreach and the like, but rather finding and accessing these materials. Laypeople, press, educators, decision-makers and even the scientists themselves deserve better access to press releases, images, videos and background information. We all need a single point of entry into all the cosmic discoveries that take place on a daily basis — a global one-stop portal for astronomy-related resources. Modern technology (especially RSS feeds and the VAMP — Virtual Astronomy Multimedia Project[8]) have made it possible to tie all the suppliers of such information together with a single, almost self-updating portal. The *Portal to the Universe* will feature a comprehensive directory of observatories, facilities, astronomical societies, amateur astronomy societies, space artists, science communication universities, as well as a news-, image-, event- and video- aggregator and Web 2.0 collaborative tools for astronomy multimedia community interaction such as ranking of the different services according to popularity as described by Russo & Christensen (2007).

Conclusions

The primary aim of a distribution service for astronomy EPO content was given by Christensen (2005) and may be defined as: *Excite, inform and educate the public about space science and astronomy through access to data, and serve as a catalyst for scientific and technological literacy*. If the new tools made possible by the internet are successfully implemented it would literally open a *Portal to the Universe*.

Acknowledgements
I would like to thank Lars Lindberg Christensen and Adrienne Gauthier for their extremely valuable inputs.

References

- Christensen L.L (2005), Progress of the Virtual Repository, in Proc. from the ESO/ESA/IAU Conference 14–17 June 2005, eds. I. Robson & L. L. Christensen
- Europlanet IDIS Green Paper, (2007), http://www.europlanet-idis.fi/documents/
- Gauthier A. (2007), Astronomy in Second Life, CAPjournal, 1, 32-34
- Gauthier A.J., Christensen L.L., Hurt R.L., Wyatt R. (2007), Virtual Astronomy Multimedia Project. In Christensen L.L., Zoulias M. & Robson I. (eds.) Proceedings from Communicating Astronomy with the Public 2007.
- Hannay T. (2007), Foo and beyond, http://blogs.nature.com/wp/nascent/2007/06/post.html
- Minol K., Spelsberg G., Schulte, E., Morris N.(2007), Portals, blogs and co: the role of the Internet as a medium of science communication. Biotechnol. J., 2, 1129 -1140
- O'Reilly T. (2007), What Is Web 2.0?, http://www.oreilly.com/pub/a/oreilly/tim/news/2005/09/30/what-is-web-20.html
- Russo P., Christensen L.L. et al.(2007), The International Year of Astronomy 2009 — An Opportunity too Good to Miss. In Christensen L.L., Zoulias M. & Robson I. (eds.) Proceedings from Communicating Astronomy with the Public 2007.
- Tweney D. (2007), Tim O'Reilly: Web 2.0 Is About Controlling Data, http://www.wired.com/techbiz/people/news/2007/04/timoreilly_0413
- Various (2007), Social Networking, the "Third Place," and the Evolution of Communication, http://www.nmc.org/pdf/Evolution-of-Communication.pdf
- Various (2007), Wiki, http://en.wikipedia.org/wiki/Wiki

---

[8] http://www.virtualastronomy.org

Credit: Dennis Crabtree

The future of the International Year of Astronomy 2009 website

Raquel Yumi Shida[1], **Pedro Russo**[2] **& Lars Lindberg Christensen**[3]
[1] IAU, ESA/Hubble (rshida@eso.org)
[2] IAU/IYA2009 (prusso@eso.org)
[3] ESA/Hubble, IAU (lars@eso.org)

Abstract

The internet will, without doubt, be one of the most important channels connecting the International Year of Astronomy (IYA2009) activities with the general public. The IYA2009 website[1] went online in December 2006 and since then has served as the main communication tool between all the countries and agencies that are taking part in this event. Recently a new strategy has been applied to the IYA2009 project and its communication. The project has changed from catering mainly to internal communication needs (IAU <-> Single Points of Contacts) to communicating more with external groups and the wider world, including lay people. Some features of the current website will be demonstrated, and ways of using web tools to empower astronomy communication will be suggested. Plans for the future evolution of the IYA2009 website as new events and ideas come up before 2009 will also be discussed.

The IYA2009 website today

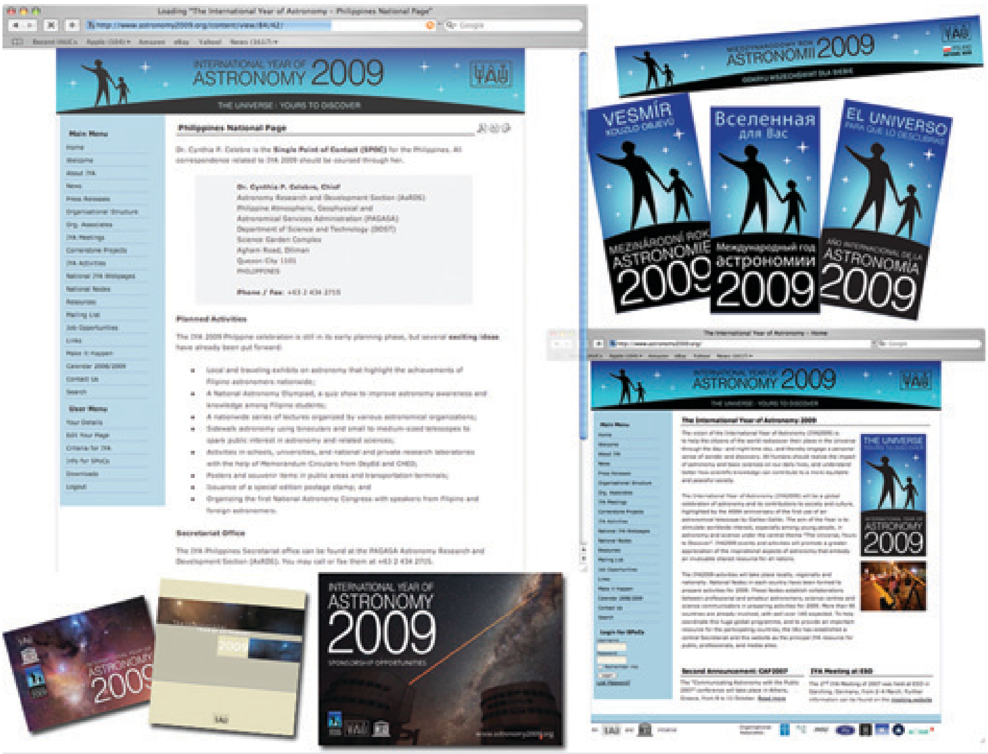
The current IYA2009 website was designed towards the end of 2006 with the principal intention of providing background information for organisations on different levels and the Single Points of Contact (SPoCs) that are the chairs of the IYA2009 National Nodes.

The structure of the website comprises a public area and an internal section, created to provide initial resources for the SPoCs to start acting to promote IYA2009 in their respective nations. By accessing the internal area with a login and password, they have access to resources that will help them to advertise IYA2009. Design kits with logos and banners in high resolution in different formats, brochures, posters, business cards, PowerPoint presentations and other documents are provided, together with their source files to allow for any necessary editing.

Every nation has a page in the IYA website where it is possible to add contact information, an introduction about any activities that are under way and further links. Each SPoC can also access tools in the internal section to edit this page.

There are already nearly 100 nations participating in the IYA2009, and we believe we have been successful in informing the National Nodes about our vision, mission and goals. It is now time to proceed to the next step and get closer to the general public. To do that, a new strategy and new tools must be adopted.

[1] http://www.astronomy2009.org/



All figures courtesy of the authors

Figure 1 – Some resources available at the internal section of the website.

IYA2009 website v.2

The current v.1 website will slowly be transformed over the next few months into a v.2 IYA2009 website. v.2 is aimed at the general public. It will try to inspire and help people to engage in teaching and outreach activities in astronomy.

The navigation must be easier, the text simpler. The first action to be taken is to make it graphically more attractive and work on the existing texts to make them more understandable. Then various parts of the website can be given a new focus:

- On INTERNATIONAL
  - Language barriers cannot be broken, but as astronomy is a universal language, cooperation between nations is not impossible. In order to improve the communication between the organisers and the public, and between different nations, we are setting up discussion forums for both the SPoCs and the public.
  - Ways for easy data sharing between the main IYA website and the individual national websites will be introduced. Integration of calendars and information posts via RSS feeds will be part of the new website.
  - Support to the Global Cornerstone Projects will be provided.

- On YEAR
  - A Global IYA Calendar is being built. It will contain information about global activities, international and regional meetings, historical dates, and important sky events visible from not only a single site but from large areas on Earth. (Local activities and local sky events should be listed by each country in each National Webpage).

- On ASTRONOMY
  - The new NEWS section should allow the SPoCs to publish short notes with the results of their activities, as well as relevant pictures, videos and links for press clippings.
  - We are studying the possibilities of providing a dynamic online sky map which will plot the sky on a given time and geographic location. In this way beginners in astronomy will be able to plan observations of the sky with the naked eye.

Brief recommendations for the IYA2009 SPoCs

The primary goal of the main IYA2009 website is not to make the efforts of the secretariat more visible; it is to make the work of individuals more visible and help in promoting astronomy all over the world.

The success of the IYA2009 website and the IYA2009 itself depends not only on our work at the global level, but very much on the work of the National Nodes. We encourage every country to build its own national website, and here are some tips on how to do that and on how to make it popular:

- Bear in mind that users always expect website creators to speed up page downloads. Design is important, but it has to be conceived with the average visitor to your pages in mind. A website designed for a developing country is certainly different from a website for a developed country. Think about the hardware and the software that your target group will be using during the time you want your website to be online.
- Check if your country participates in social and educational programmes such as the "One Laptop per Child"[2] or "Classmate PC"[3], and develop digital materials that are compatible with them.
- Make your website more visible by making links from other popular websites. Translate the existing Wikipedia entry[4] into your own language; add links to your pages. Create user profiles and groups in social networking services such as facebook, MySpace, Orkut; upload videos in YouTube, mention IYA2009 activities in your publications, etc.
- There are many free services and downloadable programs on the internet that you can use to boost your pages, from complete Content Management Systems to html page templates or icons. Some suggestions of "user-friendly" programs (some technical knowledge may be required to install them) to download or to be used online:

---

2 http://www.laptop.org
3 http://www.classmatepc.com
4 http://en.wikipedia.org/wiki/International_Year_of_Astronomy

- Joomla![5] and its extensions – Joomla! is a popular open source Content Management System (CMS).
- Google Pages[6] – Here is a quick way to build, host and publish simple web pages without any cost. No need to know html and no need to use complex software.
- Google Calendar[7] – Organising the IYA2009 events is much easier with an online calendar that can be managed by different people.
- Google Analytics[8] – This tool provides much information on visitors to your pages. Web activity statistics are desirable for as many participating sites as possible for inclusion in a possible final IYA2009 report.

If every National Node contributes by creating a national website and spreading the word about the IYA2009 and keeping us informed about progress, the International Year of Astronomy 2009 as a whole will succeed in communicating astronomy with the public.

The IYA2009 secretariat thanks all the SPoCs and National Nodes that have already started working on their websites.

---

[5] http://www.joomla.com/
[6] http://pages.google.com/
[7] http://calendar.google.com/
[8] http://analytics.google.com/

Visuospatial astronomy education in immersive digital planetariums

Ka Chun Yu[1] & Kamran Sahami[2]
[1] Denver Museum of Nature & Science (kcyu@dmns.org)
[2] Metropolitan State College of Denver (sahami@mscd.edu)

Abstract

Even simple concepts in astronomy are notoriously difficult for the general public to understand. Many ideas involve three-dimensional (3D) spatial relationships among astronomical objects. However much of the traditional teaching materials used in astronomy education are two-dimensional (2D) in nature, while studies show that visualising mental rotations and perspective changes can be difficult for many. The simplifications that occur when explaining one phenomenon may lead to new misconceptions in other concepts. Properly constructed 3D simulations can provide students with the multiple perspectives necessary for understanding. As a venue for virtual astronomical environments, the new class of digital video planetariums that are appearing in museums and science centres have the potential to bridge the comprehension gap in astronomy learning. We describe a research project which aims to evaluate the effectiveness of visualisations in both immersive and non-immersive settings, by using freshmen undergraduate students from a four-year college. The retention of students over the course of a semester for this study means that student misconceptions can be tracked and recorded weekly via curriculum tests.

Introduction

Educational research shows that many fundamental topics in astronomy are notoriously difficult to learn, with naive notions pervasive among students; see for example Driver et al. (1994), Comins (2001), and Bailey and Slater (2003). One example is the set of ideas about the shape of the Earth held by children and discussed in Baxter (1989) and Vosniadou (1991). The progression in Figure 1 hints at how mental models evolve over time. These models are the result of views that make sense to the learner, for example, “The Earth is flat”. When children learn from authority that actually “the Earth is round”, the new fact is assimilated into the pre-existing model. It is rare for the earlier model to be displaced completely.

Such results are consistent with the constructivist theory in education described in Strike and Posner (1992). People do not learn by simply absorbing new knowledge. Instead they actively construct knowledge, building mental models based on prior information and experience, in addition to formal instruction. Once a model is constructed, it is difficult to displace. Additional information can merge into and further modify the mental model, but the original framework is rarely thrown out entirely.

Because astronomy generally deals with phenomena that are outside people’s everyday experience, any understanding requires mental model construction. If errors creep into the initial understanding, it will be much more difficult for these notions to change with subsequent teaching. It is not surprising then to find that a wide range of misconception topics have been investigated by researchers (Bailey and Slater [2003]), on topics from lunar phases (Kuethe [1963]) to the Big Bang (Prather et al. [2002]).

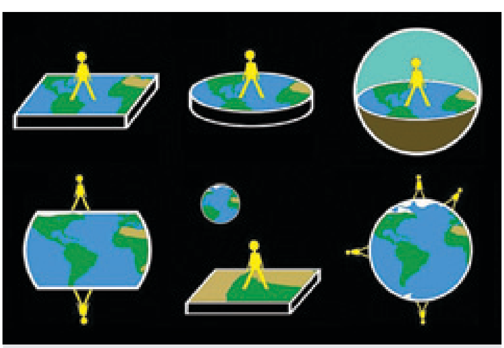
Visuospatial reasoning in astronomy education

Considerable work has been done by cognitive scientists to understand spatial reasoning. For instance Piaget and Inhelder (1948) found that children in Piaget's preoperational stage (ages 2–7) are restricted to a simple egocentric viewpoint; i.e, they have difficulty imagining a view of a scene different from that of their own immediate perspective. Shephard and Metzler (1971) found that the time it takes to mentally rotate a 3D figure scales linearly with the angle of rotation. A host of other studies have dealt with the difficulties of imagining rotational or translational changes in perspective – see for example, Huttenlocher and Presson (1973) and Wang (2005).

Yet the diagrams appearing in textbooks that teach core astronomical concepts usually ask the reader to make sense of a 3D relationship by orienting himself inside the depicted scene, e.g., imagining how the Moon would appear from the Earth at different positions in its orbit (Figure 2a). Sadler (1992) found more than a third of his subjects had difficulty answering an astronomical perspective change question. Much of the traditional astronomy instruction is also 2D in nature (e.g., Baxter, 1989), while it is usually up to the student to conceptualise 3D abstractions using 2D descriptions. Using hand-held physical models can help as reported in Trundle et al. (2002), but in general, it is difficult to translate and orient oneself from one perspective to another.

Computer visualisations

Computer modelling and visualisations have therefore been suggested for correcting unscientific astronomy ideas by Parker and Heywood (1998). Audiences can view astronomical phenomena from inside a model to see local relationships, as well as access external global views. Instead of imagining what a particular perspective will show based on a static diagram, students can see for themselves, with a change of frame-of-reference within the visualisation. Visualisations can also seamlessly transition between small and large scales, which can help in the understanding of astronomical distances, another challenging topic for students identified by Sadler (1998). At least one study has taken advantage of the abilities of virtual simulations to switch scales and viewpoints, resulting in significant gains in understanding the shape and size of the Earth (Moher et al., 1999).



All figures courtesy of the authors

Figure 1 – Children's understanding of the shape of the Earth: [a] a flat rectangular surface where people reside; [b] a flattened round disc; [c] a flat Earth bounded by a hemispherical sky; [d] a sphere flattened at the top and bottom where people can live; [e] a dual Earth consisting of a flat inhabited surface and a round Earth that floats up in the sky; and finally the correct [f] spherical Earth with a population over the entire surface.

In our oral interviews with more than a hundred pre-instruction undergraduate astronomy students at Metropolitan State College at Denver (MSCD), 66% implied from both their oral answers and drawings that the orbits of planets around the Sun are either highly elliptical, "oval," "oblong," or "egg-shaped." Only 20% of students believed that orbits were circular or close to circular, a smaller correct fraction

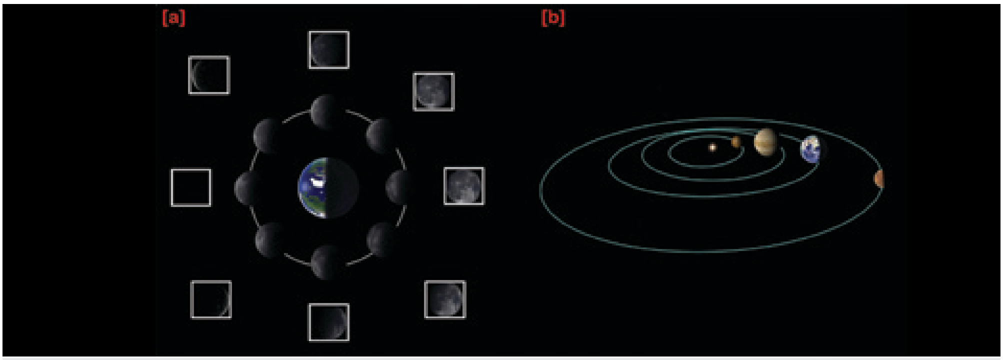


Figure 2 – Diagrams similar to those typically found in astronomy textbooks. [a] A figure for teaching phases of the Moon; the student is asked to correlate the view of the Moon from the Earth with its orbital position. [b] An oblique view of planetary orbits that can help reinforce the view that planetary orbits are highly elliptical. In both cases, the distance scales and sizes of objects are also misleading.

than found previously by Sadler (1992). It is interesting to note that many of the popular artist's conceptions of the Solar System show planetary orbits at an oblique angle which gives them an elliptical shape (Figure 2b). Textbook diagrams that explain the seasons or eclipses also usually show an oblique view of the Earth's orbit around the Sun. Thus a didactic figure may inadvertently reinforce a misconception in one topic while trying to address a completely different concept.

The ALIVE project

In the past decade, a new class of digital theatres has opened which are natural venues for computer-generated visualisations. These immersive displays may be more effective for teaching spatial relationships than their non-immersive counterparts (Raja et al. 2004). Many of these digital video planetariums have real-time simulation software that recreate an interactive virtual universe inside the dome. These virtual environments (VEs) allow audiences to gain direct experience about a place or phenomenon that would otherwise be difficult or impossible to observe in real life. Visualisations that dynamically show astronomical phenomena from multiple vantage points, coupled with a curriculum explicitly designed to address popular misconceptions, have the potential to be powerful educational tools.

The *Astronomy Learning in Immersive Virtual Environments* (ALIVE) project is the first study to evaluate the effectiveness of immersive VEs for introductory astronomy instruction. Undergraduate students enrolled in the AST1040 class at MSCD are used as test subjects. The three-year study is broken up into two stages. Phase I developed the materials for the experiment, while the experiment and follow-up analyses are now taking place in Phase II. Test classes are divided into three groups, all of which receive regular classroom instruction (including multimedia materials now standard with textbooks). Group I classes serve as the controls. Group II students are exposed to VE instruction in the classroom, while Group III students see VE instruction in the immersive Gates Planetarium at the Denver Museum of Nature & Science.

Student interviews and new curricula

The first phase of the project included prior-to-instruction oral interviews with 120+ students who were enrolled in the Fall 2005 and Spring 2006 AST1040 freshman astronomy courses. We focused on gauging misconceptions in seven different astronomy topics (phases of the Moon;

lunar and solar eclipses; seasons, lengths of day and year; Kepler's Laws, orbits, retrograde motion; scale and structure of the Solar System; outer planet moon systems; scale and structure of the Milky Way galaxy).

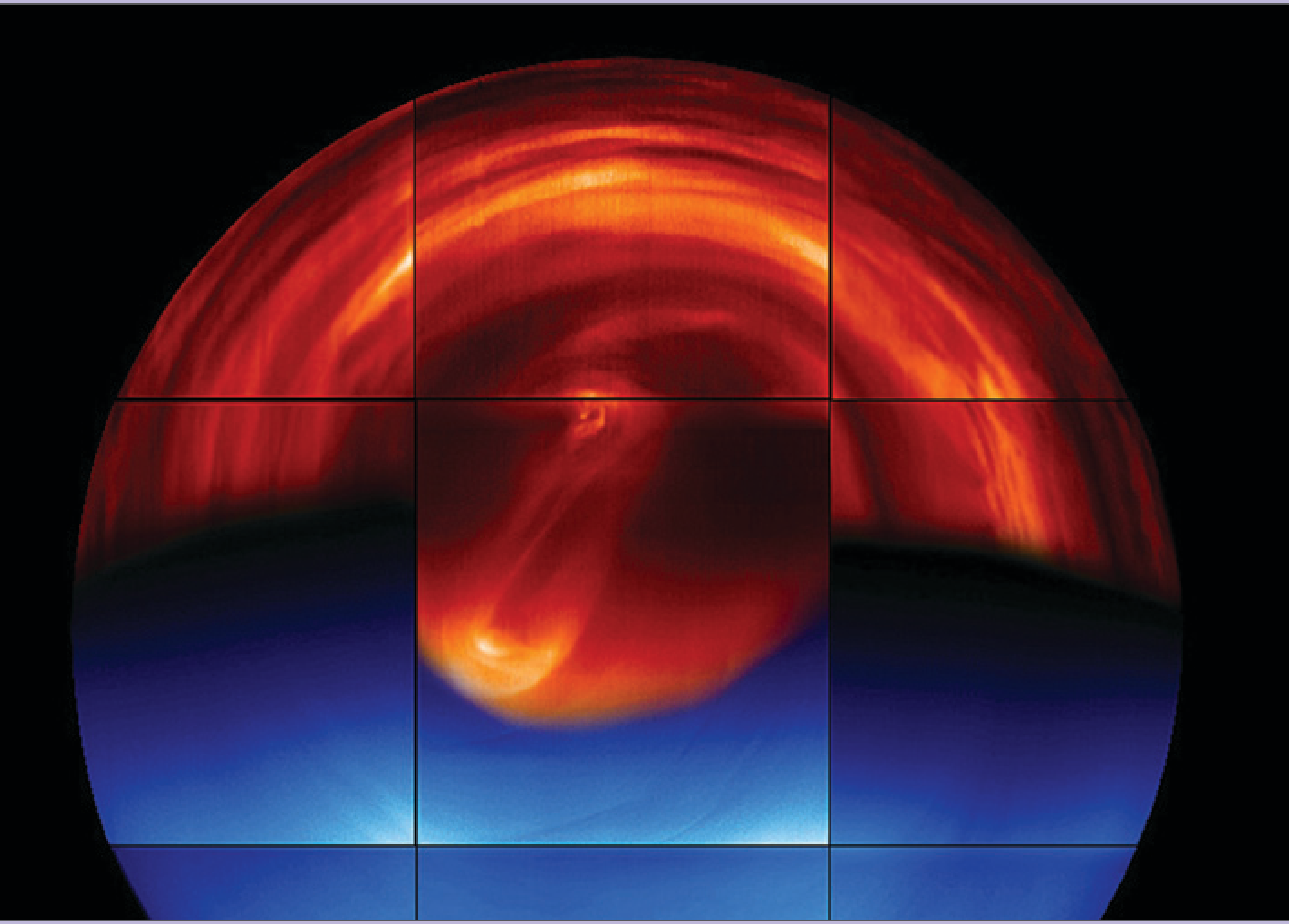
These front-end evaluations were used to build new lecture outlines to directly address common student misconceptions. A test database was generated to be used in weekly progressional (curriculum) tests for the classes in the experiment. These quizzes contain questions that cover current instruction, retention of knowledge from previous modules, and pre-test questions for upcoming modules. Using the new lecture outlines, we have created a suite of interactive visualisation modules for our VE software, Uniview from SCISS. These contain instructional outlines for the lecturer and configuration files and directions for the real-time VE pilot.

Early results

We have currently finished the second semester of data-taking for classes under Groups II and III. Analyses of scores in each of the three groups taught by the same instructor are ongoing. Early results indicate positive gains in two of the topic modules for Group III students, but none of the results are statistically significant yet. We will continue to take data from classes through next year to bolster the total sample size of our three groups.

References

- Bailey J.M., Slater T.F. (2003), A Review of Astronomy Education Research, Astronomy Education Review, 2(2):20-45
- Baxter J. (1989), Children's understanding of familiar astronomical events, International Journal of Science Education, 11:502-513
- Comins N. (2001), Heavenly Errors, Columbia University Press, NY
- Driver R., Squires A., Rushworth P., and Wood-Robinson V. (1994), Making Sense of Secondary Science, Routledge Falmer, London
- Huttenlocher J., Presson C. (1973), Mental rotation and the perspective problem, Cognitive Psychology, 4:277-299
- Kuethe, J.L. (1963), Science concepts: A study of "sophisticated" errors, Science Education, 47:36-364
- Moher T., Johnson A., Ohlsson, S., Gillingham M. (1999), Bridging Strategies for VR-Based Learning, CHI '99: Proceedings of the SIGCHI conference on Human factors in computing systems, pp. 536-543
- Parker J., Heywood D. (1998), The Earth and beyond: developing primary teachers' understanding of basic astronomical events, International Journal of Science Education, 20(5):503-520
- Piaget J., Imhelder B. (1948), The Child's Concept of Space, English translation (1958), W.W. Norton, NY
- Prather E.E., Slater T.F., Offerdahl E.G. (2002), Hints of a Fundamental Misconception in Cosmology, Astronomy Education Review, 1:28-34
- Raja D., Bowman D., Lucas, J., North C. (2004), Exploring the Benefits of Immersion in Abstract Information Visualisation. In: Proceedings of the 8th International Immersive Projection Technology Workshop, Iowa State, IA, pp. 61-69
- Sadler P.M. (1992), The Initial Knowledge State of High School Astronomy Students, PhD thesis
- Sadler P.M. (1998), Psychometric models of student conceptions in science: Reconciling qualitative studies and distractor-driven assessment instruments, Journal of Research in Science Teaching, 35:265-296
- Shepard R. N., Metzler J. (1971), Mental rotation of three-dimensional objects, Science, 171:701-7703
- Strike K.A., Posner G.J. (1992), A revisionist theory of conceptual change. In: R.A. Duschl and R.J. Hamilton (eds.), Philosophy of Science, Cognitive Psychology and Educational Theory and Practice, State University of New York Press, Albany, NY, pp. 147—176
- Trundle K.C., Atwood R.K., Christopher J.E., (2002), Preservice Elementary Teachers' Conceptions of Moon Phases before and after Instruction, Journal of Research in Science Teaching, 39:633-658
- Wang R.F. (2005), Beyond imagination: Perspective change problems revisited, Psicológica, 26:25-38
- Vosniadou S. (1991), Designing curricula for conceptual restructuring: Lessons from the study of knowledge acquisition in astronomy, Journal of Curriculum Studies, 23:219-237

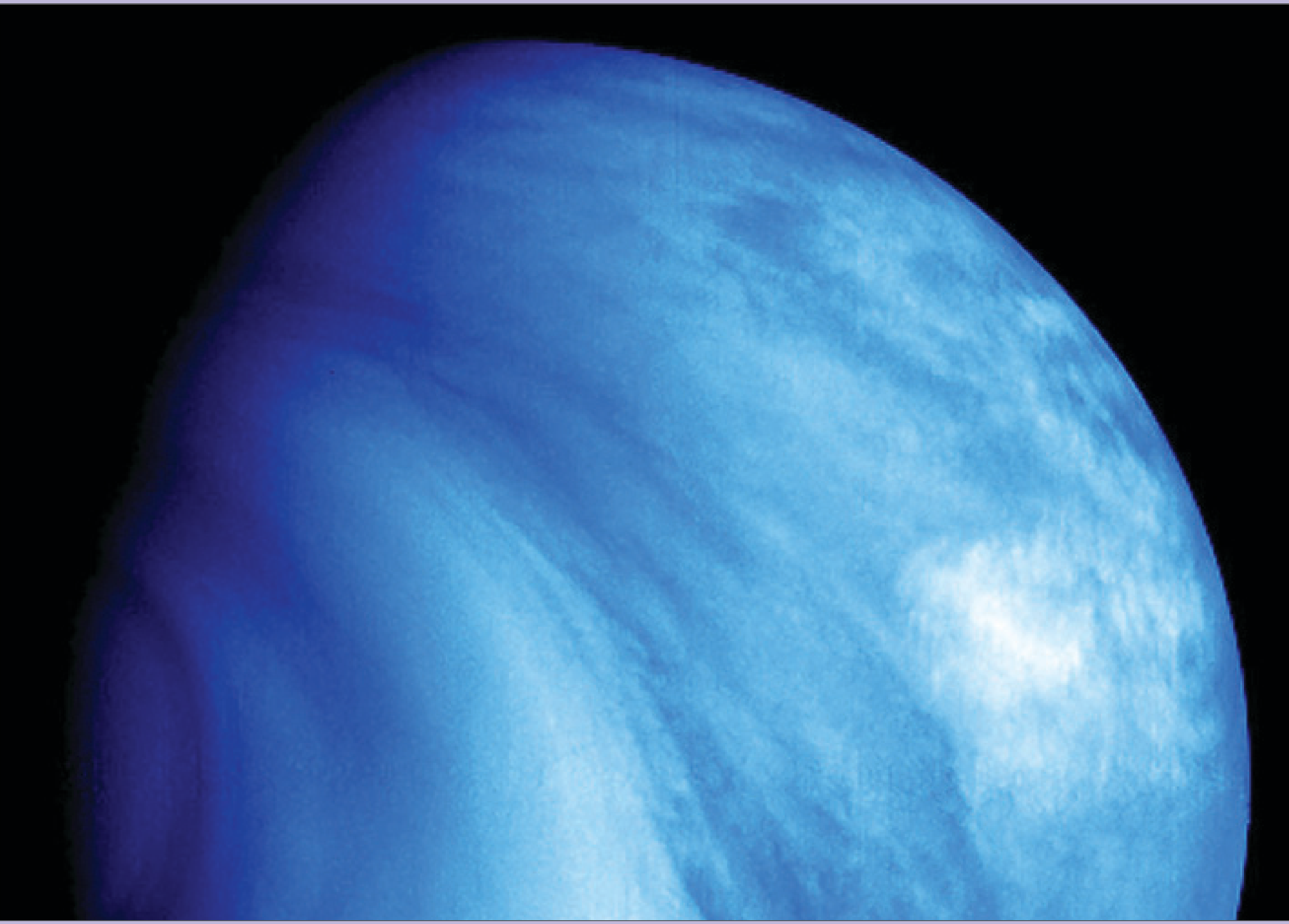


Credit: ESA/VIRTIS-VenusX IASF-INAF, Observatoire de Paris (R.Hueso, Univ. Bilbao)

This global view of the southern hemisphere of Venus is a mosaic of images obtained by the Visible and Infrared Thermal Imaging Spectrometer (VIRTIS) on board ESA's Venus Express on 16 May 2006. The night-side hemisphere (in red at the top) is made of infrared images, showing the lower layers of the cloud deck surrounding the planet at an altitude of about 45 kilometres. The day-side hemisphere (in blue at the bottom) is made of ultraviolet images. It shows the cloud top layer at an altitude of about 65 kilometres. The red part of the central panel was taken in infrared light, and shows the double vortex at the south pole, at an altitude of about 60 kilometres, surrounded by a collar of "cold" air.

Session 9

Art & History



This is a false-colour image taken with the Venus Monitoring Camera (VMC) on board Venus Express. It shows the full view of the southern hemisphere from equator (right) to the pole. The south pole is surrounded by a dark oval feature. Moving to the right, away from the pole and towards the equator, we see streaky clouds, a bright mid-latitude band and mottled clouds in the convective sub-solar region.

Using astronomy’s history to engage new audiences

Alison Boyle
Science Museum, London (alison.boyle@sciencemuseum.org.uk)

Abstract

While much astronomy communication focuses on the results and practices of contemporary astronomers, the history of astronomy can provide a useful tool to engage new audiences with the subject. The historical approach provides an opportunity to encourage science citizenship by exploring how the practices and impacts of astronomy have changed over time and across different cultures. This paper will explore how the Science Museum plans to communicate astronomy via its history in future planned gallery and web products, and the benefits of combining science education with a historical approach.

Introduction

As well as being International Year of Astronomy, 2009 marks the centenary of the Science Museum. It is one of the UK’s national museums, with a collection of over 200,000 objects (of which about 7% are on display at any given time). Over 2 million visitors a year visit the galleries, which are a mix of object-rich displays, hands-on interactives and multimedia experiences.

The museum’s current coverage of astronomy is minimal, as the bulk of the collection has been in storage for some years. The collection spans from the 10th century to the present day and includes items of international significance, such as the Kew Photoheliograph (the first astronomical instrument designed to photograph) and the 6ft mirror from Lord Rosse’s Great Telescope. 3D artefacts are complemented by an extensive pictorial collection and the holdings of the Science Museum Library, whose treasures include a copy of Galileo’s Sidereus Nuncius.

The congruence of IYA and the museum’s centenary provides an exciting opportunity to deliver some major audience outputs on astronomy for 2009. These could be in a variety of formats (exhibition, events, web) but for maximum impact and audience benefit should make use of the historical collection.

Why use history?

The benefits of history in science education have been summarised by Matthews (1994). He identifies seven benefits, briefly:

- better comprehension of scientific concepts and methods;
- “parallelism”: the connection between conceptual development in individuals and the historical development of science;
- cultural value;
- understanding the nature of science;

- counteracting scientism and dogmatism;
- humanising science, making it less abstract and more engaging;
- demonstrating connections within science and with other disciplines.

Figure 1 – Illustrations of the Moon from Sidereus Nuncius, 1610

Science Museum / David Exton

Figure 2 – This 1677 star map by Harumi Shibukawa, one of the first people to use a telescope in Japan, combines his systematic observations with concepts from Chinese field-allocation astrology. It is a useful illustration of how astronomy has developed by assimilating knowledge from different cultures.

These advantages apply equally to museum gallery presentations. In fact, historic scientific objects — the material culture — are ideal for delivering these benefits. They had makers, users, uses and roles within their contemporary society. They can be displayed to testify to the tentative nature of science, to show how problems were solved and concepts changed or were replaced. Objects with known associations can celebrate the contribution of women or other under-represented groups. The collective nature of science can be documented with apparatus used by teams. Historical objects can aid the understanding of conceptual and contextual aspects of science. But the history of science also furthers understanding of the procedural aspects or parallelism as described above — see, for example, Wang and Marsh (2002). Visitors' ideas about science are drawn from many periods in science's history, so this approach enables the choosing of stories that will resonate with them.

The historical approach enables the telling of long-term stories about science, spotting trends and painting big pictures; showing that it is not just scientific knowledge that continually changes but also scientific drivers and practices. The historical view better illustrates the connections between science and social, cultural and economic trends. The distance of time gives us a better understanding of the importance of different historical events and allows us to take a critical view of science while minimising the risk of offending current players.

Another key factor in using historical themes is that a holistic approach to science, with examples showing how it has changed over time, is becoming increasingly familiar to a very important audience for the museum — school groups. The growing emphasis on a critical evaluation of science rather than an imbibing of facts saw a new GCSE science curriculum being introduced in September 2006. This aims to give students opportunities to acquire an understanding of *how science works and its essential role in society* and *how uncertainties in scientific knowledge and scientific ideas change over time*[1]. The hope is that school visitors will engage with the museum's collection, finding in the displays the material evidence which they can interpret and evaluate, adding to what they have learned from their school textbooks.

Astronomy: a cultural perspective

The proposed approach for the museum's astronomy outputs is to examine astronomy and its history from a cultural perspective, and explore what our studies of the stars say about us as human beings.

Looking at the historical development of astronomy across different cultures helps to give a more complete picture, showing how encounters and exchanges between different knowledge systems shaped the subject. This approach can also help in reaching out to more diverse audiences.

Major developments in astronomy, and the consequential shifts in world view these sometimes resulted in, will of course feature strongly, but it is also important to emphasise the role of astronomy in daily life to help visitors relate to the subject. From the story of the giant instruments at India's Jaipur observatory (built for accurate measurements to help reconcile the Hindu and Muslim calendar systems, but rendered obsolete by the news of the Copernican theory), to the 1919 eclipse expeditions that supported the predictions of Einstein's general relativity and created a media sensation, there is a rich vein to draw on.

Learning outcomes

The target audience for the interpretation is:

- School groups aged 11-16 and their teachers;
- Families with children aged 12+;
- Independent adults.

Asking "who's the audience?" is increasingly common in the development of galleries and events. The target audience acts as a marker against which decisions about content and delivery are made, and makes it possible to evaluate success. Likewise, learning outcomes are written with the target audience in mind. The model of learning used in the Science Museum is drawn from the constructivist models of George Hein — learners are active participants rather than passive recipients, and construct their understanding of the world by adapting mental models to accommodate new experiences and information (Gammon, 2003). The table below shows the intended learning outcomes for this project:

---

[1] National Curriculum schemes of work can be accessed at www.nc.uk.net

Outcome	Description
Cognitive	Acquire new knowledge or accommodate it into existing schemas; reinforce prior knowledge or set it in context; apply existing knowledge; draw analogies With reference to the National Curriculum (science, history, citizenship) for the schools audience.
Affective	Challenge beliefs, attitudes and values; increase understanding and empathy with others' viewpoints. With particular reference to the process of science, and its social and cultural context.
Social	Develop skills of co-operation, communication, helping others to learn, developing social capital. Especially intergenerational dialogue in family groups.
Developing skills (mental and physical)	Investigation, observation, classification, assessing evidence, drawing conclusions With particular reference to historical objects.
Personal	Increase self-confidence, inspire interest, curiosity, awe and wonder, motivate to investigate further. Especially in astronomy, its history and the Museum's collections.

Table 1 – Learning Table

Widening access to the collections

Should planning and fundraising be successful, it is hoped that the museum will stage an exhibition opening in late 2008, in time for the 400th anniversary of Lippershey's telescope patent, and run this through 2009. This would be complemented by web material, school group visit resources and a series of events.

The collections are not just a resource for the Science Museum's staff — anyone working with the history of science is welcome to make use of them. A wide range of images, information and educational resources including games can be found on the Science Museum's websites[2] and everyone participating in IYA2009 is encouraged to visit.

References

- Gammon B. (2003), Learning in museum environments. Internal Science Museum document, can be provided on request.
- Matthews M. R. (1994), Science Teaching: The Role of History and Philosophy of Science. Routledge, New York.
- Wang H. A. & Marsh D. D. (2002), Science Instruction with a Humanistic Twist: Teachers' perception and Practice. In: Using the History of Science in Their Classrooms. Science & Education 11: 169-189.

Acknowledgements

Thanks to Alice Nicholls for valuable input on using history of science in education.

[2] www.sciencemuseum.org.uk and the collections website www.ingenious.org.uk

Using art as a medium in communicating astronomy

Lau Chen Chen
National Planetarium of Malaysia, Malaysian National Space Agency (ANGKASA) (lau@angkasa.gov.my)

Abstract

Batik is a delicate art that requires patience and skill. It is a process of "painting" and "drawing" a unique pattern on fabric using dye and wax. Malaysian designers usually use organic motifs such as flowers, animals, plants, shapes and geometric motifs for their Batik designs. But, in 2006, the Malaysian National Space Agency organised a Batik Art Competition "Space – My Inspiration". Participants were required to produce motifs of space science for their Batik making on the fabric (which measured 1m x 1m) and to write a summary about their Batik design. The objective of this competition was to promote space using Batik and encourage designers or the public to combine space science elements in producing Batik art. This competition had a good response and we received 106 entries from people with art backgrounds, university students, and college students to designers. These participants used backgrounds of the night sky, galaxies, nebulae, the Milky Way, the Solar System and astronauts as their Batik's motif. After this competition, a space Batik exhibition and other space Batik art activities were carried out. It showed that Batik art is an excellent educational and communication tool for astronomy. In conclusion, the Malaysian National Space Agency will carry out various types of space art activities in the future to create awareness and interest in space science among artists.

Introduction

Batik is a delicate art that requires patience and skill. Batik is the process of "painting" and "drawing" a unique pattern on fabric using dye and wax[1]. Most Batik originates from Asia. Malaysia is a relatively small country in South East Asia. It is divided into 13 states and territories. Every state has its own tradition, culture and dialects. For Batik making, two states that are well known for their Batik art are Kelantan and Terengganu, located on the east coast of the Malaysia Peninsular. There are many products that are made of Batik. Variations of Batik clothing and Batik garment include Batik shirts, Batik sarongs or Batik costumes[2]. The actual process of Batik making is quite straightforward. However the process becomes long and tedious because there are many repetitive steps. The "Tjanting" Batik-making process is illustrated in Figure 1[3].

[1] http://en.wikipedia.org/wiki/Malaysian_batik
[2] http://www.batikmalay.com/
[3] http://www.expat.or.id/info/batiksteps.html

All pictures curtesy of the author.

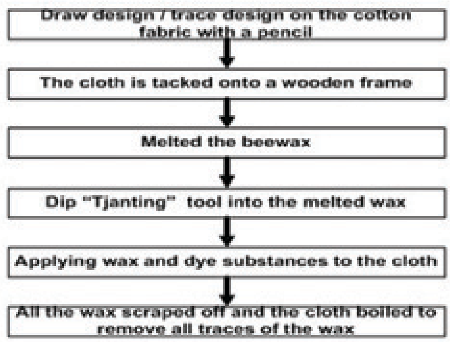


Figure 1 – "Tjanting" Batik making process.

Figure 2 (a-b) – Applying wax on the cloth

Figure 3 – Applying dye on the cloth

Figure 4 – "Tjanting" tool

Batik art competition: Space – My Inspiration

Malaysian designers usually use an organic motif such as flowers, animals, plants, shapes and geometric motifs for their Batik design. In 2006 the Malaysian National Space Agency organised a Batik art competition "Space – My Inspiration". The objective of this competition was to promote space using Batik art as a medium, to encourage designers or the public to combine space science elements in producing Batik art. This competition was open to individuals and teams with a maximum of 3 members. The participants were all Malaysian citizens of 18 years old and above. All the participants submitted a Batik painting of 1m x 1m on their chosen fabric as well as a write up on the space theme chosen, materials used, overall design, technique, colour and the research and development work done on the theme. The competition was held from 15 September 2006 until 15 November 2006.

Timeline for the competition, 17–25 September 2006

Roadshows were held at 30 places including government higher education institutes, private higher education institutes, art galleries and Batik factories. Posters and brochures of the competition were distributed during the roadshows and a briefing about astronomy was given by ANGKASA's officer.

October 2006

The competition was announced on the radio.

22 October 2006

The competition was advertised in the national newspapers.

15 November 2006

ANGKASA received 106 Batik paintings. As can be seen in Figure 5, most of the participants were government higher education institute students (48%), 32% were Batik designers, 11% were members of the public and 9% were from private higher education institutes. All the participants used various motifs on their Batik paintings, such as a background of night sky, galaxies, nebulae, the Milky Way, the Solar System and astronauts that can be seen in Figure 6.

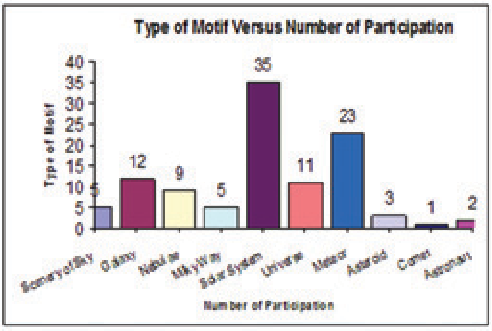


Figure 5 – Participation percentage of Batik art competition

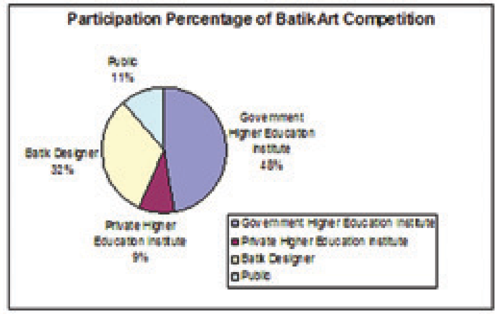


Figure 6 – Type of motif versus number of participants

20 November 2006

The first round of judging was done by three professional judges at the National Planetarium of Malaysia. 46 Batik paintings were selected after an evaluation of technique, explanation of theme, overall design, colour, finishing and research and development work done.

24 November 2006

The second round of judging was done by two professional judges and 23 Batik paintings were selected.

27 November 2006

The prize-giving ceremony for the Batik art competition “Space – My Inspiration” was held.

Space Batik painting exhibition

After the competition, ANGKASA was asked by an art and a science institute to exhibit the space Batik paintings. About 44 Batik paintings were exhibited at the Malacca Art Gallery from 14 June until 31 July 2007. Meanwhile 30 Batik paintings were exhibited at the science institute (Petrosains at Kuala Lumpur Convention Centre).

Batik shirt for the Malaysian astronaut (Angkasawan)

Five Batik paintings were selected to make two shirts for the first Malaysian Astronaut who visited the International Space Station from 10-21 October 2007. The first Malaysian astronaut wore the Batik shirt on the International Space Station.

Space Batik art activity for the public at the National Planetarium of Malaysia

Besides the competition and exhibition, the National Planetarium of Malaysia also held a “Tjanting” and Batik painting workshop from 21–26 November 2006 during the competition and on 8 September 2007 during the Space Carnival at the National Planetarium. The public were required to use objects from space to design their Batik painting. They were excited and enjoyed the activity.

Figure 7 – Malacca Art Gallery and Batik painting exhibition

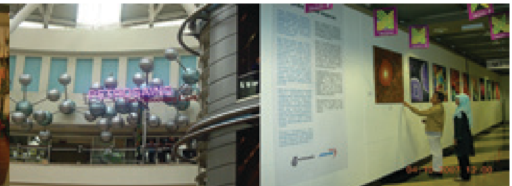


Figure 8 – Petrosains and Batik painting exhibition

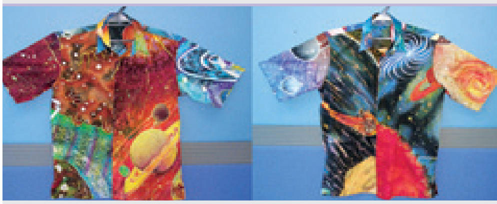


Figure 9 – 2 Batik Shirt for Angkasawan

Figure 10 – Space Batik Art Activity

Conclusion

The Batik Art Competition “Space – My Inspiration” has received a good response from university students, college students, designers and the public. Various science centres and art galleries have also shown interest in exhibiting the space Batik paintings at their premises. The space Batik paintings were also used to make Angkasawan’s shirt. As well as this, a space art Batik activity was carried out at National Planetarium during the public competition and the carnival event. In conclusion, Batik art is an excellent educational and communication tool for space science. The Malaysian National Space Agency will carry out various types of space art programmes in the future.

Everyday astronomy @ Sydney Observatory

Stephanie L. Parello
Sydney Observatory (StephanieP@phm.gov.au)

Abstract

Catering to a broad range of audiences, including many non-English speaking visitors, Sydney Observatory offers everything from school programmes to public sessions, day care activities to night observing, personal interactions to web-based outreach. With a history of nearly 150 years of watching the heavens, Sydney Observatory is now engaged in sharing the wonder with everybody in traditional and innovative ways. Along with time-honoured tours of the sky through two main telescopes, as well as a small planetarium, Sydney Observatory also boasts a 3D theatre, and offers programmes 363 days a year — rain or shine, day and night. Additionally, our website never sleeps, with a blog, YouTube videos, and night sky watching podcasts. And for good measure, a sprinkling of special events such as the incomparable Festival of the Stars, for which most of northern Sydney turns out their lights. Sydney Observatory is the oldest working observatory in Australia, and we're thrilled to be looking forward to our 150th Anniversary next year in anticipation of the International Year of Astronomy immediately thereafter.

In order to understand Sydney Observatory today, it's important to see where it's come from; and the history of Sydney Observatory begins with the history of Australia itself — or at least the European occupation of it.

Figure 1 – First Fleet

Figure 2 – Windmill

All pictures courtesy of Sydney Observatory

In 1788, the first fleet arrived from England and landed in Sydney Cove. Almost as soon as the settlers arrived, an observatory was set up at the foot of the hill, and this was known as Dawes Observatory after the Royal Marine Lieutenant, William Dawes, who set it up. It didn't last too long as the realities of settlement life prevented much attention being given to it.

The first windmill was built atop the hill near the settlement in 1796, as it was the highest natural point in the area. Less than ten years later, it had deteriorated and fell into disuse as other bigger, better windmills were now in use elsewhere. It was at the time known as Windmill Hill, and the name sticks a bit to this day in the surrounding area known as Millers Point.

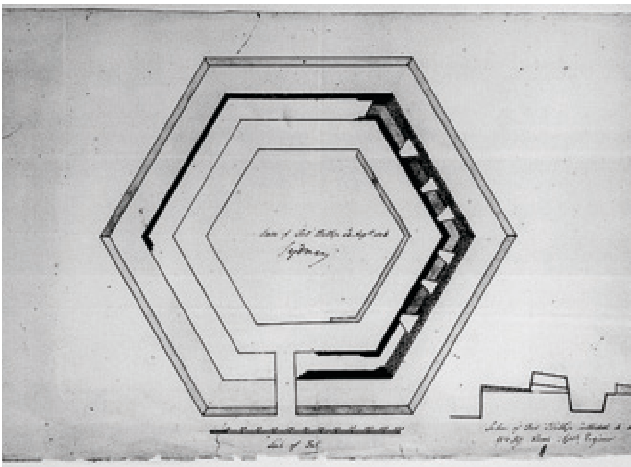


Figure 3 – Fort Phillip-plans

Figure 4 – Signal Station

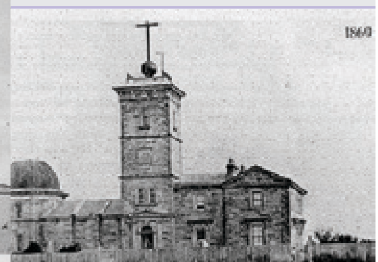


Figure 5 – Sydney Observatory, 1860

1804 saw the construction of a fort on the hill to protect the nascent colony from the rowdy Irish. Fort Phillip was never completed and no shots were ever fired in defence.

Communication became a priority a few years later and the first flagstaff was erected on the northeast wall of the fort to communicate with ships in the harbour and other signal stations along the waterways to the east and west. By the 1820s, a semaphore mast and a Signal Station were added.

The fort was partially demolished in the 1840s/50s, and a Signal Master's Cottage constructed in 1848. This remains as the oldest building on the hill today. Later (1868), a Messenger's Cottage was added. By this time, the hill was known as Flagstaff Hill.

It was quickly becoming clear that accurate time was an increasingly necessary commodity for ships in the harbour to set their chronometers, and an observatory to determine that time was commissioned and built. On 5 June, 1858, the Timeball on the 58-ft tower dropped for the first time, and daily from then on.

In 1859, Henry Chamberlain Russell was employed as a "computer" — a role he would undertake for eleven years before he was named Government Astronomer in 1870. His 35 years as the head of the Observatory included many improvements to the equipment and buildings. Russell added a Transit Circle Telescope and a 29-cm (11-inch) refractor built in 1874.

Figure 6 – Henry C. Russell

Figure 7 – Transit Telescope

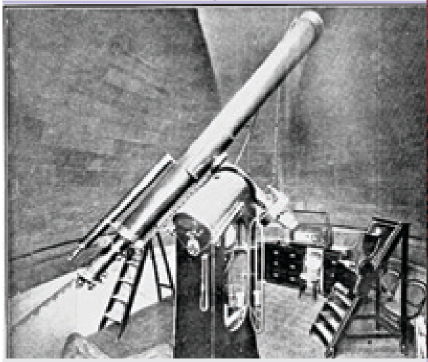


Figure 8 – Refractor Telescope in South Dome

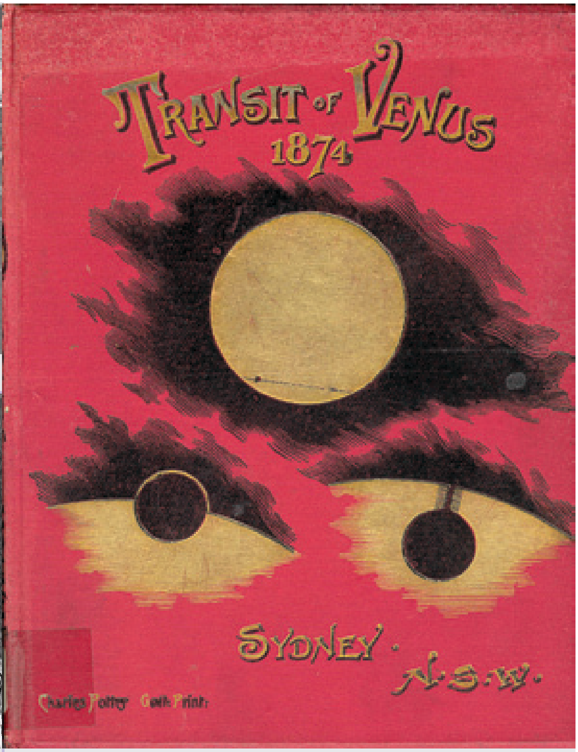


Figure 9 – Cover of 1892 book celebrating observations of 1874 Transit of Venus

The transit of Venus on 9 December 1874 was well observed — including by Russell at Sydney Observatory. The resulting observations were published collectively in a book in 1892.

Russell incorporated meteorology in his work, and published Australia's first weather map in the Sydney Morning Herald in 1877. Also in that year, a west wing was added to the Observatory that included an office and library, as well as another dome for a telescope. In the 1880s, Russell took some the world's first astronomical photographs.

The Astrographic Congress in Paris of 1887 sought to compile the first completed atlas of the sky, and Russell's attendance there pledged Sydney & Melbourne Observatories. The Sydney section would cover 52˚– 65˚ south declination. Russell returned home to design and construct proper instrumentation, and by 1891, the Astrograph (telescope) was ready to begin the survey at Sydney Observatory. Increasing light pollution in the city, however, prompted the move of the Astrograph to another site (Pennant Hills) in 1899.

By the early 1900s, thanks to the now famous Henry Chamberlain Russell, the hill was now known as Observatory Hill. Russell retired in 1905.

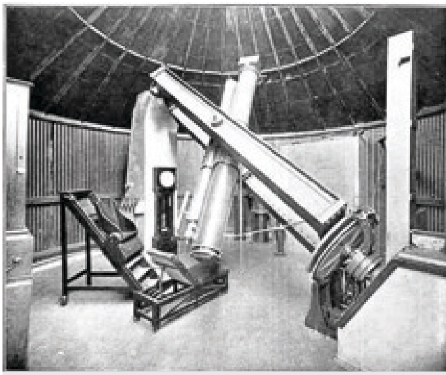


Figure 10 – Astrograph @ Pennant Hills

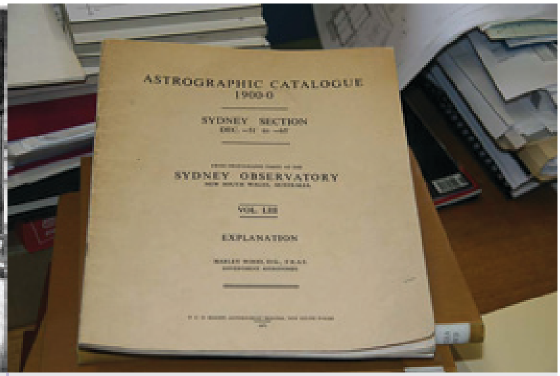


Figure 11 – Astrographic Catalogue – volume 53

In total, the Sydney portion of the Astrographic Catalogue took 80 years to complete within 53 volumes; the last volume was published in 1971. By this time, air and light pollution made astronomical work even more difficult. In 1982, the state of New South Wales converted the Sydney Observatory to a museum of astronomy and related fields as part of the Museum of Applied Arts & Sciences (MAAS) (more commonly known as the Powerhouse Museum).

Figure 12 – Sydney Observatory

Figure 13 – Timeball

Figure 14 – North Dome at night (Geoff Wyatt observing)

To this day, the Timeball Tower remains active. The Timeball drops nearly every day, though now the pips on the radio provide the accurate time (instead of the other way around).

Telescope Tours are offered daily and nightly to school groups and the public, every day of the year except Christmas and Good Friday. These tours include the North Dome with its modern 16-inch Meade LX200, and the South Dome containing the historic 1874 refractor (now the oldest telescope still in regular use in Australia).

The Observatory and attached Astronomer's Residence buildings now include many exhibitions on astronomy including the Transit Circle telescope, the Transit of Venus, Cadi Eora Birrung — constellations from an Aboriginal perspective, By the Light of the Southern Stars — a history of Australian astronomy, and others.


Figure 15 – 3D Theatre.


Figure 16 – Planetarium.

The Astronomer's drawing room is now a 3D Theatre, where short movies created by Swinburne University's visualisation team are shown as part of the Tours.

The cosy planetarium is probably the only planetarium in the world with a fireplace (having been the Astronomer's dining room). The stars are produced by a StarLab projector atop a tall wooden box pier onto a 2-m dome, and bean bags provide seating for up to 20.

Evening Courses are offered for adults in Astronomical Concepts, Exploring the Heavens, and Understanding Relativity.

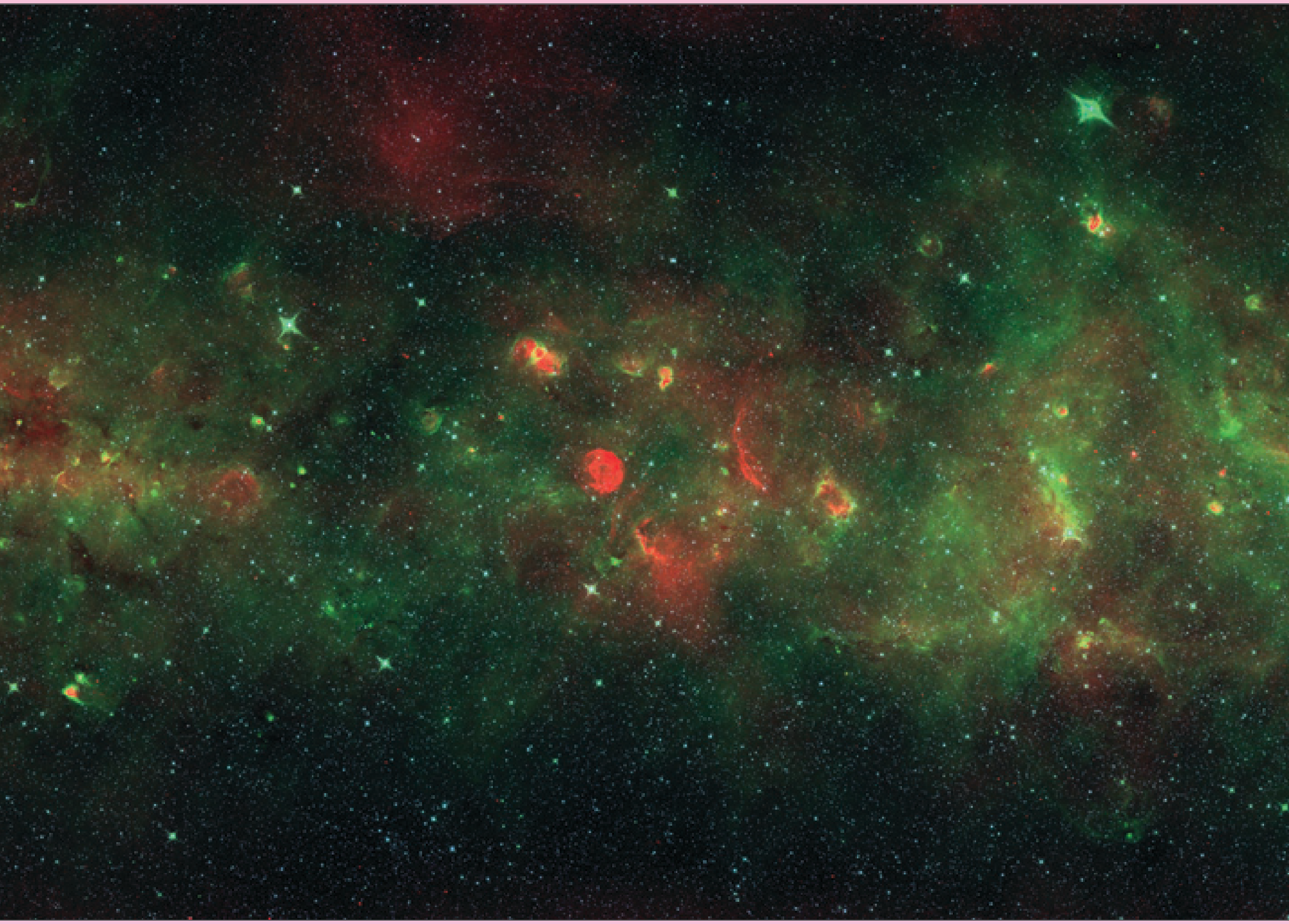
Special Events include the annual Festival of the Stars over two nights, with thousands of people taking advantage of great views of the night sky while most of the city's big buildings turn off their lights. The recent total lunar eclipse drew about 1300 people, who brought blankets and picnics to enjoy the slow pace of that celestial phenomenon. Party days encourage attendance during the day when special activities and programmes are offered.

Beyond the walls of the Observatory, outreach extends via the website with a blog and monthly online sky guides and maps.

Sydney Observatory is looking to the future as it celebrates its past. 2008 marks the 150th Anniversary of the first dropping of the Timeball. Many preparations are in progress to continue improvements of the site (both building and grounds) for this important milestone year, which leads well into the International Year of Astronomy in 2009.

The splendour of the Universe, and in particular the southern sky, is within easy reach of Sydney Observatory. Visit anytime.

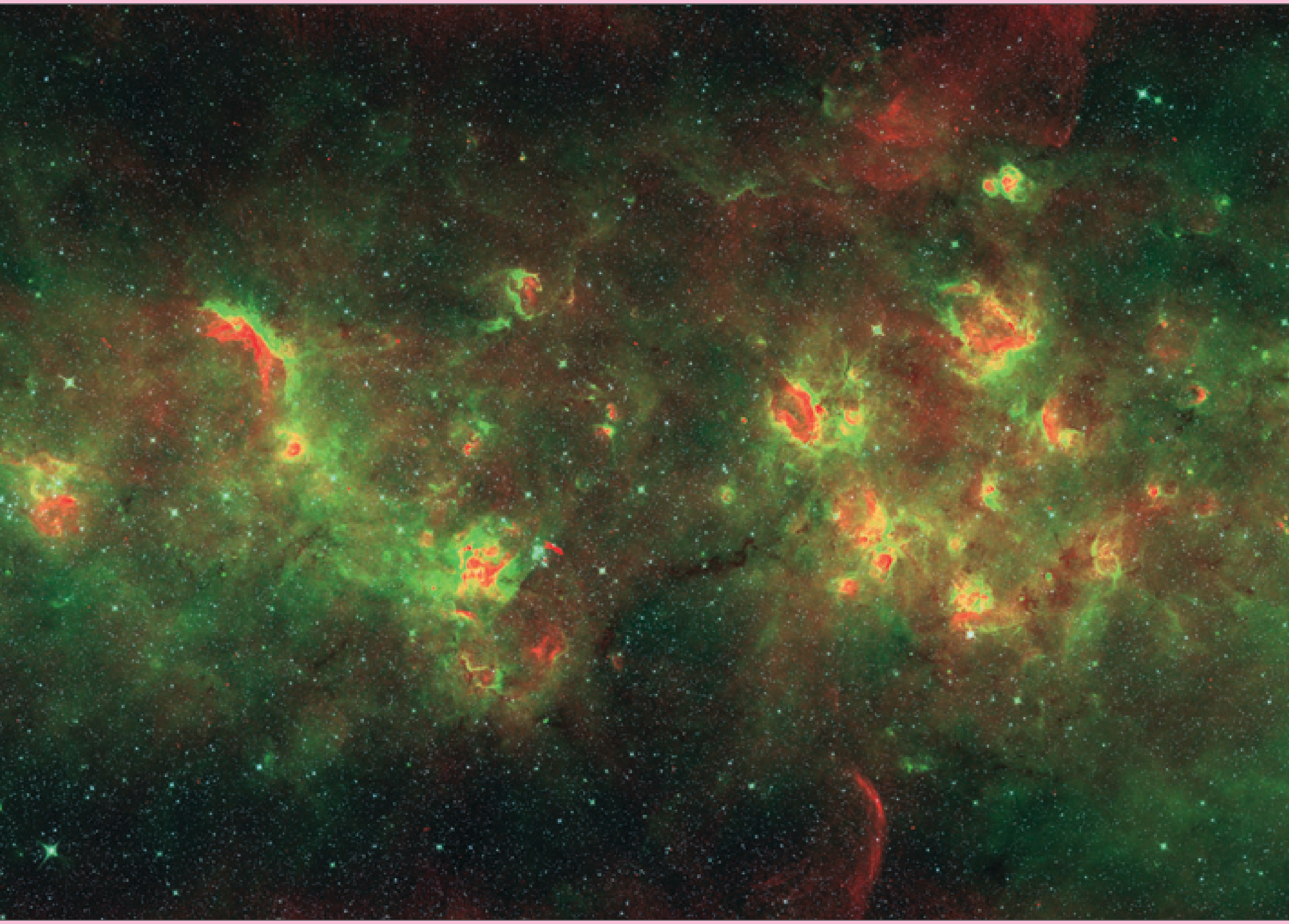
Credit: Sze-leung Cheung



Credit: NRAO/AUI and (Rick White, STScI) (Bob Becker, IGPP/LLNL & UC-Davis) (David Helfand, Columbia)

This panorama of a section of the Milky Way illustrates the dynamic interplay between the birth and death of massive stars in our Galaxy. The image is a composite of a radio image of the Very Large Array with mid-infrared data by the Spitzer Space Telescope. The radio data are coded red, the long-wavelength infrared data green, and the shorter wavelength infrared data blue-white; yellow regions in the image show places where both radio and infrared emission is prominent. Normal stars are brightest at the shortest wavelengths, showing up as the myriad of blue-white points. Birth sites of the youngest massive stars show as yellow clumps — radiation from the newborn stars heats surrounding dust producing infrared emission, while the ultraviolet light from these stars separates electrons from hydrogen atoms giv-

Session 10
Education



ing rise to radio emission. More mature stars have managed to destroy the dust nearby leaving red cores surrounded by yellow, then green, shells as the temperature drops far from the stars. The prominent red arcs mark the sites where massive stars have died in titanic explosions and blasted their gas light years into space at thousands of miles per second; their radio emission is produced as electrons, accelerated to nearly the speed of light by the outward moving blast waves, spiral in the galactic magnetic field. The diffuse green glow reveals the tiny dust particles that suffuse interstellar space along the band of the Milky Way; dark filaments superposed on this emission show regions where the gas and dust are so thick that no light can get through — regions in which future generations of stars will form.

Misconceptions in astronomy

Aurelia Teresa Gallego Calvente[1], Stefano Sandrelli[2] & Amelia Ortiz Gil[1]
[1] Astronomical Observatory, University of Valencia, Spain (teresa.gallego@uv.es, amelia.ortiz@uv.es)
[2] Astronomical Observatory of Brera, Italy (stefano.sandrelli@brera.inaf.it)

Abstract

In the present study performed by the Astronomical Observatory of Brera (Italy) and the Astronomical Observatory of the University of Valencia (Spain), we analyse some common misconceptions in astronomy. In particular we explored the evolution of these misconceptions (if any) depending on age and socio-educational factors, from a cognitive structures point of view. Cognitive structures interact with learnt contents and produce resistant conceptual schemes that are almost completely unknown and ignored by teachers and educators. We carried out an extensive survey (more than 2000 tests in the two countries) and we studied the spontaneous schemes and concepts used by youngsters when facing some basic astronomical ideas, in order to focus efforts on helping to change the above schemes by inducing a “clash of ideas” for the students. In that way, students could acquire a dynamic mental model consistent with the scientific model.

Introduction

At the last *Communicating Astronomy with the Public* conference in Munich in 2005, F. Cavallotti, S. Romaniello and S. Sandrelli presented a very interesting work called Astronomical Pills: one-shot questions about the Universe, in which they explored the evolution (if any) of some misconceptions in astronomy depending on age and educational factors, of students of different age ranges (13-19 years old) and from different types of school. They found that the use of formal or informal language in a given framework significantly affects the subjects' answers, by introducing socio-educational and emotional factors. In particular, their results highlighted the fact that scientific and non-scientific knowledge is not combined together in our cognitive structures and that age and school grade do not modify pre-existing ways of reasoning.

The school visit programmes at the Astronomical Observatory of Brera (Italy) and the Astronomical Observatory of the University of Valencia (Spain) are very similar. At both centres students are taught some concepts about astronomy, for example, with themes related to the Solar System or gravity, by means of hands-on activities, talks, etc. for approximately three hours.

We decided to perform some research about these misconceptions in Spain. As with the Italian group, we did not aim to investigate the students' knowledge of science, but the spontaneous schemes and concepts used by youngsters when facing some basic astronomical ideas, mainly focusing on their perception of the Universe, on distance and size and how gravity works. We tried to use these schemes to rebuild the image of the Universe developed by youngsters over time.

We started from the same ideas about the origins of misconceptions and modern theories about cognitive structures of Cavallotti et al. (2005). Our work follows the line of the Italian researchers. We collected almost 800 tests comparable with the Italian ones, consisting of 9 questions on astronomical topics, concerning the perception of the Universe, distance and size, properties of light and how gravity works.

Our test sampled students of different age ranges (see Figure 1):

- 11-13 years old (last years of primary school);
- 14-16 years old (secondary school);
- Over 16 years old (high school);

and from different types of school. We followed the procedure described by Cavallotti et al. (2005) to carry out the tests.

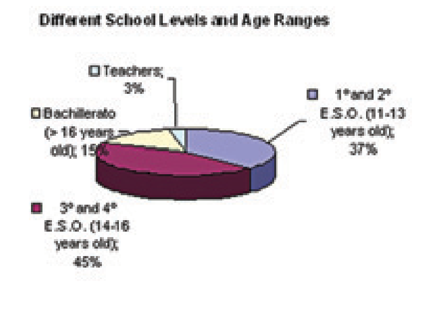


Figure 1

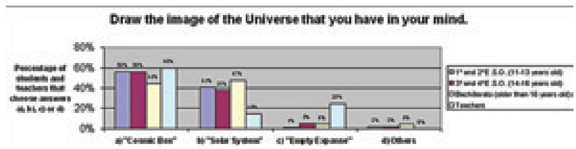


Figure 2

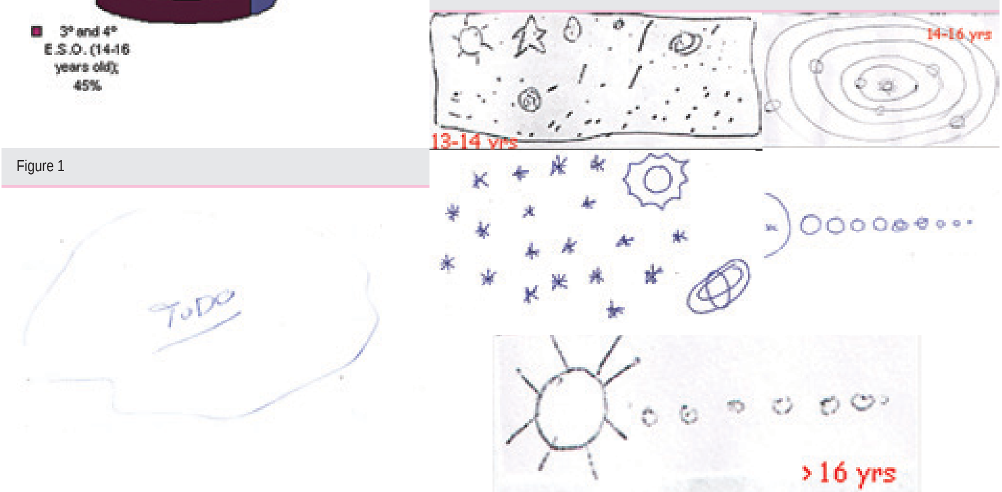


Figure 3

Data analysis

Perception of the Universe:

As in Italy, we collected drawings about the Universe representative of the subjects perception of the Universe. We found too three possible age-independent scenarios (see Figure 2):

- The so-called "Cosmic Box" in which the Universe is perceived as a box with stars, planets, galaxies in a space, sometimes encircled by an edge. It's worth noting that the Sun and stars seem to be perceived as two different types of objects.

- The so-called “Solar System”, in which the Universe is perceived as equivalent to a Solar System with very small distances between same-sized planets.
- The so-called “Empty Expanse” in which the Universe is perceived as an empty space without any evidence of stars, planets or other features.

We must point out that drawings were very similar in all scenarios in both countries (see Figure 3).

Perception of distances and sizes:
We conclude that students seem to have the correct idea about the order of magnitude for the size and distances between the Sun and the Earth but not with respect to the other planets or distances between the Sun and other stars. This is consistent with the “Solar System” scenario. (See Figures 4 and 5)

Gravity:
If using formal textbook language, students seem to have assimilated the concept of gravity. But using a different kind of question, formulated in informal language, we obtained the opposite result. So it seems necessary to conclude that the use of formal and informal language in a given framework causes differences in the resulting answers. As in Cavallotti et al. (2005), our results show that language formalism significantly affects the subjects’ answers irrespective of school grade.

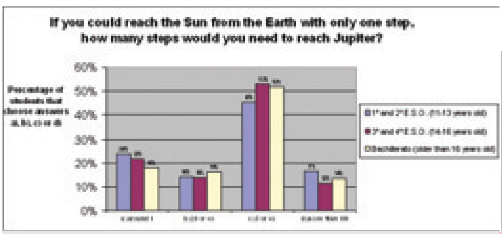


Figure 4

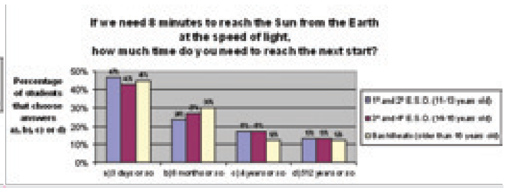


Figure 5

Conclusions

The Italian-Spanish research results agree on the following:

- Results suggest that age and schooling do not modify the most basic ideas regarding the Universe.
- Some misconceptions were demonstrated to be difficult to eradicate, while others are affected by the use of a specific language form.
- Misconceptions are resistant to time: our results are very similar to surveys carried out ~15 years ago.
- We did not find any significant difference between boys and girls. (See Figures 6 to 8).

Performance

What can we do to eradicate misconceptions? We are focussing our efforts on helping to change these schemes by inducing a "clash of ideas" situation for the students. In that way students can acquire a dynamic mental model consistent with the scientific model.

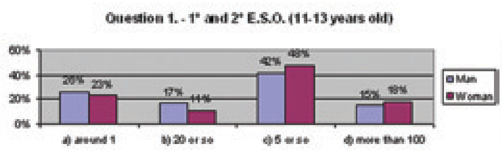


Figure 6

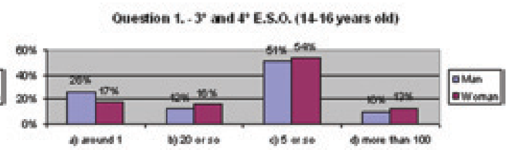


Figure 7

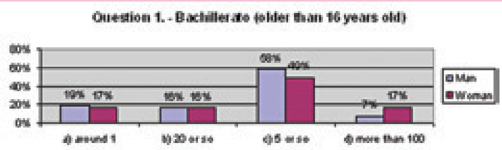


Figure 8

We have designed new hands-on activities to promote this "clash of ideas" that seem to be very effective because students realise the discrepancies between their cognitive structures (their representations of the environment in a common-sense framework) and the learnt contents (the representation from a scientific-sense point of view) for the first time.

Next steps

- Finish a new programme of activities following the above guidelines.
- Design an evaluation strategy about efficiency valid from an Experimental Sciences point of view (maybe a triangular scheme) (Rodríguez Fernández et al. (2005))
- Study lessons learnt to improve the activities for better efficiency.

References

- Calcidese, P. (2002), L'Universo che non c'e'. Preconcetti e misconcezioni degli studenti in età adolescenziale nell'ambito della fisica e conseguenze sulle idee riferite all'origine ed evoluzione dell'Universo. Ph.D. thesis.
- Cavallotti F., Romaniello S., Sandrelli S. (2005), Astronomical Pills. One-shot questions about the Universe. The ESO/ESA/IAU Conference, Communicating Astronomy with the Public 2005, pp 166-173
- Cavanilli G. (1995), La formazione dei concetti scientifici. Senso comune, scienza, apprendimento. Firenze, La nuova Italia Editrice
- Dussault M. (1999), How do visitors understand the Universe? Studies yield information on planning exhibitions and programs. Association of Science-Technology Centers Newsletter
- Mayer M. (1990), Conoscenza scientifica e conoscenza comune. Analisi dell'incidenza di fattori scolastici ed extrascolastici nell'apprendimento della fisica. Roma, I Quadeni di Villa Falconieri, CEDE
- Rodríguez Fernández S., Gallardo Vigil M.A., Olmos Gómez M.C., Ruiz Garzón F. (2005), Investigación Educativa: Metodología de encuesta. Grupo Editorial Universitario. Facultad de Educación y Humanidades, Campus de Melilla, Universidad de Granada.

Inspiring a community

Christopher Lawton
Directorate of the Scientific Programme, ESA (Christopher.Lawton@esa.int)

Abstract

For countless generations humans have gazed upon the heavens in awe and wonder. This paper considers approaches in effective communication to groups that have formed, for whatever reason, to learn about astronomy and the night sky. Inspiring small communities is a step on the path to ensure the wider public value astronomy. Achieving this makes it easier to obtain support and acceptance for expansive, and sometimes expensive, programmes.

Introduction

The heavens have, throughout the course of human history, served to inspire and influence countless generations. The foretelling and viewing of a celestial event in ancient civilisations might determine, for example, a change in cultural and political circumstances.

The night sky is a powerful hook for engaging with many communities. Everyone likes to know the objects of the night sky. As well as the patterns of the constellations, the appearance of something abnormal, while not philosophically significant, still resonates with the public today.

Influences from antiquity, some astronomical, some philosophical, still exist today. Communicators and educators in astronomy need to be aware, therefore, that it is still possible today to create influences of varying magnitudes. A small change can grow over time and become part of the public consciousness. It is not always possible to create an overnight revolution, but over a lifetime it is possible to leave an imprint in many places. As an example, the rise in popularity of sidewalk astronomy is a lifetime's work reaching out to a handful of people at a time.

The sighting of a comet, an eclipse, the Milky Way, a meteor shower, or similar event, stirs up the inquisitive side of human nature. Questions arise as to the nature of the objects and their inter-relation, what is the bigger picture? It is in answering such questions that a community can become inspired.

This paper looks at the possible steps required to inspire communities based on the author's own experiences in teaching adult education classes on the night sky.

The nature of community

A community can be viewed as a group of people brought together for a period of time with a common goal or objective. At the end of that period, if the group has been suitably inspired, it is possible for the community to go out and pass on their enthusiasm and knowledge to other people.

A community can take on many forms and sometimes be transient. For example, the gathering of people to watch a solar eclipse is a large, short-lived, community that is accessible for a brief period. By contrast, a web-based community can be quite small, but long-lived. Each community, therefore, presents a different challenge in the creation of a lasting influence.

Of primary concern, therefore, is understanding the nature of the community and why it has gathered. It is often easy, with a desire to impart knowledge, to overlook this element. The event must be the focus of a short-lived community, such as for an eclipse, but for a longer-term community there is more scope to explore a range of topics. The challenge in the latter case is to broaden the scope while retaining interest.

Questions

The formation of a group with a specific goal that meets at regular intervals determines the agenda. While the details of each meeting are down to the lecturer, the group sets the context. This implies that the community already has a set of questions. Some are very simple, such as, "What is that star I can see from my bedroom" and others more complicated, such as "What is a star?".

It is easy, however, to ignore the questions that arise from the community and focus on a topic of personal interest. It is necessary, therefore, in all forms of communication, to either ascertain specific questions in advance, or pre-empt likely questions. This is not always easy to do, but it is a vital if a community is to be inspired.

People listen to experts because they value the opinion and they hope to find answers to questions. Individuals tend to have less affinity with the lecturer and less of a desire to hear about a different topic the longer questions remain unanswered.

Answering questions through general dialogue as well as in specific sessions engages the group. A link forms between the group and the lecturer that starts to open up a path for further dialogue. This is the beginnings of inspiring a community.

Inspiration

Inspiring communities involves many steps. A first is to answer their questions, but this alone does not inspire. Simply stating facts is ultimately dry and insipid and creates an informed community.

To inspire requires additional effort and language used is a key part of the process in shifting from information to inspiration. People enjoy listening to a good story. In explaining the night sky, for example, showing imagery and interweaving facts, legend and anecdote creates powerful mental images that not only reinforce learning, but also raise interest.

What is required, therefore, is a consolidation of additional information that stimulates discussion of ideas and concepts and allows the presentation of a much broader picture. The underlying information should come from many different and varied sources. In an ideal case, the story should be built in layers that gradually introduce more complex ideas and concepts.

Consider the following two narratives, either of which meets the basic requirement of answering questions about objects in the night sky.

Narrative 1
There are two main stars in Orion: Betelgeuse upper left and Rigel lower right. In addition, there is the belt of Orion – three stars in a line, which, if you extend it in one direction points to Taurus and in the other to the bright star Sirius.

Narrative 2
There are two main stars in Orion. The star on the upper left, α-Orionis, also known as Betelgeuse, is a red supergiant. It is one of a number of candidate stars to end its life in a supernova explosion. Because of its proximity, approximately 500 light-years, were this to take place it would be visible in broad daylight. The star on the lower right, ß-Orionis, also known as Rigel, is a very hot, young, blue star. The belt of Orion is a pointer to the Constellation of Taurus and the brightest star in the sky, Sirius, in the constellation of Canis Major. Sitting just below the belt is the Orion Nebula, which also goes by the classification of M42 from the catalogue of comet-like objects compiled by the French astronomer Charles Messier.

In Narrative 1, although addressing some basic questions, the community has been informed rather than inspired. The information presented would also be contained within any reasonable publication on the constellations. Yet this is often the level of material presented. The community requires more if it is to be inspired.

In Narrative 2, by introducing contextual information a new universe presents itself to the community. All of a sudden the hidden objects, such as nebulae and galaxies, have a context and a place in the sky. There is no limit to this path of exploration – because it is in addition to answering the basic question. Topics often considered out of reach for most people such as multi-wavelength astronomy, graphical representations and similar, are now in reach of any audience because they are being presented within a wider context.

Politicians frequently employ such a tactic to good effect. They take a question and make an initial answer that to some extent is a response, but as the answer evolves they shape it to convey the message they want to promote. What infuriates people is when politicians avoid answering the question and immediately switch to their own agenda. Although people are, generally speaking, not as emotionally involved in astronomy as in politics the principle still applies.

Having begun a process of inspiration by providing a range of additional information, further questions arise that often extend much further than the original scope of the material. Once this process starts a critical point is achieved and the community is to some extent now in a position to share its knowledge with others.

The members of small classes are often keen to share their newfound knowledge with family and friends. This is why a strong narrative is important. Firstly, it is easy for them to relate a story and secondly, they have plenty of information to pass on.

Benefits

Today, the global community is not a stakeholder in astronomy. It has not reached a point where it either desires, or sees the need for successful astronomical programmes. One result of this is to create the strange situation where justification for a programme arises out of the success of a programme. This means revealing little until success, and if there is no success then everything remains quiet. This strategy may appear to work, but it is a defensive strategy and is reactive.

Inspiring communities can, as discussed, lead to the public becoming stakeholders and it is no longer sufficient to be reactive. A proactive strategy, however, requires effort before a programme commences. It requires careful planning and the gradual promotion and selling of ideas and concepts in ever increasing detail. Just like the analogy with Orion, feeding people more information makes them aware of the bigger picture and supportive of programmes.

A main benefit from this is to reduce the fear of failure. Failure occurs in many forms in astronomy and space science, from a cloudy night to the explosion of a rocket to the failure of an instrument, or a spacecraft. Often the fear of any of these happening prevents communication before an event. This fear arises because the groundwork of investing in and inspiring communities has not taken place.

A clear, engaging message has two advantages. Firstly, it further inspires those who are already stakeholders and secondly, it stirs in interest in others to become stakeholders.

One of the best examples of overcoming this fear is John F. Kennedy's speech at Rice University where he pledged to put a man on the Moon before the end of the decade. The community was already to some extent a stakeholder in that there was a desire to overcome communism. What was lacking, however, was a message that would inspire that community to achieve that goal. Kennedy sold them a vision and a way to fulfil and satisfy the desire. Once announced a collective national pride drove the programme forward.

What is fascinating to note is that no one ever updated the vision. So, once the US had placed a man on the Moon the pressure to cancel the programme became huge. Suddenly there were fewer stakeholders and the lack of inspiration meant the programme quickly evaporated.

Conclusions

The difference between informing and inspiring is often small: the information is the same, but the presentation is different. Yet, as discussed, small differences can lead to substantial short and long term benefits.

For the International Year of Astronomy 2009, while creating and planning events it is necessary, to consider what the questions of the community are. It would be a disappointment, if at the end of the year the global community was aware of astronomy, but ultimately frustrated because questions were still awaiting answers.

Credit: Sze-leung Cheung

ESO Education and Public Outreach for IYA2009

Douglas Pierce-Price, Claus Madsen, Henri Boffin, & Gonzalo Argandoña
European Organisation for Astronomical Research in the Southern Hemisphere (dpiercep@eso.org)

Abstract

ESO, the European Organisation for Astronomical Research in the Southern Hemisphere, is planning a range of education and public outreach activities for the International Year of Astronomy 2009 (IYA2009). In addition to support for IYA2009 global Cornerstone Projects, these will include local, national, and international activities, aimed at the general public, the interested public, and school students.

Introduction

ESO is the European Organisation for Astronomical Research in the Southern Hemisphere. It currently has 13 member-states, and has its headquarters in Garching, near Munich, Germany. It runs three observatory sites in Chile: La Silla at 2400 m, Paranal at 2600 m, home of the Very Large Telescope (VLT) array, and Chajnantor at 5000 m, where ESO is the European partner in the global collaboration to build ALMA, the Atacama Large Millimeter/submillimeter Array. In addition, ESO is currently engaged in the design of the future European Extremely Large Telescope (E-ELT).

For the International Year of Astronomy in 2009 (IYA2009), ESO is planning a range of education and public outreach projects. These will range in geographical scope from local to global, and will be aimed at a range of groups including the general public, the interested public and amateur astronomers, and school students. ESO is also willing to work, where appropriate and feasible, with national nodes in ESO member-states and other countries.

ESO will also support various IYA2009 Global Cornerstone Projects. The IYA2009-specific events will take place in addition to ESO's normal education and public outreach activities.

Global Cornerstone Projects

A number of Cornerstone Projects[1] will be organised for IYA2009 at a global level, and ESO plans to take part in and support some of these. For example, ESO participation is planned in the *100 Hours of Astronomy* (previously *24 Hours of Astronomy*) project, a round-the-clock, round-the-world event linking large observatories around the planet. Some of the stunning images from

[1] http://www.astronomy2009.org/content/view/292/80/

ESO telescopes such as the VLT will appear in the *Universe from the Earth* exhibit of astronomical images. Furthermore, ESO is supporting the *Universe Awareness* (UNAWE) project.

Local events in the Garching/Munich area

ESO is also planning various activities around its headquarters, in the Garching and Munich areas in Germany. One such activity is a local image exhibition, showcasing the images produced by and associated with ESO telescopes and observatories. There are possible links with the *Universe from the Earth* global Cornerstone Project.

Another plan is a series of "Astronomy Cafés", in the style of "Café Scientifique"[2]. ESO astronomers will engage with the public, discussing astronomical topics in an informal setting such as a café. By taking the astronomers out of a more traditional "lecture theatre" setting, we aim to reach people who may not visit a formal venue, and to engage in two-way dialogue with the public. A pilot scheme will be run in Garching, with the aim to expand this to Munich.

National level events in Chile

The events in Chile are organised and coordinated by the ESO Public Affairs Department in Chile. They include a series of "Science Cafés", similar to the Astronomy Cafés described above, which are a continuation of an ongoing project. There will also be a travelling exhibit, featuring observations of the sky in different cultures, from historical times, including Native American cultures, to the present, and using modern instruments.

A series of national videolinks to Paranal, the site of the VLT, will give people in cities across the country a chance to experience the VLT first-hand without the difficulty of visiting this remote site. Afterwards, these videos will be provided on the internet. There will also be a virtual tour of Paranal, with a simulation of night observations. ESO is working with EXPLORA (a national programme for popularisation of science among young people, from the Chilean Ministry of Education), in order to have astronomy and observations of the sky as the main theme for all the activities during 2009 including the National Science Week. This will provide extremely high visibility for astronomy during 2009.

During the International Year of Physics in 2005, ESO supported *100 Años, 100 Colegios* (100 Years, 100 Schools), where schools from the north to the south of the country made scientific measurements of levels of solar radiation. For 2009, the follow-up will be *400 Años, 400 Colegios*, which will create a network of astronomy clubs and teams at schools throughout the country.

International ESO projects

ESO is producing a planetarium show about ALMA, in collaboration with the Association of French-Language Planetariums and the German Planetarium of Augsburg, as described by Boffin and Acker (2007).

---

[2] http://cafescientifique.org/

Many of ESO's other international projects will use the web to reach their audience. We plan an *Astronomy Web Quest*, in the form of an interactive website where people can answer quizzes and solve puzzles, with prizes available. This will be a way for the general public to learn about astronomy and ESO.

The Life of an Astronomer will feature blogs, podcasts, and more from selected ESO astronomers. This will be an opportunity to follow individuals for all or part of the year, and see what the life of an astronomer is really like. There is the possibility of links with the *Cosmic Diary* global Cornerstone Project.

Catch a Star

Figure 1 – Some previous "*Catch a Star*" written project and artwork winners. Clockwise from left: Yuriy Baluk; Karolis Markauskas; Rumen Stamatov, Alexandra Georgieva, with Petar Todorov; Gilles Backes; Denitsa Georgieva, Rositsa Zhekova, Tanya Nikolova, with Dimitar Kokotanekov; Edina Budai, Andrea Szabo, Judit Szulagyi, with Akos Kereszturi.

Catch a Star[3] is an international competition for school students, organised by ESO and the European Association for Astronomy Education (EAAE). Students from all over the world can take part, to win prizes such as astronomy DVD-ROMs, posters, and T-shirts. Furthermore, students from Europe and Chile are eligible to win major travel prizes, including a trip to the VLT on Cerro Paranal in Chile.

[3] http://www.eso.org/catchastar/

The competition is divided into three categories: “Researchers”, “Adventurers”, and “Artists”, to ensure that there is an appropriate activity available for all levels. As “Researchers”, up to three students plus a teacher will write about a topic of their choice in astronomy, and discuss how large research telescopes such as those of ESO can be used to study it. In this category, entries must be written in English, and are judged by an international jury. The “Catch a Star Adventurers” category is similar to “Researchers”, but entries do not need to be in English, and prizes are awarded with a lottery. This is a deliberate decision, to avoid a sense of elitism, and to get students interested in and thinking about astronomy, no matter what their level.

The third category, “Artists” is an art competition. Students create artworks with an astronomical theme, and these are displayed in a gallery on the web. The winners are chosen with the help of a public web-based vote. In 2008, for the first time, there will also be a special prize awarded by an astronomical artist. The “Artists” competition allows students of all ages to take part, and has the interdisciplinary effect of bringing astronomy into art lessons, or vice versa.

Catch a Star is run annually. In the 2007 competition, hundreds of students from over 20 countries submitted written projects and artwork. There will be a special *Catch a Star 2009* linked with the International Year of Astronomy.

Future astronomers of Europe

ESO is also planning a somewhat higher-level competition, to introduce keen school students to professional astronomy. Called *The Future Astronomers of Europe*, it is based on an earlier competition of the same name, which took place in 1993 (see West, 1994). In that competition, students were invited to write about an observing night on the (then future) Very Large Telescope (VLT), with the winners developing observing projects and travelling to La Silla to carry out their observations. In 2009, the design phase of the European Extremely Large Telescope (E-ELT) will be coming to an end, and the construction phase will be approaching. This means that the school students of 2009 may be among the first users of the E-ELT. Therefore, the timing is appropriate for a similar *Future Astronomers of Europe* competition where we ask school students to think about observing with the future E-ELT.

Competition entrants from across Europe will be asked to write an essay about *An observing night with the E-ELT*. The winners of this contest will travel to the ESO headquarters in Garching, where they will receive an intensive course in astronomical concepts and observing techniques from ESO astronomers. In Garching, they will work in teams to develop their own observing projects and proposals. There may, at this stage, be an additional level of competition to decide the winning proposals, and these teams will travel on to Chile. Here they will visit the ESO telescopes, to learn more and to make their astronomical observations.

We aim to publicise both the competition and the winners’ adventures to Garching and Chile, both online using the web, and also in other media such as television and astronomy magazines.

ESO

Figure 2 — The Very Large Telescope (VLT) array at Paranal.

Conclusions

ESO will have a wide range of its own education and public outreach activities for the International Year of Astronomy 2009, as well as participating in various global Cornerstone Projects. ESO-specific projects will include local (for example in the Munich area), national (for example in Chile), and international activities, aimed at audiences from the general public to school students. As well as new projects, such as a travelling exhibit in Chile and an ALMA planetarium show, there will be follow-up projects based on previous activities, such as *Future Astronomers of Europe*, and continuations of existing programmes such as the science cafés in Chile and the international *Catch a Star* competition for school students.

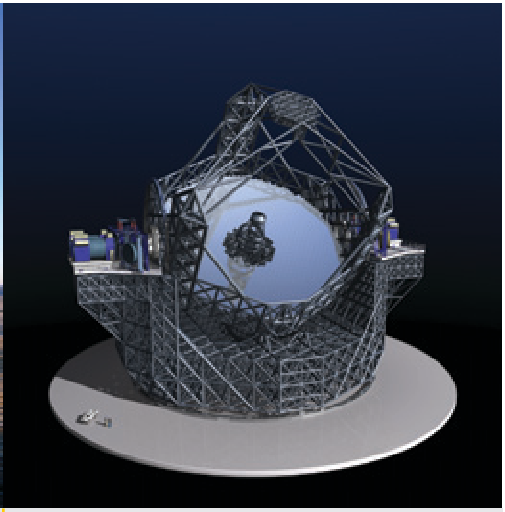
To find out more, please contact Douglas Pierce-Price, who is the ESO Single Point of Contact (SPoC) for IYA2009.

References

- Boffin H., Acker A. (2007), Exploring the Cold Universe — a European Planetarium Show for the IYA2009. This volume.
- West R. (1994), Future Astronomers of Europe. Sky and Telescope, volume 87, number 3, pp 28-32

Composing, ESO

Figure 3 — A composite image of how the Atacama Large Millimeter/submillimeter Array (ALMA) may look on Chajnantor, northern Chile.



Rendering, ESO

Figure 4 — Computer rendering of the 3-dimensional model of the European Extremely Large Telescope (E-ELT).

Education through communication

Magda Stavinschi
Astronomical Institute of the Romanian Academy (magda_stavinschi@yahoo.fr)

Abstract

Children have always been the best distributors of information. They impart what they learn in school to family, friends and to other children. That is why astronomy communication should begin at their level, for children, at school.

IAU Commission 46 is undergoing a period of major transformation, seeking new ways to educate, motivated by the appearance of new technology and the attention given to it by children, and also to the internet, TV, films, DVD, etc. The special events celebrated by the entire world – International Heliophysical Year (IHY) and the International Year of Astronomy (IYA2009), to which Romania added the centenary of Romanian astronomy in 2008 – help us to attract people, and particularly children to astronomy and to science. So, in this presentation, we will approach the ways in which communication can help education, and how this may lead to an increase in the level of education in civilised societies today.

The International Year of Astronomy IYA2009 is close, and is preceded by the National Year of Astronomy 2008 in Romania, when we will celebrate the centenaries of the Observatory in Bucharest and of that at Dubasari, now in the Republic of Moldavia. These are sufficient reasons why astronomy education should find new ways of expression, and of disseminating astronomy education at the level of the general public and at that of children, teenagers and young people in particular. We must also take this opportunity to present the role of astronomy education in a nation's development to the authorities.

Furthermore, the IAU Commission 46 *Astronomy Education and Development* is currently trying to implement programmes for developing countries, members or future members of IAU, as illustrated by one of its founding statements: *it seeks to further the development and improvement of Astronomy education at all levels throughout the world through various projects initiated, maintained, and to be developed by the Commission and by disseminating information concerning Astronomy education at all levels*.

There have been other efforts to this effect for some time. It is worth mentioning the *IAU Resolution on the Value of Astronomy Education*, approved at the XXV General Assembly in Sydney in 2003, which recommends that:

- Educational systems include astronomy as an integral part of the school curriculum at both the elementary (primary) and secondary level, either on its own or as part of another science course.

- Educational systems and national teachers' unions assist elementary and secondary school teachers to obtain better access to existing and future training resources in astronomy in order to enhance effective teaching and learning in the natural sciences.
- The National Representatives in the IAU and in Commission 46 call the attention of their national educational systems to the resources provided by and in astronomy.
- Members of the Union and all other astronomers contribute to the training of a new, scientifically literate generation by assisting local educators at all levels in conveying the excitement of astronomy and of science in general.

To fulfil its goals, the Commission collaborates with many international bodies, including other IAU commissions.

Various methods of collaboration have been used:

Classical, theoretical and practical methods

Classical methods concern traditional lessons held in schools, which combine lectures with discussions involving the pupils, checking the knowledge gained during earlier classes by means of questions or tests and practical, observational or computer lessons.

Textbooks

Astronomy textbooks have been edited for various audiences: for groups of pupils taking classes in both general and specialised education programmes, for schools both with normal and special training programmes (for both gifted children and disabled ones), for students who want to improve their astronomy knowledge to complete their personal study programmes (in physics, biology, etc.), and who have not yet had an astronomical training.

Special schools

Recently, special astronomy schools have been organised across the globe, the best known example being that of the International Schools for Young Astronomers – ISYA. The 2007 School was held in Malaysia, and that of 2008 (the 30th) will take place in Turkey. The Schools are intended primarily for graduate or PhD students who want to find out more about astronomy or who want to find a field in which to concentrate and study astronomy more deeply. An ISYA took place in Romania in 1999 to give students the opportunity to observe and discuss the total solar eclipse of 11 August, whose maximum was on Romania's territory.

Astronomy Olympiads

Astronomy Olympiads are an excellent opportunity to stimulate the improvement of astronomy knowledge at various school ages. Between 29 September and 7 October 2007 the Euro-Asian Astronomical Society organised the 12th International Astronomy Olympiad in Simeiz, Crimea. The Promotion of Academic Olympiad and Development of Science Education Foundation (POSN) is organising the 1st International Olympiad on Astronomy and Astrophysics between 30 November and 9 December 2007 in Thailand.

Naturally, more competitions at the regional level would allow more children than ever to participate as travel expenses would be significantly lower.

Special astronomical events

Any astronomical event, from regular meteorite showers to spectacular total solar eclipses or rare events such as the transit of Venus, in 2004, is an opportunity to attract children to astronomy. Children are one of the main vehicles for the spread of scientific information, because they can disseminate what they find out about the Universe to their circles of friends or families, thus avoiding, for instance, the creation of panic in social groups not warned in time about a total solar eclipse.

However such events require long and special preparations, at both national and international levels. In 1994 I remember writing that "*there are only five years left until the eclipse*". From scientific preparation proper to teaching children about the importance of the event, promoting effective and secure means to observe the eclipse, the prevention of panic and persuading the authorities to support astronomy and the education of the general public was a long road, strewn with many obstacles, but bringing great satisfaction in the end. The eclipse day turned from a scientific into a media event, due to the presence of our country's president and of the NASA general manager, as well as of an impressive number of government members and diplomats, all of whom attracted reporters from all over the world. Thus the public found out not only about the event, but about the place where it was taking place.

Special events connected with celebrations

The three successive years, 2007, 2008 and 2009, are being dedicated to special astronomical events in Romania.

2007: This is the International Heliophysical Year — IHY, when we celebrate the 50th anniversary of space exploration and the tenth anniversary of the Cassini-Huygens launch[1]. Europlanet's Outreach network has named this year *A very "Spatial" Year*[2], and has proposed a range of events during the first two weeks of October 2007. This is an opportunity to meet our celestial neighbours, due to the very favourable conditions for observing Venus, Mars, Jupiter, and Saturn. Various theatrical shows related to the planets and their exploration are scheduled in Europe. A very attractive way to discover the Solar System is through food, by means of a programme named *Astronomy/Gastronomy*.

Last but not least we should mention the three categories of the Europlanet Competition, namely:

- For amateur astronomers, the most beautiful picture of an object (or objects) of the Solar System, taken during 2007;
- For children from 6 to 12 years old, the most beautiful drawing of object (or objects) of the Solar System, made during 2007;
- For artists, the best artistic tribute to the Solar System (in the form of a video clip, drawing, painting, sculpture, and so on).

The site has been translated in very many languages, thus facilitating the access of a great number of participants from Europe.

---

[1] http://ihy2007.org/igy.shtml
[1] http://www.europlanet-eu.org/index.php?option=com_content&task=section&id=11&Itemid=37

2008: This is the national year of Romanian astronomy. Between 2007 and 2009 Romania will celebrate 100 years since the Observatory in Bucharest, the main Romanian astronomical research institution, and Donici's private Observatory, now in the Republic of Moldavia were established. Preparations for this event are coordinated with efforts to have astronomy education reintroduced into the school curriculum.

2009: This is the most important of the three years mentioned, when the celebration of the 400th anniversary of the first use of an astronomical telescope by Galileo Galilei offers a great opportunity for a large astronomy education campaign at all levels, from children to the politicians responsible for the future of our planet. The IAU Commission 46 has not yet set a special programme, as all its goals should lead to the implementation of astronomy from the earliest ages to the use of any opportunity to attain the IYA2009 objective *to help the citizens of the world rediscover their place in the Universe through the day- and night-time sky, and thereby engage a personal sense of wonder and discovery. All humans should realize the impact of astronomy and basic sciences on our daily lives, and understand better how scientific knowledge can contribute to a more equitable and peaceful society*.

What can be considered utterly new is the ever more frequent use of new means of communication. In particular, those related to the mass media can be readily applied to astronomy education and are more efficient than we could have hoped several years ago.

The general public and young people in particular are increasingly attracted by TV channels broadcasting scientific information, producing documentaries portraying the Universe as an endless source of information. Scientific journals, although maybe less in demand than popular magazines (due not least to the international languages in which they are written), and even the journals of some societies, clubs, etc. give handy material to anybody who wants to learn about a certain topic and keep it to hand.

Maybe here we should also mention posters which, although less rich in information, still have an important educational role to play and additionally give one the pleasure of decorating one's room with the latest space missions or with images from “the new” Solar System.

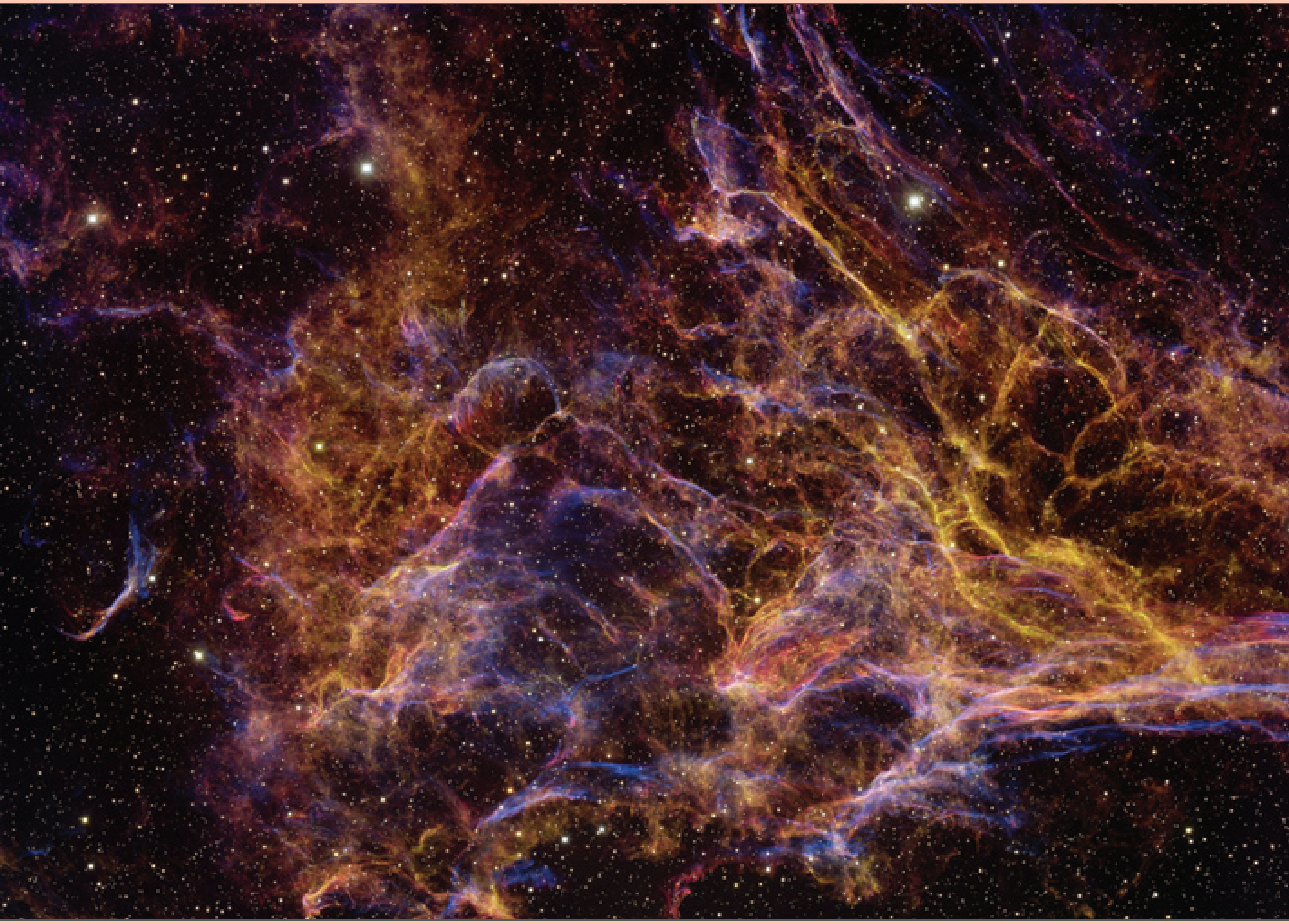
More attention should be paid to what is presented on the internet. I have personally found so many errors while looking for something connected with astronomy, and, last but not least, so many confusions between astronomy and astrology that I believe that the way in which children especially learn about the sky from the computer screen should be treated more carefully. It should also be mentioned that we have to take steps so that children can learn about the sky directly, away from city lights and not only from monitors or screens. To this effect there should be a greater collaboration between:

- Mass media;
- Schools;
- Amateur groups;
- Planetariums;

- Museums;
- Scientists;
- National and international associations.

Finally, there should be a closer collaboration even within the International Astronomical Union, between Commission 46 *Astronomy Education and Development* and Commission 55 *Communicating Astronomy with the Public* in particular, which might lead to the identification of new means of astronomy education throughout the world and in the developing countries in particular.

Credit: Sze-leung Cheung



Credit: T.A. Rector/University of Alaska Anchorage, H. Schweiker and NOAO/AURA/NSF

Session 11

EPO / Case Studies

Pickering's Triangle is part of the Cygnus Loop supernova remnant, which includes the famous Veil Nebula. It is located about 1500 light-years from Earth, in the constellation of Cygnus, the Swan. Astronomers estimate that the supernova explosion that produced the nebula occurred between 5000 to 10,000 years ago; the entire shell stretches more than six full Moons in width across the sky. This wide-field image of Pickering's Triangle was taken at Kitt Peak National Observatory in the USA.

The Global ALMA EPO programme: Communicating astronomy with the public at millimetre and submillimetre wavelengths

Mark Adams[1], **Henri Boffin**[2], **William Garnier**[3] **& Daisuke Iono**[4]

[1] National Radio Astronomy Observatory (mtadams@nrao.edu)

[2] European Organisation for Astronomical Research in the Southern Hemisphere (hboffin@eso.org)

[3] Joint ALMA Observatory (wgarnier@alma.cl)

[4] National Astronomical Observatory of Japan (d.iono@nao.ac.jp)

Abstract

The Atacama Large Millimeter/submillimeter Array (ALMA) is a major 21st century international science research facility that will open new windows on celestial origins. ALMA construction is underway in the high-elevation Atacama Desert of northern Chile. Science operations will begin in 2010, and full science operations will start in 2013. The ALMA Education and Public Outreach (EPO) programme is a global collaboration that seeks to communicate the excitement and value of the ALMA mission, science, and technology to international audiences effectively. The ALMA EPO programme is the responsibility of the Joint ALMA Observatory (JAO), the National Radio Astronomy Observatory (NRAO), the European Organisation for Astronomical Research in the Southern Hemisphere (ESO), and the National Astronomical Observatory of Japan (NAOJ). This contribution provides an overview of the ALMA Project and the global ALMA EPO programme.

Introduction

The Atacama Large Millimeter/submillimeter Array (ALMA) is a partnership of Europe, Japan, and North America in cooperation with the Republic of Chile that will open new windows on celestial origins. ALMA is funded in Europe by the European Organisation for Astronomical Research in the Southern Hemisphere (ESO) and in Japan by the National Institutes of Natural Sciences in co-operation with the Academia Sinica in Taiwan, and in North America by the U.S. National Science Foundation in cooperation with the National Research Council of Canada. ALMA construction and operations are led on behalf of Europe by ESO, on behalf of Japan by the National Astronomical Observatory of Japan (NAOJ), and on behalf of North America by the National Radio Astronomy Observatory (NRAO), which is managed by Associated Universities, Inc. (AUI).

Because millimetre (mm) and submillimetre (sub-mm) radiation is strongly absorbed by atmospheric water vapour, ALMA is being built at a very dry, high altitude site. Since ALMA antennas are separated by baselines of up to 18 km, the array's physical extent requires a relatively flat high altitude site. After an extensive survey, the 5000 m+ elevation Chajnantor plain in northern Chile's Atacama Desert was chosen as the ALMA site.

When complete, ALMA will be a radio telescope array of at least 66 high-precision millimetre and submillimetre antennas: at least fifty 12 m diameter antennas, and an Atacama Compact Array of twelve 7 m and four 12 m diameter antennas. Construction began in November 2003, and the first antennas arrived on-site in April 2007. Early Science will be achieved in 2010 and Full Science operations will begin in 2013.

ALMA EPOroles

The ALMA Education and Public Outreach (EPO) Working Group was organised in summer 2006 to provide oversight for the global ALMA EPO programme and to provide a forum for communication between the partners. Through this Working Group, the existing EPO organisations at the NRAO, ESO, and the NAOJ collaborate on international and Chilean ALMA EPO that the JAO coordinates. The NRAO, ESO, and NAOJ also lead regional EPO programmes in their respective communities: the NRAO leads North American ALMA EPO; the ESO leads European ALMA EPO; and the NAOJ leads East Asian ALMA EPO. The global ALMA EPO programme is the sum of these international, Chilean, North American, European, and East Asian ALMA EPO programmes.

ALMA EPO programme elements

The global ALMA EPO Programme seeks to communicate the excitement, discovery, and value of the ALMA mission, science, and technology to the broadest possible international audience effectively. Vision, leadership, and excellence in astronomy education and public outreach are mandates for the programme. Seven primary ALMA EPO programmes have been implemented initially: Science Community Outreach, Online Outreach, News & Public Information, Formal Education, Informal Education, Astronomical Data Visualization, and Public Affairs.

Science community outreach

To communicate ALMA's progress and vision to the professional science community, the ALMA EPO Programme designs and deploys informative exhibits, support materials, and staff to key science meetings around the world. These include truly international venues, such as the International Astronomical Union (IAU) General Assembly, as well as regional science meetings. In North America, for example, the NRAO designs and staffs ALMA exhibits at meetings of the American Astronomical Society and the American Association for the Advancement of Science. In Europe, ESO designs and staffs ALMA exhibits at the Joint European and National Astronomy Meetings (JENAM) and the EuroScience Open Forum.

Online outreach

The internet is arguably ALMA's most important communication tool, given the web's round-the-clock availability and ability to reach millions. Thus, the JAO, NRAO, ESO, and NAOJ are currently renovating and integrating their ALMA websites[1]. Innovative use of the internet, staying abreast of technology development, and aggressively employing emerging internet-related technologies are essential programme elements. Existing and planned web content includes news releases, media resources, educational materials and programmes, images and illustrations, animations, video, podcasts, presentations, and more.

---

[1] http://www.almaobservatory.org

Through the internet, the ALMA science vision and construction progress are reported to and discussed with the science community, the public, and the media. ALMA data will be broadly accessible to the public, teachers, students, and the media via online tools, procedures, and tutorials that will enable anyone with a computer, a web browser, and an interest in astronomy to access and study ALMA images, data products, and educational materials. To achieve this capability, the ALMA EPO programme will establish mutually beneficial partnerships with companies working at the cutting-edge of internet technology.

News and public information

The generation and distribution of ALMA news and information to the international electronic and print news media is a critical programme element. This work requires coordination with the international media, as well as establishing and maintaining strong working relationships with regional news producers in North America, Europe, East Asia, and Chile. Prior to the initiation of Early Science in 2010, the news team tracks and publicises key ALMA construction milestones. When Early Science commences, the news team effort begins to shift towards publicising ALMA's scientific discoveries.

The EPO teams at NRAO, ESO, NAOJ, and the JAO collaborate and coordinate ALMA news and information distribution through the ALMA EPO Working Group. News release packages include informational copy, images, illustrations, animations, video interviews, and supplemental background information. In addition to being directly used by print, television, and online journalists, news products feed into numerous other products and activities such as brochures, DVDs, books, podcasts, and public exhibitions.

The News and Public Information team is also documenting ALMA via video and photography, creating short and mid-length features that relate the many compelling ALMA stories about science, technology, people, and the Atacama Desert.

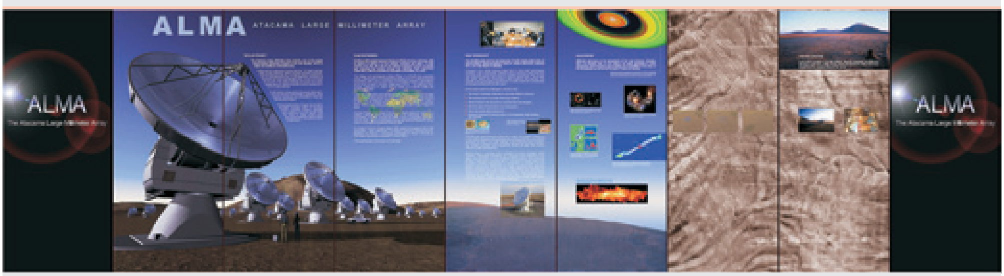
Formal education

The ALMA EPO Formal Education programme employs science, education, and multimedia experts to develop online and hard copy curriculum support products for K–12 educators and students. The ALMA Interdisciplinary Teaching Project encompasses physics, engineering, Earth sciences, life sciences, and culture, exploring the extraordinary astronomical observations planned with ALMA, as well as the Atacama Desert.

ALMA EPO education products are crafted in accord with the appropriate educational standards and are subjected to rigorous evaluation before and after their release. Addressing the curriculum requirements of the many countries participating in ALMA is a significant challenge. This programme also supports education communities by developing and hosting professional development training and workshops for teachers. In the future, software tools will be developed and distributed that enable the exploration of ALMA data in the classroom.

ALMA/ESO/NRAO/NAOJ

Figure 1 — An artist's concept of ALMA on the high-elevation Chajnantor plain of northern Chile.



ESO

Figure 2 — The latest ALMA news and information is communicated to the science community by the ALMA EPO programme's active participation in exhibitions and science meetings around the world.

Informal education

The ALMA EPO Informal Education programme establishes links with science centres, planetariums, natural history museums, observatory visitor centres, libraries and similar forums that are visited by public audiences seeking to broaden their understanding of science. A planetarium show, *Exploring the Cold Universe* is under development for IYA2009, for example.

ALMA informal education materials will be distributed via existing infrastructure such as ViewSpace[2], through new technologies such as video podcasts, and through new programme opportunities such as the Virtual Astronomy Multimedia Project[3] and the World

---

2 http://hubblesource.stsci.edu/exhibits/self-update/viewspace
3 http://virtualastronomy.org

Wide Telescope. ALMA will also be incorporated into exhibits at existing facilities such as the NRAO Green Bank Science Center in the US and the Museo Interactivo Mirador[4] in Chile.

An ALMA Visitor Centre will be integrated with the Operations Support Facility in Chile. This centre will be operational in 2013 and will include exhibits describing the project's science and technology.

Astronomical data visualisation

ALMA will provide a quantum leap in our ability to generate high-resolution images of astronomical objects at mm/sub-mm wavelengths. The value of breathtaking astronomical images for capturing media and public attention need hardly be stated, and excellent images will be a major contributor to establishing and maintaining ALMA's public and media profile.

ALMA/ESO/NRAO/NAOJ

Figure 3 — The ALMA EPO Programme creates and delivers a wide range of products to the media and the public, including brochures, DVDs, and books.

Thus, the ALMA EPO programme is investing in mm/sub-mm data visualisation, supporting the marriage of ALMA science and art. This programme will also develop methods to create effective composites with images acquired by ALMA era observatories operating at other wavelength regimes such as the James Webb Space Telescope, the European Extremely Large Telescope, the Expanded Very Large Array, and the Large Synoptic Survey Telescope.

Public affairs

Actively promoting ALMA science, technology, and value to the Chilean national and regional governments, and to the Chilean people, is an important EPO responsibility. The ALMA EPO programme has established and maintained excellent relations with Chilean communities, especially those located near the ALMA site: San Pedro de Atacama and Toconao. The project partners place a high priority on their obligation to be excellent stewards of the ALMA Science Preserve, conserving archaeological sites as well as the flora and fauna within the Preserve.

[4] http://www.mim.cl

Summary

The ALMA is a major international astronomical observatory under construction in northern Chile that will soon open new windows on celestial origins and explore new science frontiers. A global ALMA EPO programme has been initiated by the NRAO, ESO, NAOJ, and the JAO that includes Science Community Outreach, Online Outreach, News & Public Information, Formal Education, Informal Education, Astronomical Data Visualisation, and Public Affairs. ALMA is as an extraordinary new astronomical observatory, and the global ALMA EPO programme described here seeks to take full advantage of ALMA as an extraordinary opportunity to communicate astronomy to the public.

Putting EuroPlaNet on the news — The European Planetary Science Congress 2007 case study

Mariana Barrosa[1,2,3], Anita Heward[2]
[1] University of Glamorgan
[2] EuroPlaNet OSC (anitaheward@btinternet.com)
[3] Navegar Foundation (mariana.barrosa@multimeios.pt)

Abstract

In this article we analyse the exercise of science communication through a very particular medium and in a very specific work environment: the press office of the II European Planetary Science Congress in Potsdam, Germany, from the 19–24 August 2007, hosted by EuroPlaNet — the European Planetology Network. During this event, the most important discoveries and research in planetary science recently made in Europe were presented and discussed by the scientific community. It was the press office's task to try to put these discoveries and research on the news.

Introduction

Let us first contextualise the scope of our case study: what is EuroPlaNet? EuroPlaNet was created in 2005 to bring together the European researchers working in planetary science by setting up an interdisciplinary European Planetary Science Network (EuroPlaNet) and in this way achieving a long-term integration of the discipline in Europe. It is a pan-European organisation involving institutes from seventeen different countries and deals both with planetary science and its communication.

The network's objectives are to increase the productivity of planetary projects with European investment, with emphasis on major planetary exploration missions; to initiate a long-term integration of the European planetary science community; to improve European scientific competitiveness, develop and spread expertise in this research area and to improve public understanding of planetary environments. Since its creation in 2005, the organisation has worked on implementing an outreach strategy, which is now beginning to bear fruit. This strategy was one of the founding stones of the contract that lead to the formation of EuroPlaNet. The press office at the annual congress plays a major role within the organisation's communication strategy.

The press office, step by step

At the end of June the press office took the first steps when it received the 512 abstracts accepted for the Congress. The first task was to go through all of them and to identify those with possible interest to the media. The main search key word was results, but other topics like scientific relevance, proximity, major discoveries, new angle or human interest were also considered. There was also some input from the conveners of each panel who gave their opinion on the talks they considered of special scientific interest.

In mid July, a preliminary list of 67 abstracts had already been prepared. Some would probably be under embargo or could be combined into a joint release with other talks on similar topics. After some first contacts and analyses, the list came down to 35 abstracts. The objective was to prepare and send out around 15 to 20 press releases under embargo to journalists before the Congress.

It was now time for the next important step in this process: contacting the scientists. This was done by e-mail, using a template with some questions that would allow the press office to know if the story was worth following up. In case of a positive response, further information (papers, etc) would be asked for, to complement the data we already had.

The modus operandi would be to write a text announcing and describing a finding or discovery, using language aimed at news media (print and broadcast reporters) and the general public, based on text supplied by the lead research scientist, but re-written for news focus and style. The final text would have to be approved by the scientist.

The process of the production of the press releases occurred without problems as far as the relation to the press office and the scientists is concerned. Overall, they were extremely helpful, patient and willing to collaborate. However, at least in the first contacts, one could not help but noticing a certain discomfort, distrust and even surprise from the scientists when asked for information and told it would be used for media release purposes.

Next we present some comments collected during these contacts that we believe illustrate many of the known problems that the complicated relationship between science and the media faces, like lack of knowledge regarding "news value", bad experiences in the past, lack of experience in science communication, some distrust in the work of the press office and sometimes even an uncontrollable desire to control what was being written[1].

Regarding the suitability for a press release, I'm not an expert whether my results can appeal the media or not.

Some additional information on my work... I'm not sure what it can be interesting, so I put everything together so you can have an idea. Please feel free to take out everything you don't find useful, I wrote a lot!

[with media] We had some bad experience here in Germany. Newspapers called us "strange people", astronomy and astrology were confounded and they made us ridiculous...

My collaborators and I would like to know more about what kind of "media release" you have in mind, particularly if the release will be available on internet. Thank you very much for providing us with more information so that we can reach a decision on this matter.

---

[1] As the scientists did not know that these communications would be used in this case study, their comments and remarks will remain anonymous and are maintained in their original format.

I would be very grateful to you if you let me know whether this text will be released or not and to contact me for any modifications made in the material prior to the release.

It is very important to make the above changes. I would be very grateful to you if you could send us a new draft of the press release as soon as possible.

I'm also sorry for asking it because I have never experienced press release activity. Thank you for your instruction.

Now I modified your first draft. I would appreciate it if you can accept the modification, making the press release clearer and more precise.

The modified version did not make the press release more precise and clear. This scientist's knowledge of the English language was not very good.

The second paragraph begins with "A large amount of dust...". Since there is no clear evidence yet of the amount of dust coming from comets in the Solar System, it would be better to use the phrase "A fair amount of dust..." instead.

The sentence "*a large amount of dust*" was taken from the abstract submitted to the Congress, therefore written by the scientist himself.

But, in spite of these minor "fears", as said before, the scientists were extremely helpful and vital to the success of the press office. Most of them understood their primal role in the science communication process and were happy and eager to help and to improve their communication skills. Some even offered to write the press release themselves!

Writing and distributing

The press office produced and distributed a total of 15 press releases from very different scientific areas, which correspond to the initial objective. The complete list of the press releases can be found online at EuroPlaNet´s outreach website[2].

The distribution of the press releases was done mainly by three methods: distribution to the press officer's private media mailing list, distribution to AlphaGalileo[3] and posting on the EuroPlanNet's outreach website.

AlphaGalileo posted all our releases, which was a precious help as it allowed us to reach a vast number of science journalists. Also, the press officer's media mailing list, with many private direct contacts of journalists, included the contact of the American Astronomical Society's press officer, who helped disseminate the releases with the American press. Reuters also picked up most of

[2] http:// www.europlanet-eu.org
[3] http://www.alphagalileo.org/

the stories and played an important role in distributing them. Many of the printed news reports referred to Reuters as the source.

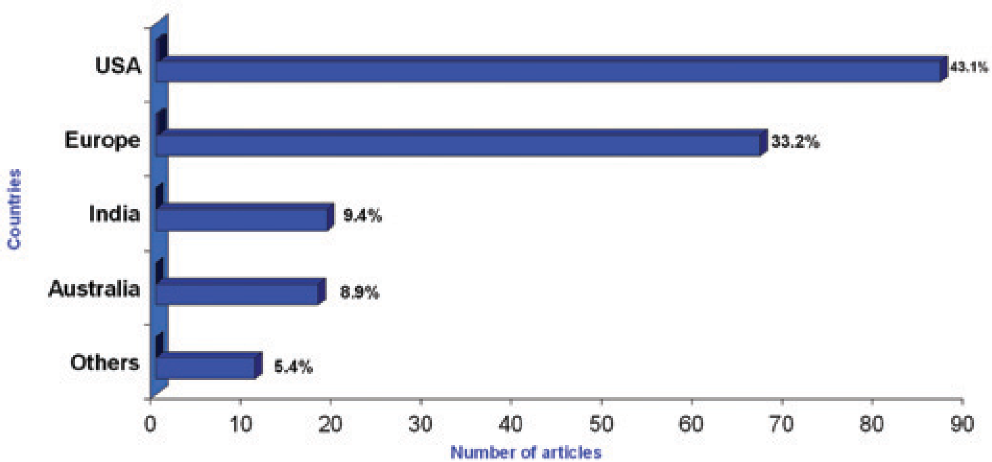
Here, we must emphasise the importance for any public information officer (PIO) of keeping an organised and updated contact database of journalists and media. In this particular case, as in most situations, networking and personal contact with journalists had more effective results than distributing press releases randomly.

Press coverage results — how much, what, where and when

Because we aimed at an international coverage, it was quite hard to keep track of all the news published or aired in the different countries. Bearing in mind that the vast majority of printed publications around the world now have online versions, we opted for using the Google News Alert service and used the articles we were able to pick up on the internet to measure the results of the work of the Press Office. Although we are aware that some news has necessarily escaped this "search net", and that this sort of search may be a little biased, we are confident that the results presented are a fair enough representation of the reality.

The clippings were collected over a period of 25 days, between the first day of the Congress (19 August) and 12 September 2007. During this period we collected 189 articles directly derived from our press releases and 14 others not directly related, but that still mentioned the Congress, giving a total of 203 news items originating from 19 different countries.

It is interesting to note that, although this was an European scientific event, the majority of news was publish or aired in American media (43.1%) while only 33.2% originated in European media (please see Figure 1). An analysis of the clippings showed us we were present in a total of 110 different media, from which we can point out some media that, for their journalistic importance and



Courtesy of the authors

Figure 1 – Distribution of press coverage by countries

prestige, assume special significance for our work. These include Nature (UK), Sky & Telescope (USA), New Scientist (UK), National Geographic News (USA), The Times (UK), BBC Online (UK), CNN (USA), Scientific American (USA) and Le Monde (FR).

Conclusion

The press coverage results of this event showed us that it is possible to place science related news in the media. They also showed us that this is only possible with planning, preparation and hard work. In a word — professionalisation! The results of this press office were based on months of work, contacts and the use of all the distribution channels available. We finish by listing some practices we believe would help enhancing the visibility of European science in the media:

- Public communication of research results must be a part of the scientific process itself and not considered as an optional activity only something you do if you have the time or energy for it.
- The role of the PIO is vital in this process — his or her relationship with external audiences influences the results and products of science communication. Also, the PIO's expertise in the relevant field of research will certainly influence the quality and effectiveness of the communication process.
- Scientists and press officers need to work more closely together. In the present case study, none of the scientists contacted during the media activities for the Congress, with one or two exceptions, had prepared the communication of their results with the PIO representing their institution.
- The production of multilingual products would improve science visibility in the European press. English is the "official scientific language". But this is not necessarily the case when we talk about European journalism, journalists and most certainly not when we talk about the European public.

Credit: Dennis Crabtree

The IYA2009 in Guanajuato, Mexico: Activities for astronomy education and popularisation at *La Azotea*

Hector Bravo-Alfaro[1], Klaus-Peter Schröder[1], Luis Ramírez[1] & Rosendo Yebra[1]
[1] Departamento de Astronomía, Universidad de Guanajuato. Mexico (hector@astro.ugto.mx, kps@astro.ugto.mx, luisrg@astro.ugto.mx)

Abstract

Since the year 2000 the facilities of a rustic observatory, named *La Azotea* (the roof-top terrace), have been part of the Departamento de Astronomia de la Universidad de Guanajuato, 400 km NW of Mexico City, where ten professional astronomers do research and teach at both undergraduate and graduate level. In previous meetings we described the refurbishment of this public observatory which was finally reopened in November 2006. We present here the main achievements of the refurbishment and the first public activities.

Introduction

The public *La Azotea* observatory had already made rudimentary astronomical observations over decades. Miguel Izaguirre, an engineer in topography, was in charge of the site from the 1950s. He received funding for a dome, a 150 mm reflector, and a 100 mm refractor, which were installed on the roof of the main university building, right in the historic centre of Guanajuato City (Figure 1). In addition, an office and a classroom with a capacity for some 50 people were constructed. For more than 10 years, the classroom was also used to teach astronomy to high-school students.

Miguel Izaguirre initiated the project to install a professional observatory in the mountains surrounding Guanajuato City late in the 1970s. In a fruitful collaboration between the Universidad de Guanajuato and the Universidad Nacional Autonoma de Mexico (UNAM), a 57-cm Ritchey-Chretien was installed some 25 km W of Guanajuato City. Years later, in 1994, these efforts gave birth to the Departamento de Astronomia (DA), where nowadays ten professional astronomers do research and teach at both undergraduate and graduate level[1] (see Figure 2).

Since 1990, however, with the retirement of Izaguirre, the public observatory *La Azotea* received neither maintenance nor any modernisation. After a total of 35 years without any major refurbishment, the general state of the facilities (Figure 3a) had become less than satisfactory. By 2001, when the site was formally placed under the DA administration, the only modern equipment was a portable 8-inch SC-telescope. During the following 5 years we ran a public programme of free astronomical observations for a non-specialised audience. However, substantial repair work on the building and dome, and the acquisition of new telescopes and adequate furniture were urgently required. By March 2006 we were awarded the finances for both, a refurbishment of the building (see Figure 3b) and new equipment. This support was given by the Universidad de Guanajuato and the Consejo Nacional de Ciencia y Tecnologia del Estado de Guanajuato.

[1] http://www.astro.ugto.mx

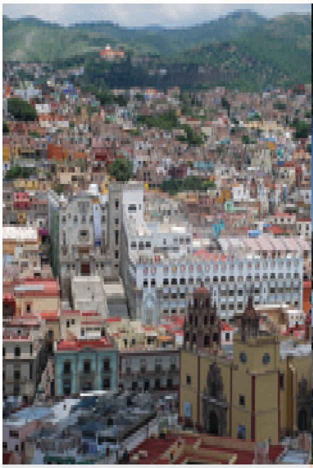


Figure 1 – The central building of Universidad de Guanajuato and the observatory.

Figure 2 – A view of the Department of Astronomy.

Results of the refurbishment

1. The building: lecture room and office were totally rebuilt (Figure 3b).
2. Antique Instruments: We repaired two antique instruments, a transit-telescope of Lerebours & Secretain (Paris ~1850, found without optics), and a heavy mount by Negretti & Zambra (London ~1880). Both instruments were in very bad shape but are now fully operational. The heavy mount was stripped of its gravity drive and given a modern electric motor. It currently carries our new 14-inch Schmidt-Cassegrain (SC) telescope (see below).
3. Modern Telescopes: The observatory is now equipped with one 14-inch SC, two portable 8-inch SC telescopes, one new portable 4-inch refractor, solar filters, and a set of filters and eyepieces for astrophotography.
4. Other: The office and lecture room are now equipped with comfortable furniture. A beamer, sound system, computers and internet access have been installed, and a modest collection of Spanish astronomy books and magazines is available. These upgrades now enable us to carry out conferences and seminars.

Figure 3(a-b) – A view of the observatory before (Figure 3a) and after (Figure 3b) refurbishment.

Activities and Future:

The following activities have been carried out during 2007 and will continue in 2008:

- A daily programme of astronomical observations open to the general public and school groups. Already, we have ~200 visitors per month.
- A Conference Series in Astronomy, consisting of five public talks. For over 12 years, we have been organising two such series per year (in spring and autumn) in Guanajuato. Our XXV Conference Series was held, for the first time, at *La Azotea* in April–May 2007, complemented by astronomical observations, and it was a complete success (Figure 4).
- In July 2007 we organised the 1st Summer School in Astronomy for elementary and high school teachers. The topics were: the History of Astronomy, Stars, Galaxies, and Using a Telescope (Figure 5).
- It hasa been proposed that *La Azotea* act as a consultation centre on astronomical topics for teachers and students.

Figure 4 – View of a public talk.

Figure 5 – View of a group during the first summer school for teachers.

All images © Hector Bravo

For the near future, we have plans for some additional activities; for example, the foundation of an amateur astronomy society, and regular daytime visits of school classes in order to promote solar observations and basic physics experiments.

We plan to involve university students from our astronomy programmes in some public activities. Students in advanced levels of the undergraduate physics programme will support our work as part of their social duties. Our aim is to run *La Azotea* as a centre for science popularisation with an important impact on students from all educational levels. With the activities described above we will start a public promotion campaign for the IYA2009 early in 2008.

Credit: Jan Wainstam, Jonas Lindqvist —

Astronomy in my shopping cart — Today I bought some asteroids, hundreds of black holes and three Solar Systems!

Caterina Boccato & Elena Lazzaretto
INAF National Institute for Astrophysics — Astronomical Observatory of Padua
(caterina.boccato@oapd.inaf.it, elena.lazzaretto@oapd.inaf.it)

Abstract

Here we will present a pilot project that will be tested and developed throughout 2007/08 in advance of the International Year of Astronomy. Why "putting astronomy in the shopping cart"? The aim of the project is to publicise astrophysics at a popular level, choosing a place that best matches the meaning of the word "popular": the shopping mall. With this project we want to arouse consumer interest in science, making use of the supermarket inside any shopping mall: a place people are familiar with and where they find common consumer goods. The final purpose is to give our science consumer the chance to bring home shopping bags filled not only with consumer goods, but also with a piece of knowledge about astronomy, astrophysics and the way astronomers work and think to understand the Universe and its phenomena.

Introduction

The authors work at the Astronomical Observatory of Padua, one of the 19 Institutes that make up the Italian National Institute for Astrophysics — INAF — which promotes and coordinates research activities in astrophysics in Italy. Our observatory benefits from the substantial experience of our working group in astrophysics education, information and outreach gained in the last 10 years of work in these fields. *Astronomy in my shopping cart* is a project about a new method of communicating science to the public at large. The aim of this project is to bring astrophysics to real people at a popular level, choosing a place that best matches the meaning of the word "popular": supermarkets inside shopping malls. We will try to describe why we have chosen these types of places; i.e. what considerations led us to choose places like supermarkets and shopping malls and how we want to pass on our science in places like these. In particular, we would like this to be an initial pilot project; to test it in one chosen shopping mall in order to collect feedback so that we can develop it further throughout 2008. We would then be able to propose it, with a well-structured format and over a wider area, for 2009 under the aegis of the International Year of Astronomy. The shopping mall in which our pilot project will take place is located near Padua and had about 6,200,000 visitors in 2006: hence we expect to have a very large number of potential "science consumers"!

Shopping malls as real breeding grounds of "science consumers"

Thanks to our experience over many years, we understand that if we want to bring science to the public, and not vice versa, we have to follow the public first!

But where does the public go? To answer this question we have considered several different kinds of studies and researches, from our own or the direct experience of other communicators in the field, to recent statistical studies about the public perception of science. The first thing to point out is that "the activity's location in space is truly as important as its format", Riise (2005). The second point, as has recently been demonstrated, again by Riise (2005), is that "shopping mall-goers" match closely with local demographic profiles. When we say "location", we obviously mean a shopping mall and, in particular, the supermarket placed inside it. It is important to explain that Italians are only just beginning to appreciate the shopping mall experience in large numbers and so we apply the golden rule: follow the public! Moreover, we can clearly say that today we have overcome the negative idea that arose 15 years ago, when shopping malls first arrived in Italy. This idea was expressed for the first time by the French anthropologist Marc Augé (1995), who saw shopping malls as no-places (Augé himself coined this word), that is, places that do not hold enough significance to be regarded as "places". Today, our sociologists and anthropologists assert that these new peripheral spaces are becoming, at least in Italy, a sort of favoured "meeting point" for all kinds of people: shopping malls are drastically changing their social roles and assuming a high enrolment, communication and experience value, Musaro (2007). Indeed, it was in Athens that the first market in the world, the *Agorà*, was founded. It is perhaps relevant that Herodotus, the Greek "Father of History", considered this marketplace as the defining sign of civilisation. A last, but not least, point is that, according to the 2005 Eurobarometer Research of the European Commission[1], Italians much prefer public meetings and street events about science than visits to museums or science centres.

The project

We have briefly described the considerations that led us to choose shopping malls and supermarkets; in the following we will describe how we intend to apply these ideas in these popular places.

Astronomy in my shopping cart consists of two steps:

- firstly inside the supermarket, in the fruit & vegetables section;
- secondly at a stand outside the supermarket, in the shopping mall's gallery.

Keeping in mind that malls in different countries different have different layouts, it is necessary to stress the fact that inside almost every Italian shopping mall you can find a supermarket, positioned in a big closed space. As well as the supermarket, you come across a lot of different shops while just wandering around in the so-called gallery. The first of the steps mentioned above is the most important because it really enables us to reach everybody, even people who do not care at all about science in general. At this level we want to "sell" some astrophysical concepts by positioning them among the fruit and vegetables. We want to take advantage of the supermarket's wares to perform comparisons and to offer visual explanations. Fruit and vegetables belong to everyday life: people are used to choosing, touching and buying them. That is why we chose them: to drive people's interest toward unfamiliar concepts using familiar items! The approach is innovative: we catch the consumer's attention using "commercial language" but our "spots" are

[1] http://ec.europa.eu/research/rtdinfo/pdf/rtdspecial_euro_en.pdf

not empty at all. They deliver information, they arouse curiosity and they contain a message. The message is simple: astronomy exists and it is an active science.

Furthermore, showing simple astrophysical concepts, we will demonstrate that to develop astronomy it is necessary to have a scientific method, which enables us to understand objects that are too distant from us and from our senses. We want to show that it is POSSIBLE to understand the Universe despite the fact it is NOT POSSIBLE for us to reach the objects directly. But, to do this it is necessary to really make the effort. In other words: we would like to bring people to think about the fact the we can deduce a lot about the Universe even though we have not direct access to it.

At this point, the message and related remarks could appear obvious but they are not at all! We have to keep in mind both the context in which we are going to present them and, more importantly, the fact that we are the ones who have followed the public and not vice versa as it usually happens in performing outreach activities. We are really bringing astrophysics to people who did not ask to know about it.

Astronomy in my shopping cart is an ongoing project: we are going to try it out in a supermarket by the end of the year. At the moment we are planning the astrophysical concepts we are going to “sell”. Here we want to show two examples of what we think we could write down on the cards to be positioned among the fruit and vegetables.

On one card we will put an image of the Hubble Deep Field showing galaxies and, right over this image, we will write down something like this: *Stop here and look at them, the Universe is like a supermarket! There’s a lot of stuff! But the difference is that you have to understand celestial objects without reaching them! Astronomers have to invent a lot of tricks to get at the information.* This card can be positioned somewhere in the fruit and vegetables section and the comparison is between the variety of the supermarket items that one can reach and touch, and the variety of the Universe’s objects (i.e. galaxies) which one cannot reach by any means. Another card, showing how Saturn and the Earth differ in dimensions, could be positioned near oranges or cherries.

Figure 1 – One example of card with the Hubble Deep Field

Figure 2 – A second example of Card with a comparison between Saturn and Earth

All figures courtesy of the authors

Written upon it, a short sentence like this: *Saturn and the Earth: think of them as a big orange and a cherry. Astronomers can obtain this kind of information just by observing and using the laws of physics, it's not necessary to go to Saturn to measure it!*

Once the "tour" in the supermarket is finished, the consumer will find a stand in the shopping mall's gallery where two astronomers will answer their questions and distribute information. Obviously people who have not even entered the supermarket can stop at the stand and find substantial information. But this is a normal outreach activity. Our project's originality can be found in the first step when we are actually inside the supermarket. At the astronomy stand we expect to see a sort of "natural selection": not all consumers will choose to stop there, only the "science consumers" will. The science consumer will be the one who has read our "astronomy facts" inside the supermarket and, as a consequence, has had his curiosity excited. He wants to learn more, to ask questions.

At this point, our project's conceptual path can be summarised in four basic points:

1. Astronomy exists and it is an active science.
2. You CAN understand the Universe despite the fact you CAN'T reach and touch its objects, but you have to really make the effort (this is our main message, and once absorbed by someone it allows a deeper understanding of this science).
3. This effort leads to a better understanding of natural laws and improving technology.
4. Better understanding means an enrichment of human knowledge, and improving technology means an improvement in everyday life.

Summarising further, we can say that the philosophy of our project is to present astronomy in everyday life! The ultimate aim is to give our science consumer the chance to bring home shopping bags filled not only with consumer goods but also with a piece of knowledge about astrophysics and the way astronomers understand the Universe and its phenomena.

References

- Augé M. (translated by John Howe) (1995), Non-places: Introduction to an anthropology of supermodernity. Verso, London & New York. First published (1992) as Non-Lieux, Introduction à une anthroplogie de la supermodernite
- Musarò P. (2007). È l'uomo chef a il luogo, non viceversa. Luoghi e non luoghi del consumo. In: L'esperienza negli spazi di consumo. FrancoAngeli, Milano, pp. 57-71
- Riise J. (2005), When the place has a role. In: At the human scale. International practices in science communication. Metcalfe J. et al, Beijing, P.R. China; pp 83-91

Dark Sky Scotland

Dan Hillier
Royal Observatory Edinburgh (djh@roe.ac.uk)

Abstract

Dark Sky Scotland (DSS) 2006-2008 is a nationwide programme of public and educational astronomy events. It demonstrates successful national partnerships with non-astronomy organisations and effective ways of delivering events in remote rural communities. DSS is looking for international partners for IYA2009.

Introduction

Dark Sky Scotland[1], which runs from October 2006 to March 2008, is a nationwide programme of public and educational astronomy events. It is the first such programme in Scotland and perhaps the first time any country in the world has developed a national programme of events around its dark skies. As a case study it demonstrates success in forming national partnerships with organisations that are not normally involved with astronomy and also ways of running events that have a lasting impact in rural communities.

Scotland has approximately 10% of the population of the UK and some 33% of the land area. Consequently, some of its regions have among the lowest population densities in Europe. This means it has it has some of the largest areas of dark skies in western Europe. It also means that there is a nationally recognised need to provide support for, and services to, remote rural communities.

Dark Sky Scotland harnesses the national asset of Scotland's dark skies, bringing together a range of partners to deliver astronomy events in these rural communities. The steering group partners are the Royal Observatory Edinburgh, Forestry Commission Scotland, Institute of Physics Scotland, Careers Scotland and Glasgow Science Centre. The main funding partners are the Office of the Chief Scientific Adviser to Scotland, Highlands and Islands Enterprise and the UK Science and Technology Facilities Council. Additional funding is provided by some of the local organisations that host the Dark Sky events.

These partners provide an essential mix of contributions to the project including venues, event marketing, astronomy communication and science education. The Forestry Commission Scotland (FCS) is a particularly interesting contributor to the project because, as a forestry agency, it has no specific remit to promote astronomy or even science more generally. FCS is Scotland's largest landowner and therefore a "custodian" of much of the country's dark skies. Since the 1990s, FCS has placed a greater emphasis on its work to promote the environmental and social benefits of its forests. In the terminology of FCS, astronomy is a "non-timber forest product". FCS has been contributing to the hosting, organising and marketing of DSS events because of the

[1] www.darkskyscotland.org.uk

social and tourism benefits of these events to the communities near its forests. At a simpler level, FCS staff have been highly motivated by the opportunity to play a role in helping to run popular and inspirational astronomy activities.

During the eighteen months of the project, the DSS will run some 40 events involving over 60 organisations. It has trained some 60 research astronomers, students, amateur astronomers, teachers and science communicators to run these events.

So what do these Dark Sky events entail? In particular, in what way are they effective in rural communities? The format of the events varies from location to location but a typical event follows this format:

Friday

am Dark Sky team travels to the venue.
pm Training workshop for teachers on observing with naked eye and robotic telescopes.
evening Family stargazing session.

Saturday

am Training workshop for tourism and community organisations on naked eye observing.
pm Astro-fun for families including Starlab planetarium, comet-making demonstration, rocket-making.
evening Family stargazing session.

The Dark Sky team returns home on Sunday. Given the often cloudy Scottish weather, there are plenty of indoor activities and the events are marketed as “weatherproof”.

This format means that the event reaches all parts of the community, creating a buzz during the weekend. In particular, through the training workshops, it leaves a legacy among teachers, tourism organisations and other community groups inspiring them to run astronomy activities in the future. This is important because it is not financially viable for the Dark Sky team to visit these communities on a regular basis in the future. So the event must make a make a big and enduring impact.

Ideas for 2009

The experiences of DSS offer a number of ideas for other countries planning for International Year of Astronomy 2009. Firstly, the successful partnership with Forestry Commission Scotland suggests that large land managers and conservation agencies in other countries might form national partnerships to host and support inspirational astronomy events. DSS will continue to run in Scotland and it is also looking for links with other parts of the UK and internationally. For example, 2009 is International Year of Homecoming for Scots when there will be special programmes to make links with the Scottish diaspora around the world. Meanwhile, the Royal Observatory Edinburgh manages the OPTICON network for European astronomers. Both these programmes may provide opportunities to establish links with international Dark Sky programmes in 2009. In practical terms, DSS will be looking to run a demonstration event for international partners – probably in 2008 – so that they can see a DSS event in action and take home ideas that will work in their own countries.

Intermediary astronomy: Education through the leveraging of networks, partnerships and intermediaries at the Astronomical Society of the Pacific

Jim Manning, Suzy Gurton, Michael Gibbs, Dan Zevin, Marni Berendsen, Andrew Fraknoi
Astronomical Society of the Pacific (ASP) (jmanning@astrosociety.org)

Abstract

The Astronomical Society of the Pacific (ASP) represents a wide body of astronomical interests within the US, including a very vibrant educational section. The ASP aims to play a major role in IYA2009 as shown in this article.

Introduction

Compared to the ancient olive tree that is Greece, the Astronomical Society of the Pacific is a mere sapling. But at nearly 120 years old, it's a pretty old organisation for the United States. During that lengthy existence, the ASP, founded in San Francisco, California in 1889, has positioned itself at the intersection of all of the major astronomical constituencies: the community of scientists, the community of formal and informal educators, the community of amateur astronomers, and increasingly, the family of education and public outreach (EPO) professionals as well.

One of the primary objectives of the society is to focus on serving astronomy "intermediaries", i.e. those at the interface between astronomy and the public to achieve maximum impact in its education and outreach efforts. A primary mechanism for achieving this leveraged effort is through the establishment of physical and electronic networks and partnerships.

Project ASTRO

Our oldest such programme is Project ASTRO, which pairs volunteer professional and amateur astronomers with educators to create teaching teams to improve astronomy and science teaching in the classroom. It is an enquiry-based programme, and has served more than 200,000 students since 1993. A spin-off programme of this effort is called Family ASTRO, which uses leader kits to engage families in activities, programmes, and games to help improve the understanding of astronomy in family groups. Thousands of families have been involved since this programme's inception. There is presently a network of 13 Project ASTRO/Family ASTRO sites across the US; their coordinators meet annually to exchange innovations and resources.

One of the additional resources we use to support formal educators is the Universe in the Classroom newsletter, a quarterly publication for teachers of Grades 3-12 that features astronomy articles, classroom-ready activities, and resources. We have several thousand subscribers to the newsletter and many more downloads of the issues from our website; these users constitute another kind of network using ASP resources in education efforts. The publication is now hosted on the web and we are looking for international translators of the newsletter to enhance accessibility around the world.

Figure 1 — The Night Sky Network program provides outreach materials and training for amateur astronomy clubs to use with their audiences at star parties and other events.

THE UNIVERSE IN THE CLASSROOM

Invisible Galaxies: The Story of Dark Matter

ASP

Figure 2 — The on-line Universe in the Classroom newsletter provides astronomy content and inquiry-based activities for classroom teachers.

Networks form the key

Another network of formal educators that we hope to develop in the future involves NASA's Stratospheric Observatory for Infrared Astronomy (SOFIA). The ASP, in partnership with the SETI Institute, manages the education and public outreach effort for SOFIA. "First light" for the observatory is scheduled for 2009, and once it is in full operation, one of the EPO goals is to fly high school teachers with researchers on missions, creating a growing network of teachers with authentic science experiences in a manner similar to the Project FOSTER (Flight Opportunities for Science Teacher EnRichment) programme for the Kuiper Airborne Observatory in the past.

Another network that we help to serve is that of introductory astronomy teachers at colleges and universities. Every three years, the ASP organises COSMOS in the Classroom, a hands-on symposium on teaching astronomy to undergraduate non-science majors. We believe that this helps to create an informal "community of practice" among these teachers. Proceedings from past meetings are available through the ASP.

The Society has also cultivated networks of informal educators. Among these are the network resulting from the National Science Foundation-funded program called Astronomy from the Ground Up, which provides professional development opportunities for informal educators at small and medium-sized science and nature centres who are interested in bringing more astronomy to their audiences. We use themed education "toolkits" of hands-on activities, and both on-site workshops and an online distance-learning programme to provide this professional development. This effort has created a community of practice of 160 (and growing) across the United States and beyond, with the ability to share experiences and ideas. This effort is conducted in collaboration with the National Optical Astronomy Observatory (NOAO) and the Association of Science-Technology Centers (ASTC).

Another informal network we manage is the Night Sky Network (NSN) – a collaboration of amateur astronomy clubs across the United States whose members are engaging the public through outreach events. The ASP, under contract to NASA and with the support of numerous partners (including the Jet Propulsion Laboratory Planetquest Public Engagement Program, NASA's Origins, Solar System, and Structure and Evolution of the Universe Forums, and the Kepler Discovery Mission, NASA EPO at Sonoma State University: GLAST, Swift, and XMM-Newton Missions, and the Suzaku Mission EPO Program), develops toolkits on astronomical themes and training DVDs for use by members of the network, and provides ongoing support through monthly newsletters, and teleconferences and webcasts with NASA scientists. More than 6,500 outreach events have been logged by the NSN, serving more than 550,000 people, since 2004. Some 200 clubs are presently involved in the NSN.

The society has received a new National Science Foundation grant, called *Sharing the Universe*, to study amateur astronomy clubs to learn more about why some do public outreach and others do not, and to see if we can develop and provide additional support mechanisms that will help to establish a culture of outreach among astronomy clubs in the United States.

Another community we strive to support is the EPO community itself. In recent years, the ASP has used its annual conference as a venue for bringing together EPO professionals to share, learn, and develop networks of support and communication. Several hundred EPO professionals have attended each conference of the last three years. In 2008, our conference will be in conjunction with the American Astronomical Society (AAS) summer meeting using its meeting-within-a-meeting format. We will be partnering with the AAS in developing an International Year of Astronomy (IYA) Symposium to include several days for EPO professionals to share, plan and coordinate their IYA efforts, and one or more days of demonstration and training workshops to test our efforts on each other and on target audiences (intermediaries such as formal and informal educators, amateur astronomers, etc.) we want to engage for IYA. Further, the ASP has proposed the theme for its 2009 meeting as one of "securing the legacy of IYA", to facilitate and develop ways to sustain the efforts, interest, and awareness generated by IYA beyond 2009. The venue has yet to be established.

The ASP also serves science community networks through the dissemination of peer-reviewed research papers in the Publications of the ASP (PASP), and by providing a publications service for science conference proceedings. And the ASP membership itself forms a *de facto* network as a community of support for the work we do. This community is served through Mercury magazine, e-mails, regular mailings and other means and member benefits.

Summary: the ASP and IYA2009

The US goal for IYA is *to offer an engaging astronomy experience to every person in the country, and build new partnerships to sustain public interest*. We at the ASP believe that this goal is very compatible with our mission to increase public understanding and appreciation of astronomy through scientists, educators, enthusiasts and the public as a vehicle for advancing science literacy and exchange. We think that our work in leveraging networks and partnerships of astronomy intermediaries – and our efforts to support networking among our professional colleagues–helps to advance this mission. This approach can be a powerful tool for advancing the goals of the IYA as well. So let us work together; the ASP welcomes the opportunity to partner with others with similar goals in mind.

In short, the ASP's mission is to advance science literacy through engagement in astronomy. During the next few years, we hope that mission will also be to advance the goals of the International Year of Astronomy through the leveraging of astronomy intermediaries in partnership with our friends. By the time the dust settles on 2009, we sincerely hope that we may count all of those assembled among our friends, and that you may count the ASP among yours.

People can find out more about the ASP's programmes and networks, and more about the Society itself online[1].

---

[1] http://www.astrosociety.org

Naming asteroids for the popularisation of astronomy

Orlando A. Naranjo
Grupo de Astrofísica Teórica, Universidad de Los Andes, Facultad de Ciencias, Mérida, Venezuela (naranjoula@yahoo.com)

Abstract

We give a detailed description of how the naming of asteroids was used as a prize in competitions run by educational institutions and museums. There were two events, one in Venezuela and one in Brazil, which used this as an attractive alternative method for the popularisation of astronomy. The first competition, named *Bautizo Espacial* (Space Baptism), consisted of scientific stories written by high school students. The second, called *Grande Desafio* (Big Challenge), was a competition where teams of students were challenged to design and build prototype equipment to fight forest fires. Nationally, both events received wide publicity through newspapers, radio, TV and web pages, reaching many people in both countries. As part of both the events, several activities promoting the public knowledge of astronomy were held.

The asteroids that were named in these competitions are just some of the many discovered in a search programme developed by the Group of Theoretical Astrophysics of University of Los Andes in Mérida, Venezuela (Grupo de Astrofísica Teórica de la Universidad de Los Andes) as a mainstream research programme.

Finally, *Asteroids for the Popularisation of Astronomy* has been formally proposed to the IAU as a worldwide programme during the celebration of the International Year of Astronomy in 2009 (IYA2009).

Introduction

When Galileo Galilei first observed the moons of Jupiter he never imagined that later discoveries made with more sophisticated and modern telescopes could be used as a tool for the popularisation of science, technology, and innovation. Nowadays, even though many hundreds of thousands of asteroids have been discovered, the public still does not know the importance of studying them and much less, the risk that they represent as a potential danger for mankind. However the relationship between scientific development and technological progress is recognised as a significant contributor to the welfare of mankind.

Latin American and Caribbean countries need to improve their emerging scientific development dramatically. One way to do this is to increase the number of scientists, innovators, and technologists. Astronomers and scientists have an obligation to play a significant role in disseminating science, technology and innovation, attracting as many students as possible towards scientific careers, and presenting science to the public as something natural and necessary to achieve substantial development. For this reason, we need to establish a closer relationship between professionals and public through the teaching of science at all educational levels. Astronomy has been used recently to introduce other phenomena of science in an enjoyable way that also makes it more understandable.

According to data provided by UNESCO, Ceto and Vessuri (2005), the spending on research and development (GRED) of Latin American and Caribbean countries, with approximately 8.3% of the global population, is only 3.2% of the global total. This spending has been falling recently in most countries, and only a few (Brazil, Argentina, and Mexico) have increased spending. Research spending from these three countries represents 85% of the expense on research of the entire region. All other countries have spent 0.1% or less of their gross domestic product, except Cuba, which has spent 0.6%. If we compare these figures with those from the USA, with 35.9% world GRED with 5.2% of the world population, and Europe (including Russia and Turkey) with 27.6% world GRED and 14.5% of the world population, together representing approximately 20% of the world population, we see that Latin America and the Caribbean countries have a very low science spending. This data may have changed by 2007. Finally, some statistics have shown that collaborations between researchers from developing countries and researchers from developed countries increase the productivity of researchers in developing countries. The International Year of Astronomy 2009 could promote collaboration between different researchers around the world. Furthermore, we must consider inequalities and the several forms of exclusion from different genres that exist in all countries of the world. According to Hill (2004): "*The impact of S&T on society has not been achieved for gender equity. Cultural attitudes and gender stereotyping are impediments to education leading to more men than women in S&T careers and in decision-making positions with increasing inequity and inequality.*"

This work proposes, by using the discovery and naming of asteroids, a mechanism to popularise science, technology, and innovation (and specifically, astronomy), during the celebration of the International Year of Astronomy 2009. Naming asteroids was used as an award in events held in 2007 in Venezuela: *Bautizo Espacial* (Space Baptism), and in Brazil: *Grande Desafio* (Big Challenge).

During the presentation we give a brief description of the search for moving objects currently developed in the Group of Theoretical Astrophysics at the University of Los Andes, then we give a short account of the competitions resulting from this proposal and finally, we introduce this proposal to the IAU/UAI for inclusion in IYA2009 with the aim of popularising astronomy.

Discoveries of asteroids from Venezuela

Asteroids represent a group of objects left over from the formation of the Solar System. Since 1992, the Theoretical Astrophysics Group (Grupo de Astrofísica Teórica) at the University of Los Andes (ULA) has searched for moving objects in the Solar System, using the 1-m Schmidt Camera of the National Venezuelan Observatory of Llano del Hato, located in the State of Mérida, Venezuela. The first discoveries with this camera were made with photographic plates, which were able to observe an area of 5 square degrees of sky. Currently, an array of 16 (2048 x 2048) CCDs has been attached for direct observations of the sky. When all 16 CCDs are functioning, a field of 3.3 square degrees of sky can be seen.

More than 600 asteroids and, independently, comet Shoemaker-Levy 9 which collided with Jupiter in 1994[1], have been discovered by this project. In addition, we are using a 1-m reflector telescope, installed at the same observatory, to monitor and study some physical properties of near-Earth objects, comets and asteroids. Until now, a total of 37 asteroids have been numbered[2]), some of which already have been given names such as: Mérida, Venezuela, Cajigal, Unilandes, Luisapla, Kabudari, and Ourinhos. The last two were named by students from primary and secondary schools as part of the events: *Space Baptism* and *Big Challenge*.

Bautizo Espacial (Venezuela) and *Grande Desafio* (Brazil): events illustrating the proposal in action

All scientific discoveries should be disclosed to the general public as their taxes pay for part of the resources invested in science, technology, and innovation. So far, there have been two events in which naming asteroids following the rules of the IAU has been used an award. The first competition, *Space Baptism*[3], was held in the Bolivarian Republic of Venezuela. The competition entries were scientific stories written by elementary and high school students from twenty eight schools from different regions across the state of Lara. This event was organised by the Educational Area of the local government of this State, ALDA (Association of Amateur Astronomy, Asociación Larense de Aficionados a la Astronomía), ULA, Universidad Centro Occidental (UCLA), Zoo and Botanical Bararida Park, Fundacite Lara, and other government agencies. As a result of the competition the asteroid 12758 (1993 SM3) was named: "KABUDARI", an indigenous name for a big plant of this state. The event was broadcast on TV, radio, and national and regional newspapers spread the information to thousands of people. As the "Space Baptism" project developed workshops and talks were given to teachers and the general public.

The second event, known as *Grande Desafio*, was organised by the Exploratory Science Museum of the State University of Campinas (UNICAMP), Sao Paulo state, Brazil[4]. This event challenged students to find their own technological solutions to a major local problem. It was designed by a team of scientists and educators from the University of Campinas (UNICAM). The goal of the *Big Challenge* was to encourage participants to apply the knowledge acquired in school imaginatively. Young people had to work in teams over a period of months, designing, constructing, and operating a piece of equipment to remove water from a river to put out a fire in the forest, caused by a balloon launched into space on the occasion of the celebrations of Saint John (San Joao, Festas Juninas). Almost three thousand schools throughout Brazil, but mainly in the state of Sao Paulo, were invited to participate. At the end, around five hundred students, formed into 80 teams, took part. Asteroid 12367 (1994 CN8) was named by the winning team as "OURINHOS", after their

---

[1] http://cfa-www.harvard.edu/iauc/05700/05744.html
[2] http://www.cfa.harvard.edu/iau/lists/MPDiscsNum.html
[3] http://www.tayabeixo.org/bautizo/introduccion.htm
[4] http://www. mc.unicamp.br / challenge / grande-desafio / grande-desafio
[5] http://www.unicamp.br/unicamp/divulgacao/BDNP/NP_1697/NP_1697. html

home city. This event was covered on web pages[5], and by the national and regional press, radio, and TV, reaching an audience of more than one million people.

Proposal to the International Astronomical Union (IAU) to use the naming of asteroids as a mechanism to popularise astronomy, science, technology, and innovation

Naming asteroids by the winners in competitions related to astronomy, science, technology, and innovation devised by educative institutions and museums is of great importance. As Dr. Marcelo Firer, Associate Director of the Exploratory Science Museum of the State University of Campinas, said: *It is exactly the kind of prize that we wanted: no commercial value, but of great symbolic value that will leave indelible marks in the minds of the participants, and will serve as encouragement and appreciation to your effort.*[6]

Based on the success of events resulting in the naming of asteroids by young students from Venezuela and Brazil, it is proposed that the International Astronomical Union use this naming process as a tool for popularising and publicising astronomy, science, technology, and innovation during the celebration of the International Year of Astronomy 2009. An event should be scheduled that is open to young people everywhere, and is related to education, popularisation, and the dissemination of astronomy, science, technology and innovation. I hand over 20 asteroids discovered in the search programme from the University of Los Andes in Mérida for naming to the IAU, as a beginning of this future worldwide activity.

References

- Cetto A.M, Vessuri H. (2005), Latinoamerica and the Spanish speaking Caribbean. Unesco Science Report 2005.
- Hill S.C. (2004), Introduction in: Gender, Science and Technology: An Asia-Pacific Gender Mainstreaming Training Manual, UNESCO, APGEN and UNDP, Jakarta.

[6] Personal communication

Las Cumbres Observatory: A global telescope network for astronomy education and outreach

Paul Roche
The Las Cumbres Observatory Global Telescope Network UK (proche@lcogt.net)

Abstract

The Las Cumbres Observatory Global Telescope Network (LCOGTN) is an independent, non-profit private operating foundation that is building a global network of remotely operated telescopes, to be used for both educational and scientific research purposes.

The Faulkes Telescope Project was launched in the UK in March 2004 with the goal of engaging students in real science using the largest entirely robotic telescopes in the world. In late 2005, the FT became part of a much bigger programme, the Las Cumbres Observatory Global Telescope Network (LCOGTN)[1]. This will ultimately comprise around 40 robotic telescopes of different sizes, spread across the globe, with several telescopes in night time (i.e. observing) at any one moment, giving a truly global observatory. While the larger instruments are intended primarily for research, this network will also contain many telescopes dedicated to educational use. In addition, the project will train local people to act as "ambassadors" in their countries, and provide resources and facilities so that these ambassadors will be able to train others in their area to use the telescopes.

LCOGTN is the brainchild of Wayne Rosing, described by his professional colleagues as "a legend in the computer industry", and a keen amateur astronomer. Like others, Rosing had long held the view that a global network of telescopes could provide a valuable research tool, but he also saw an inspirational educational opportunity to help motivate school children to appreciate science, technology and mathematics better. When Rosing met with Dill Faulkes, the UK-based founder of the Faulkes Telescope Project, it became clear that their goals were similar, and the existing infrastructure and expertise in the FT team would give LCOGTN a great head – start in its educational plans.

There are currently two telescopes in operation: one on the island of Maui, Hawaii (FT North), and another at Siding Spring in New South Wales, Australia (FT South). Although they feature research-quality equipment, the Faulkes Telescopes were built primarily for educational users, with associated support and resources provided by the LCOGTN education team at Cardiff University in the UK. The telescopes are controlled in real-time by users via a simple website[2] that delivers inspiring images of space to the classroom within minutes. This allows all students embarking on astronomy projects access to expertise and state of the art equipment.

[1] http://www.lcogt.net
[2] http://www.faulkes-telescope.com

Hundreds of schools in the UK are currently working with LCOGTN to take their own images of distant astronomical objects. But the telescopes offer much more than just pretty pictures; it is when these images are processed that investigative science begins. Using FT North, students have discovered new asteroids, observed supernovae[3], and studied other phenomena including gamma-ray bursts. Telescope targets can be tracked as they move across the sky, variations in brightness can be monitored, and even their chemical composition probed by using different filters. A group of UK schools even helped to name an asteroid (2004 WB10, “Snowdonia”) that they observed with FT North — one of eight serendipitous asteroid discoveries to date. The real-time facility, unique to LCOGTN, fosters a feeling of ownership over the images among the students. Couple this with the potential for real discovery that the telescopes offer, and the result is a powerful educational resource.

LCOGTN can enhance the teaching of many subjects within the classroom, and not only the sciences. The most obvious application is in physics, with topics such as light, the Solar System, and the life cycle of stars offering plenty of opportunity for telescope use, even within restrictive curricula. However, the telescopes can also be readily linked to other subjects including chemistry, IT and technology and have been used in interdisciplinary projects combining the beauty of space with creative writing, art and design, and even music, dance and drama.

LCOGTN does more than just facilitate telescope use: a comprehensive range of support materials and educational resources is available. The website provides the real-time interface for control of the telescope, booking sessions, advice for planning sessions, suggestions for suitable projects, podcasts, and an image archive, and acts as a portal to many additional features.

In the UK, free teacher training days are offered at locations nationwide, covering a wide range of topics including image processing and science curriculum links. A new programme of online training is on trial to complement these courses, and will be available internationally.

LCOGTN’s educational arm already extends beyond the UK. When NASA fired a copper “bullet” into comet Tempel 1 in 2005, the first images obtained from Earth were taken by a group of FT North users from Hawaiian and Icelandic schools, working with Professor Alan Fitzsimmons’ team from Queen’s University Belfast. Further small-scale projects have been established in Malaysia, Israel, Portugal and France, the latter two in conjunction with the European Union *Hands-On Universe* project[4]. Since September 2006, a programme to monitor supernova explosions has been piloted by Polish schools, working through the British Council[5]. Students are involved in measuring changes in the brightness of supernovae — information which can help astronomers understand the processes that govern the death of massive stars.

Another, far larger, British Council-funded project involving schools and astronomers from Russia, was launched in Moscow in September 2006[6]. Twenty four schools from five regions of Russia are working with local astronomers to study galaxies, asteroids, and supernovae, and will

[3] http://www.eu-hou.net/spbdadm/
[4] http://www.euhou.net/
[5] http://www.britishcouncil.org/bg/poland-the-faulkes-telescope.htm
[6] http://www.britishcouncil.org/russia-science-faulkes-telescope.htm

make a genuine contribution to scientific knowledge. Linking these bright, motivated students with researchers in Russia will provide LCOGTN with an ideal test of our plans for developing "real astronomy" programmes across the world. Dr Patrick Fullick from the School of Education at Southampton University, who co-ordinated the British Council project in Russia, believes that: "*Britain and Russia have much to learn from each other in the fields of science, mathematics and computer education, and closer links can provide great benefits to education in both countries.*"

The team also hope to partner UK schools with their counterparts overseas to facilitate the exchange of ideas, language skills and cultural awareness, via e-mail, video conferencing and, potentially, visits. A major strength of the telescopes is their ability to promote collaborative working, not just between different schools in different locations, but also between schools and scientists.

The future — the global telescope network

Under the LCOGTN umbrella, the educational programmes currently on offer in the UK through FT are expanding internationally, making use of the increased access to telescopes and geographical locations. Whilst the network currently consists of just two instruments, FT North and South, the designs for the educational network of smaller instruments (better suited to most schools' needs) are well advanced, and a number of potential sites have already been identified to host the initial wave of new robotic telescopes.

Whilst the plans for the LCOGTN facilities are still evolving, some basic principles have already been established. Rather than building several more 2-m telescopes, clones of the existing FT North and South, the research plans for LCOGTN were found to be more suited to clusters of small (1-m) telescopes. Current thinking is that LCOGTN will build at least 18 of these 1-m instruments, grouped in sets of three at six professional observatory sites. These can then operate as independent telescopes, or be pointed at the same target in order to produce simultaneous imaging/photometry.

With a focus on extrasolar planets, gamma-ray bursts and variable stars, the LCOGTN research plans will ensure maximum use of this unique global network of identical telescopes. In parallel with the research programme, an educational network (currently involving 28 x 0.4-m, telescopes; clusters of four at seven professional observatory sites) will service users all over the world, requiring only internet access. With LCOGTN's links to Google (Wayne Rosing was Google's Senior Vice President of Engineering), it is perhaps not surprising that plans are in hand to utilise the company's vast computational and data storage capacity as part of these ambitious research and education plans.

Ultimately, the aim of LCOGTN is to offer a free, supported service to users across the world, similar to that currently provided in the UK, and to enrich the education of students from many different cultures and backgrounds through access to exciting investigative science programmes. This programme will be primarily web-based, and will work with anyone wishing to want to learn more about the science, technology and maths that underpin modern astronomical research.

Where are we now?

LCOGTN currently has around 450 registered users in the UK, of whom around 150 are regularly using the telescopes, plus another 100 or so users overseas (mostly as part of the British Council programmes mentioned above, plus a growing number in Hawaii and Australia, as access to the existing telescopes spreads within the host regions). After running dozens of face-to-face training courses with teachers and students, FT is moving to a more globally scalable system that uses the Moodle Virtual Learning Environment (VLE) to deliver basic instructional courses for new users.

Within the UK, a series of more advanced courses are now being run, aimed at showing teachers the current state-of-knowledge in particular research areas (e.g. supernovae, asteroids and NEOs etc.) and training them in the specific skills required to participate in collaborative research projects. These UK programmes are being sponsored by the Dill Faulkes Educational Trust, which is providing bursaries to cover supply and travel costs for teachers.

The buzzword for the education team is now "scalability" — how can we take examples of best practice from the UK and Europe, and expand them up to the global scale? Once purely an innovative UK science and technology programme, LCOGTN is now a truly global organisation which has as one of its core objectives *to transform science education to an enquiry-based learning experience for its users*.

The future for astronomy education is, in all ways, looking up!

Figure 1 – image of the Pillars of Creation in the Eagle Nebula was taken by students from Thomas Hills High School in the UK, and processed by Tommi Warton, a technician at the school.

Figure 2 – Students controlling the Faulkes Telescope North in real-time.

Figure 3 – The Faulkes Telescope Project offers training on use of the telescopes and their applications in education.

The Las Cumbres Observatory Global Telescope Network

Communicating radio astronomy with the public: Another point of view

Stefania Varano
Institute of Radio Astronomy, National Institute of Astrophysics, Italy (s.varano@ira.inaf.it)

Abstract

Radio waves cannot be sensed directly, but they are used in daily life by almost everybody. Even so, the majority of the general public do not even know that celestial bodies emit radio waves. Presenting invisible radiation to a general audience with little or no background knowledge in physics is a difficult task. In addition, much important technology now commonplace in many other scientific fields was pioneered by radio observatories in their efforts to detect and process radio signals from the Universe.

Radio astronomy outreach does not have such a well-established background as optical astronomy outreach. In order to make radio astronomy accessible to the public, it is necessary either to add more scientific detail or to find a different way of communicating. In this paper we present examples from our work at the Visitor Centre "Marcello Ceccarelli", which is part of the Medicina Radio Observatory, operated by the Institute of Radio Astronomy (IRA) in Bologna, which in turn is part of the National Institute for Astrophysics (INAF).

Introduction

The Visitor Centre (VC) *Marcello Ceccarelli* is an outreach facility located near the two radio telescopes, the Northern Cross and the 32-m VLBI antenna, operated by the Institute of Radio Astronomy (IRA-INAF) in Bologna.

Stefano Parisini

Figure 1 – Exhibition room at the Visitor Centre "Marcello Ceccarelli"

The IRA-INAF personnel have always been involved in outreach and educational activities, taking care of conferences, lectures given in schools, public events, newspaper and magazine articles and websites.

The Visitor Centre *Marcello Ceccarelli* was opened to the public on 15 October 2005. The VC was almost entirely created and designed by IRA personnel and has been supported for the first two years of operation by the INAF, which has funded a fellowship position for a young astronomer, who is an expert in science communication and is in charge of the management and development of the centre in cooperation with several IRA researchers and technicians. The centre hosts a permanent exhibition, with historical equipment from the radio laboratories, interactive exhibits and multimedia contents that are continuously updated and improved, and a multimedia conference hall, where lessons and educational presentations are given to visitors. The total number of visitors exceeds 5000 persons/year including school classes and the general public. The Visitor Centre also hosts meetings and outreach events organised by the IRA.

Aims and goals

The outreach activities at the VC *Marcello Ceccarelli* aim to improve public awareness of science: we try to show the experimental nature of science, and to show the necessity and effectiveness of a world-wide collaboration for research purposes. In particular, we try to give a sense of the difficulties related with observations both for astronomy in general and for radio astronomy in particular, and to answer basic questions about what telescopes are and how they work.

For radio astronomy in particular, one often has to start from scratch with a general public without a background in physics, and explain how we can study something that we cannot sense ourselves. Communication of radio astronomy (and infrared, X-ray, and gamma-ray astronomy, the other “invisible” wavelengths) has to include some basic discussion of observational techniques. The guided tour at our VC includes exhibits on both on the “production” of science and the results.

The general public perception of doing astronomy is “looking at the stars through a telescope”. Most people have seen some of the astonishing pictures around today and know something about the visible Universe, but they will typically think that radio waves are something used only for communication. People coming to our VC often do not even know that celestial bodies also emit radio waves. Observing the radio sky is a new concept in itself: and radio telescopes a new discovery for visitors, since they are unfamiliar scientific instruments. The complexity of the fundamental concepts and the lack of direct visualisation make the task of communicating radio astronomy with the public difficult. Involving the public in this different way of studying the Universe is an achievement.

Organisation, guided tours and public

The Visitor Centre *Marcello Ceccarelli* is open for school tours during the week. The weekends are dedicated to the general public. Guided tours can be reserved during the week and on Saturday. On Sunday the Centre is open and one guided tour is given to drop-in visitors without the need for a reservation. The guided tour consists of a talk, presentation or a hands-on activity held in the VC, followed by a tour through the permanent exhibition. The tour ends at the radio telescope sites, where the history of the radio observatory and observational techniques are demonstrated.

The particular activities depend on the tour visitors, who fall into three broad categories:

- Students (from primary to high schools);
- General public (organised groups, amateur astronomers, radio amateurs, occasional visitors);
- Children (both from schools and other contexts, both organised groups and occasional young visitors).

The distinction between categories is not sharp, but each requires a slightly different approach.

Strategies of communication

For each of the different "target groups" listed in the previous section, we pursue different strategies, trying to convey the fundamental concepts and involving our visitors by connecting to their daily experience and pre-existing knowledge. Our list is only a rough guide to distinguish between different levels of background knowledge and attitudes towards science. The strategies shown in the following examples are to be considered as different "ways of thinking" and projecting the outreach activities, which can then be mixed in the actual communication according to the circumstances and the actual group composition.

Procedure 1: School students

Many teachers plan a visit to our VC and the radio telescopes as part of existing courses. The visit to the radio telescopes typically forms part of either courses in general astronomy (for middle schools and junior classes of high schools) or physics (for senior classes of scientific high schools). We expect the audience to have a good level of background knowledge, since the students should have been taught something about "radio astronomy" before coming to our VC, and so we can skip detail on how we get information from the radio Universe (i.e. the electromagnetic spectrum, emission processes and image processing) and go into more detail about the physical phenomena observed at radio wavelengths (e.g. radio emission from galaxies, rotation curves, HI lines, pulsars, quasars, black holes etc.). The information is presented through lectures given by the researchers. To supplement this rather formal teaching, we try to go a bit further. Since there is not enough time to develop a more complex programme during the visit at the VC, we ask teachers to carry out some "project work" (laboratories, experiments, etc.) with the students. These activities can be undertaken before, or right after, the visit at the radio telescopes, to add a supplementary, informal element to the programme.

Sometimes we host groups of children from primary or even infant schools, but here the strategy of communication is more typically that used for smaller children as described in Procedure 3.

Procedure 2: General public

The general public who visit our VC and the radio telescopes have a different perspective on science from students: they may have no scientific background, and have heard about the radio telescopes from a variety of sources. They need to be addressed at a different level and to be filled in on the background of this young science. Any presentation must take into account any pre-existing conceptions about astronomy and radio waves, with reference to everyday experience (e.g. the use of radio waves for communication, the visualisation of the invisible in other applications such as X-rays in medicine, etc.).

We also use a number of metaphors to explain the transmission of radio waves and the observation techniques needed in this kind of observation. Some examples of metaphors are:

- *The coarse sieve and the filter*: to explain the different appearance of the Northern Cross and the VLBI antenna, which are designed to receive waves at different wavelengths.
- *The car not stopped by an ant*: to explain filtering of electromagnetic waves.

Metaphors are certainly effective in making difficult concepts or a new piece of unfamiliar information accessible. Nevertheless, they should be used carefully, because they are very powerful and if the metaphor is not properly thought out, they can lead to misconceptions that are difficult to correct.

Besides an explanation of how radio astronomy works, we try to involve our public with the "human side" of the story, recalling the birth of radio astronomy and the first revolutionary discoveries (CMB, pulsars, quasars, and the like) and telling them anecdotes about the people engaged in the research.

Procedure 3: Children

We believe that children make a very good audience and that they are really willing to learn and find out new things. However, they can also be very demanding and a tough challenge if one is not able to catch their attention in the right way. Children need to be actively involved, so it is really important to make them "try" things out through dedicated activities. Some hands-on experiments have been developed, including one experiment about the difference between electromagnetic bands and the connection between frequency and wavelength. Other interactive exhibits are used to let them "play" with radio astronomy and simulate the search for artificial signals among natural ones. Cooperation with teachers and educators is even more important than for older students. Since we do not have many "human resources", we take advantage of the work done by some teachers and educators in their primary school classes who have come with their pupils to our Visitor Centre.

Conclusions

Ways to communicate and popularise radio astronomy at the Visitor Centre *Marcello Ceccarelli* are still a work in progress. We have described some of the major strategies we use during the guided tours with different categories of visitors. We believe that projects and communication activities for astronomy at the "wrong" wavelengths (i.e. the ones that are not accessible to our senses) need to be carefully studied, tested and improved. There is a strong need to create a working group of people engaged in communicating and popularising radio astronomy directly with the public. The activities at the Visitor Centre are increasing and future synergies with other partners – such as the Bologna Astronomical Observatory, other INAF Institutes and several Visitor Centres of European radio observatories – are being developed.

Acknowledgments

The author would like to thank Franco Mantovani for believing in this project, and making many efforts to keep it alive. Thanks also for giving the author the opportunity to participate in CAP2007. Many thanks to Karl-Heinz Mack, who has followed the preparation, and revised and double-checked the contents of this contribution. Without his collaboration and precious advice, it would not have been possible. Thanks also to all the personnel from the Institute of Radio Astronomy, who took care of all the activities of the Visitor Centre *Marcello Ceccarelli* while the author was busy with this work and during the period in which she was in Athens for CAP2007.

Daniela Fiorini

Figure 2 – Children performing an experiment in our VC

Credit: Lars Holm Nielsen

Credit: NASA, ESA, and M.J. Jee (Johns Hopkins University)

Session 12
Media

This Hubble image of the Antennae galaxies is the sharpest yet of this merging pair of galaxies. As the two galaxies smash together, billions of stars are born, mostly in groups and clusters of stars. The brightest and most compact of these are called super star clusters.

Communicating astronomy with the public in Cuba

O. Alvarez
Dirección de Ciencias, Ministerio de Ciencia, Tecnología y Medio Ambiente,(oscar@citma.cu)

Abstract

Communicating astronomy with the public to produce attractive materials for a broad audience on TV is a difficult job in a third world country. One way of developing effective communication in fields like astronomy, astrophysics, and cosmology whilst connecting the professional astronomer with a majority of the people is to combine the knowledge of the scientist with the most spectacular TV production methods of first world countries: integrating, through commentary and analysis, astronomy and science into the public debate of lay citizens. Here I present my ten years of experience of presenting a TV programme devoted to general science outreach. I also comment on the progress of the construction of the new planetarium, a cultural centre for science and technology, to be opened as part of the commemoration activities for the 2009 International Year of Astronomy. It is hoped to guide the interest of the people of Cuba towards basic science and astronomy in the most populated and frequented area of the country.

Introduction

The collage in Figure 1 belongs to a fifteen to twenty minute introduction to the most popular Cuban TV programme devoted to science outreach. It is broadcast nationwide by Telerebelde, one of the main TV channels, for one hour in a primetime slot after the Sunday evening news when most Cuban families are at home with the TV set as the main source of entertainment.

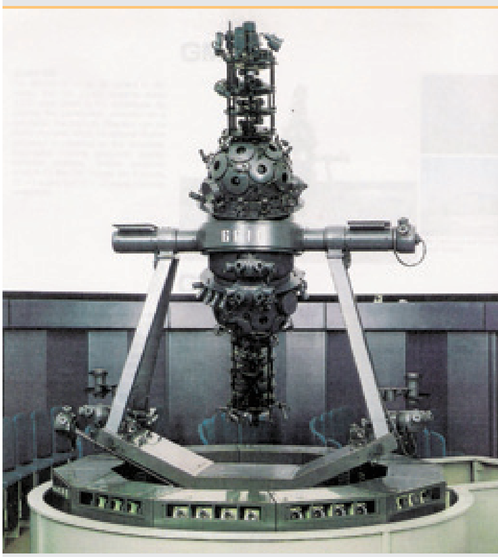
Science outreach on television in a third world country is hard to do if you want to produce attractive materials for a broad audience. Budget constraints (in most cases) and lack of the technical equipment required to produce first class visual materials conspire against the motivation and creativity of local scientists and media professionals.

One way to show the advance of the national scientific community in fields like astronomy, astrophysics, and cosmology whilst connecting the professional astronomer with a broad majority of the people is to combine the knowledge of the scientist with the most spectacular TV production methods of first world countries: integrating, through commentary and analysis, astronomy and science into the public debate of lay citizens.

The science communication objective of this paper is to describe how our TV professionals can convey cutting-edge science to the general public, despite limited resources, to produce imaginative television and film footage, by highlighting the development, knowledge and wisdom of local scientists.

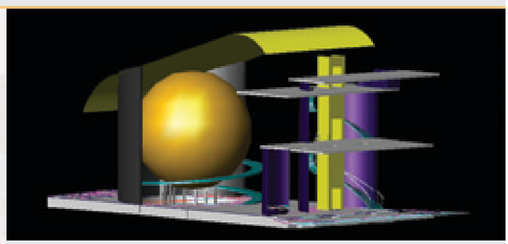
Oscar Alvarez

Figure 1 – *Pasaje a lo Desconocido* snapshots



GOTO OPTICAL MFG. CO.

Figure 2 – GOTO G CUBA Projector

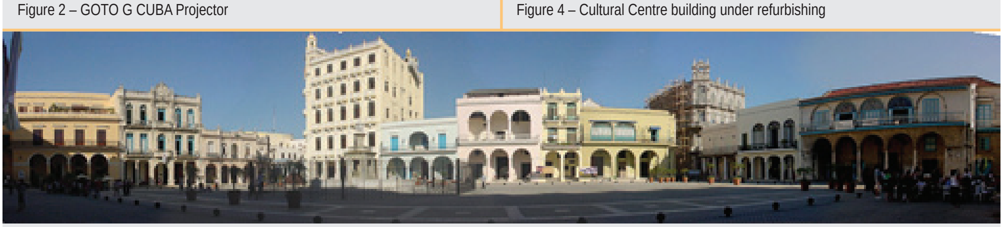


Silvia Morales

Figure 3 – Planetarium and Cultural Centre 3D interior rendering

Oscar Alvarez

Figure 4 – Cultural Centre building under refurbishing



Silvia Morales

Figure 5 – Panoramic View of the Plaza Vieja, Havana Old Town

In my astronomy outreach TV experience, I have learnt that in order to reach a broad audience and a reasonably high rating index in a TV science popularisation programme you should create a fascination for the, as yet unproven, effect or theory, by maintaining a balance between a mystery to be unravelled and hard science. It is important to show the uncertain fight between the questionable truth and the scientific speculation. Maybe a single one of these elements, or a partial, or whole mix of them will be the spice to flavour the final product making it attractive to a broader audience.

Ten years ago, in March 1997, Cuban television aired a science outreach programme entitled *Pasaje a lo Desconocido* for the first time. The programme aimed to convey cutting-edge science and new discoveries to a public with a special interest in the subject.

As a popular TV critic remarked in the main Cuban newspaper: "*very few TV programmes devoted to science outreach, have promoted the desire to know about, the reflection on, and polemic for, science themes in Cuban television so well.*" Paneque (2004).

The programme, intended at first for a niche market of interested viewers, has turned out to be a general phenomenon. The initial high popularity rating for the programme led the TV directorate to move the regular airing space from a late night Tuesday to a Thursday slot, and finally, to a Sunday prime time slot, just after the news at 8:30 pm.

These decisions are proof of the impact of the programme on the whole nation, with a regular audience ranging from 3 to 4 million viewers out of around 12 million inhabitants in the country.

The programmes have not only covered the hardest topics of cosmology and astrophysics, which have been made more popular by including elements on extraterrestrial life and UFOs, but also some more general episodes on science and culture, and their unlimited range of unanswered questions.

The introduction of one or two Cuban panellists and the contrast of their opinions with the messages of the documentaries, add an undeniable national touch the programme. The participants play a decisive role in the success of the popularisation, sometimes arguing between themselves, sometimes expressing their own points of view, but always being questioned by the programme host who assumes the role of the lay citizen.

The evaluation of the audience impact of this programme within the rest of Cuban TV programming is conducted regularly by the Centre of Social Studies of the Cuban Television and Radio Institute and presented in its annual report. In 2003 *Pasaje a lo Desconocido* was 26th out of 117 programmes, with a mean audience index of 25 and public acceptance of 90-95 percent. If we take into account that more than half of the programmes obtain mean audience indexes less than 10 it is possible to figure out the relevance acquired by the programme in the national TV spectrum. Its peak audience was obtained in 2002, reaching 48 points, when it was aired on the other main TV channel CUBAVISION.

In general, we all love mystery; it is the way to reach the soul of the people while illustrating fundamental concepts established by science. We have learned that science outreach must leave space for reasonable doubts and questions in the spirit of the scientific method to achieve maximum effectiveness.

If *Pasaje a lo Desconocido* is a success as an outreach experience it is due, in the most part, to the use of first class visual materials spiced by a debate. In this way, the knowledge and wisdom of the local scientific community is highlighted and scientific developments are conveyed to the public by debate between lay citizens.

In the summer holidays period in 2007, when films and programme materials are carefully selected for the bigger and wider audience that are at home, *Pasaje a lo Desconocido* made a special tribute, airing outreach video material celebrating the Fifteen Year Jubilee of the Hubble Space Telescope.

A new planetarium and cultural centre in Havana

Astronomical education in Cuba is not widespread in the educational system; nevertheless the public interest in science in general, but in particular in astronomy, is very high, as is reflected by the attention paid to educational and scientific programme broadcasts in the national television channels.

The Planetarium and Cultural Centre for Science and Technology is under construction (Figure 2) and is aimed at guiding this interest towards a basic science and astronomy orientation of people in the most populated and frequented area of the country.

A key objective of this project shall be to serve as an instructive and motivational form of entertainment for the casual or habitual visitors to the Centre; offering vivid images, games with interactive displays and audio presentations on astronomy and related sciences, guided by qualified specialists.

Another fundamental aim will be to establish a plan for complementary educational material in coordination with schools, to allow children and young people to participate in activities enabling them to get into the fascinating world of astronomy, the exploration of outer space and life as a cosmic phenomenon.

The setting up of the new Planetarium and Cultural Centre for Science and Technology in Havana (Figure 3) will come under the general administration of the Office of the Historian of the City of Havana, and led by the Ministry of Science Technology and Environment. The planetarium (Figure 4) obtained under a Japanese Cultural Grant Aid, will develop into an unparalleled national resource for scientific outreach and education of the sciences. Surrounded by the attractive colonial "ambience" (Figure 5), it will become a centre for dissemination of information about new discoveries and scientific programmes developed at national and international levels.

References

- Paneque A. (2004), Estrellas y quásares en la constelación "debate", Gramma newspaper, 24 November 2004, p. 6.

Anthropomorphic astronomy in the IYA2009

Gary Evans
Science Photo Library, London (gary.evans@sciencephoto.com)

Abstract

For the International Year of Astronomy to be deemed a success, astronomy must reach a significantly larger fraction of the general population than ever before. New and exciting pathways through outreach and education are already being developed. However, astronomers and communicators should also be looking at new pathways, ones in which entertainment, not education, is the imperative. These new pathways need to be found through the dark lands of mass popular culture, primarily through television.

Introduction

Anthropomorphism is a word derived from Greek roots — *anthropos* and *morphi* — and may be defined as "assigning human characteristics to an inanimate object or a concept". Thus, anthropomorphic astronomy is used here as an attempt to assign human characteristics such as friendliness and welcoming to the concept of astronomy.

Although public trust in scientists is generally good, public interest has been falling. In European Community (2005), a comparison was made between public opinion in 2005 and the previous Eurobarometer survey of 1992. Across the three science categories (environmental pollution, new medical discoveries and new inventions and technologies) there was a definite shift away from "very interested" toward "moderately interested" and "not interested". 43% of UK respondents agreed that young people are less interested in science than the corresponding age groups 20 years ago.

A possible knock-on effect has been seen in scientists' view of their public face. Hughes (2001) highlighted a surprising level of transference of mistrust and elitism that scientists put on the public, despite evidence to the contrary in, for example, Whitmarsh and Kean (2005). This results in a strong desire to improve communication, but historically this has depended on education-based programmes. If scientists (and by extension, science itself) continue to be seen solely in the context of education, the public will continue to view their relationship with science as one between educator and student.

This is not a good omen for the activities of the International Year of Astronomy in 2009. In order to communicate with the public at large, not just those already interested in astronomy, we need to break this perceived educator-student dialogue and use the tools of mass communication, specifically television.

The television audience

The appeal of the educator-student relationship can be simply seen by looking at television ratings over any given week. In the UK there are five terrestrial free-to-air channels (i.e. that only require a standard aerial for reception). A list was made of the top 30 rated programmes on each of these channels by audited viewing figures (BARB, 2007). For each programme, its viewing figure was multiplied by its duration to obtain its number of viewer-hours, and each was categorised for content. The total is 359.2 million viewer hours. The result of this analysis is seen in Figure 1 below.

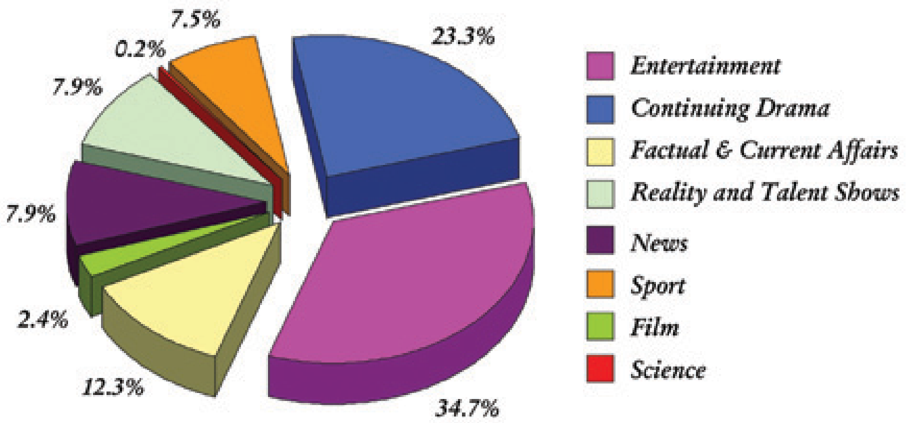


Figure 1 – Proportion of viewer hours by category of free-to-air terrestrial programming for the week ending 26 August 2007.

The contribution of science programming was a single half hour show called “The Cosmos: A Beginner’s Guide” broadcast on BBC2 to an audience of 1.49 million. The author’s contention is that we should be investigating ways of talking to the 58% of the viewer hours devoted to entertainment and continuing drama (“soaps”).

There is an apparent gulf between the culture of science and popular culture, yet to maximise the visibility of IYA2009 this gulf has to be closed. We must engineer a great collision between these two cultures, and to do this we must encourage crossover between them, and the perfect medium with which to achieve this is television. Through television we have a choice, either to plant astronomy directly into existing TV shows, or to create programmes in which the public is welcomed into the experience of astronomy on camera.

The public embraces astronomy

Exploiting existing TV formats may take one of two routes:

- Astronomy-themed programming.
- Astronomy specials of format shows.

Astronomy-themed programmes are those in which a basic idea is taken over by overt astronomical themes. Some suggestions of the type of existing programmes that could be approached would include:

***American Chopper* —** made by The Learning Channel (part of Discovery Channel), the show follows the work of the Teutul family of Orange County, NY who make custom-built motorcycles. The somewhat dysfunctional father and son business is commissioned by some very high-profile clients, including Jay Leno and Bill Murray, Hollywood studios and even NASA to celebrate the return to flight after the Columbia disaster. The family could visit Mauna Kea for some design ideas, be filmed getting out of breath at altitude, and so on before making the bike. Perhaps there will be a suitable IYA event in Hawaii or the continental USA at which this could be unveiled.

***Scrapheap Challenge*/*Junkyard Wars* —** a show in which two teams compete to make something working out of junk, although a few specialist pieces of equipment are usually planted in the yard. One previous special had three teams competing to make piloted, powered aircraft to celebrate the centenary of flight. Perhaps they can be challenged to make a working telescope with powered drive, and have to image Jupiter and its moons as the final test.

***Travel shows* —** several channels have shows dedicated to suggesting great places for your next vacation. Most also have a weekly slot for special reports. How about the intrepid reporter visiting a series of astronomical sites, both current and historical? The benefit here is that, not only does the viewer find out that the site exists, the show tells the viewer how to get there. With many major observatories not far from popular resort destinations this is an ideal way to boost visitor center numbers.

Astronomy specials are programmes in which the inclusion of astronomy is more incidental. Examples would be:

***Format shows* —** the three biggest franchise format shows in the world are *Who Wants to be a Millionaire?, The Weakest Link* and the *Idol* series. In the first two, the idea is to have astronomers as contestants, although the questions would be the same general knowledge as ever. Let us be honest, who wouldn't like to see their professor told "You are the Weakest Link, goodbye?" Money won by contestants could be donated to the effort to distribute Galileoscopes. Is *Astronomy Idol* a step too far? Not with university common rooms full of students adept at karaoke.

***Continuing drama* —** also known as "soaps". The viewership for these programmes is astounding. In the UK, the top-rated shows regularly attract audiences of 7-10 million viewers, this from a total population of about 60 million. Each week, soaps account for 83.8 million viewer hours (BARB, 2007). In 2002, the Commonwealth Games were held in Manchester, England, the setting for the highest-rated soap in the UK, *Coronation Street*. One of the characters volunteered as a steward for the event. This meant that the organisers could feed bits of information about the Games to the programme for the character to present as if talking to his friends. Thus the Games' organisers had access to up to 10 million viewers, four times a week, in the run-up to the Games. Jodrell Bank is not far from Manchester. *Eastenders*, the second-highest rated programme, is based in east London, not far from Greenwich. Similar coincidences of location must exist in other countries. Now is the time to start talking to producers about the possibility of including this kind of thread into their storylines.

Astronomy embraces the public

When presenting ideas to TV production companies, the following three rules should be considered:

- Keep it simple.
- Make it competitive.
- Add a celebrity or two.

If the format isn't simple, many people will simply switch channels. Making a programme competitive in some way adds an extra hook of excitement. It also helps define how much astronomy to teach — just enough that the viewer can understand why it is a competition is a good guide. Finally, it is crucial to add celebrities to the mix. It entices viewers, helps with trailing the shows, and boosts event publicity. Many celebrities claim to be interested in astronomy to a greater or lesser extent. This is the time at which they should be invited to "walk the walk" and contribute their name and their time to the effort.

A few ideas include:
***The Naked Astronomer* —** a TV show called *The Naked Chef* revolutionised home cooking, presented as it was by a camera-friendly, endlessly enthusiastic chef, Jamie Oliver. IYA needs a similar ambassador for astronomy, someone with the camera presence and endless enthusiasm of the late, great Steve Irwin, someone prepared to go literally from the streets of a big city to the ends of the Earth to show how astronomy is done and what it produces. In an ideal world, this presenter will be female in order to support the *She is an Astronomer* Cornerstone. Surely somewhere, in all the astronomy departments of the world, there must be someone suitable.

***The Messier Marathon* —** perhaps as part of the *24 Hours of Astronomy* Cornerstone. Schools, amateur astronomy groups and professional observatories compete to observe or image as many Messier objects as possible in one night. One possibility is to use the Griffith Observatory at Los Angeles. Teams could comprise school children from local public (state) schools, each with a Galileoscope, a professional astronomer and a celebrity guest from the local soccer team, the LA Galaxy. Their star player, David Beckham, is keen to help disadvantaged children and Major League Soccer would like the exposure. Most of all, the children get to meet the players and see amazing things through telescopes which they are given to take home. Everyone wins.

***The Galileo Challenge* —** to recreate historic observations using a Galileoscope. This also has the benefit of showing people what is possible to be viewed through a Galileoscope, and how to find objects such as Jupiter.

***Total Eclipse Watch* —** the total solar eclipse of 22 July 2009 will pass over India, Bhutan and China before crossing south of Japan over the Pacific. The path of partial eclipse encompasses around half the population of the entire planet. What will be needed are cheap viewing glasses — cardboard frames with Mylar filters — that can be distributed in bulk, preferably in front of TV cameras by celebrities.

Conclusion

There are many opportunities to take astronomy to the widest audience we have ever known. What we must do is maintain the core educational effort, but accompany this with wider-ranging entertainment-based broadcasting. We need to think outside the traditional box, and encompass the world of popular culture if we are to spread the word of IYA in a truly global fashion. Most importantly, we must start doing it now.

References

- Broadcasters' Audience Research Board (2007), Weekly Viewing Summary for week ending 26/8/07, http://www.barb.co.uk/viewingsummary/weekreports.cfm, accessed 10/9/07.
- European Commission Research Directorate-General (2005), Special Eurobarometer 224/Wave 63.1, Europeans, Science and Technology.
- Hughes C. (2001), Shackled to Stereotypes. In: Roberts A. (ed.) Science & Public Affairs. British Association for the Advancement of Science, London, 2001 No.1, pp 21-23
- Whitmarsh L., Kean S. (2005), Connecting Science, British Association for the Advancement of Science, London

Credit: Jan Warnstam, Jonas Lindqvist

Credibility of science communication: An exploratory study of astronomy press releases

Lars Holm Nielsen[1]**, Nanna Torpe Jørgensen**[2]**, Kim Jantzen**[2] **& Lars Lindberg Christensen**[3]
[1] ESA/Hubble & Roskilde University (lnielsen@eso.org)
[2] Roskilde University (torpe@ruc.dk, kimjan@ruc.dk)
[3] ESA/Hubble (lars@eso.org)

Abstract

Current developments in the media marketplace and an increased need for visibility to secure funding are leading inevitably to faster, simpler and more aggressive science communication. This article presents the results of an exploratory study of potential credibility problems in astronomy press releases, their causes, consequences and possible remedies. The study consisted of eleven open-ended interviews with journalists, scientists and public information officers. Results suggest that credibility issues are central to communication, deeply integrated into the workflow and can have severe consequences for the actors (especially the scientist), but are an unavoidable part of the communication process. In general a major credibility problem was not found to exist for astronomical press releases.

Introduction

Science communication operates in the modern media marketplace and competes for headlines with politics, business, sports, crime and large commercial communicators such as the entertainment industry. Science communication is partly a political tool and the pressure on the communicator to deliver is greater than ever. Due to the very nature of public communication, the temptation to overstate the importance of scientific results or to take credit for more than is deserved is great. Two of the better known examples of credibility problems within astronomy and physics are the “NASA Mars meteorite” case (Kiernan 2000) and the “Cold fusion” case (Gregory and Miller 1998, p. 61). A more recent and less problematic example from September 2007 is given in the next section.

The extent of the damage done to the public perception of science and scientists by examples like these is very difficult to measure. A public opinion survey (European Commission, 2005) has shown that Europeans generally see scientists as being credible and having a positive impact on society.

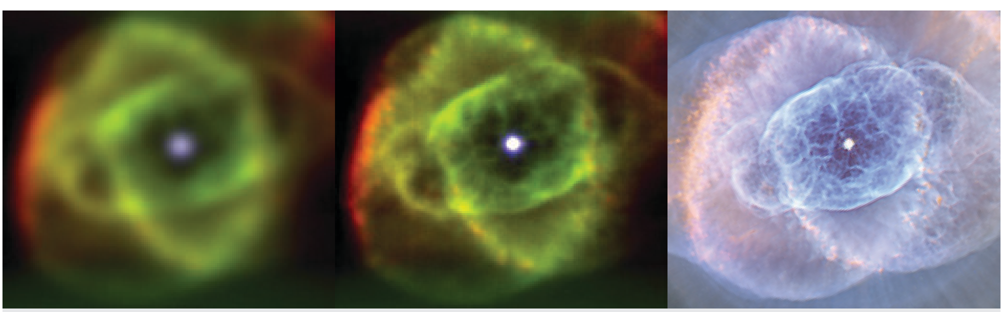
Many scientists have the impression that science reporting is inaccurate and that science news is often overstated (Shortland and Gregory 1991, p. 8; Dunwoody 1986, p. 11). This perception has, in the case of astronomy, been shown to be false by Shaefer et al. (1999), who found that none of 403 evaluated newspaper articles on astronomy misled the reader significantly. Furthermore, most errors in the evaluated articles could be contributed to the fact that they were reporting on front-line science, where no reliable conclusion had yet been reached. Scientists and journalists can have very different perceptions of the term accuracy, and thus what is accurate to journalists usually does not have the required level of detail for scientists (Peters 1995).

Credibility in science communication is one of the most actively discussed issues in science communication today: *How far can we, in the name of science communication, keep pushing, or promoting, our respective results or projects without damaging our individual, and thus also our collective credibility?* (Robson 2005, p. 162). However, serious studies about this important, but rather elusive, topic are difficult to find in the literature.

Case Study

One of the main conclusions of the study is that there are no major credibility problems for astronomy press releases. There are nevertheless certainly examples of credibility problems in press releases. However, before going into more detail with the most recent example, it is important to mention that the examples have not been chosen to point fingers at anyone in particular, but only to illustrate how little it takes to generate credibility problems when fighting for visibility in the media.

On 3 September 2007 the University of Cambridge issued a press release with the headline "*Lucky camera" takes sharpest ever images of stars (and it's 50,000 times cheaper than Hubble)* (University of Cambridge, 2007). Just below the headline were two images of the Cat's Eye Nebula obtained from a ground-based telescope. The images were showing the before and after effect of using the new "Lucky Imaging" technique, which significantly reduces the blurring of the images by the Earth's atmosphere. The first paragraph in the press release elaborates further: *[…]sharper than anything produced by the Hubble telescope […]*.



University of Cambridge (left, middle), ESA, NASA, and The Hubble Heritage Team STScI/AURA (right))

Figure 1 – Cat's Eye Nebula imaged with ground-based telescope without Lucky Camera (left), ground-based telescope with Lucky Camera (middle) and Hubble (right).

Comparing the Cat's Eye Nebula image obtained using the "Lucky Imaging" technique with one taken with Hubble reveals that the Hubble image is clearly sharper[1] – contrary to the impression given by the press release. Four days later the lead scientist is quoted in an online NatureNews article, saying: *Well, perhaps their press release got a little out of hand. The team wanted the world to know about their camera, and this seemed like a simple, provocative way to make the point. But, he admits, the press release "did kind of hype it up"*. (Brumfiel, 2007).

[1] Said with tongue in cheek, please note that two authors work for ESA/Hubble (meaning they are Hubble-fans) and thereby of course are incapable of giving any neutral judgment in this case study.

The “Lucky Imaging” technique is indeed scientifically very exciting and the technique can in fact produce sharper images than Hubble in certain cases. However, the claims are nothing like as clear-cut as the press release claims. Taking a step back from the case study, we might ask how do the communication actors actually define credibility and exaggeration? In which situations do they experience credibility problems? What factors may cause the problems, what are the their consequences and how can they be reduced? It is the purpose of this exploratory study to answer these questions.

Study design & method

This paper only examines the credibility of the communication of scientific results, and not the credibility of the actual scientific results themselves. We thus assume that the peer-review process produces credible scientific results, though some scholars question this claim (Russell 1986, p. 93; Nelkin 1995, p. 150; Gregory and Miller 1998, p. 168). The communicated scientific results may of course later be proved wrong, but this is how the scientific process works.

We chose to examine the problem of credibility in astronomical press releases from the perspective of the actors in the science communication process: scientists, journalists and public information officers at large governmental and intergovernmental scientific organisations. According to Madsen (2003) and sources quoted therein, nearly 50% of all reported science news in the media result directly from press releases, making this particular way of communicating science news very important. Eleven open-ended interviews were conducted with science communication actors.

Results

Finding 1: Credibility is primarily defined as being honest and doing your homework.

Eleven out of twelve of the interviewees largely defined credibility in science communication as being honest and doing your homework well. Interestingly, Heck defined credibility as, *credibility occurs if the message that you conveyed has been perceived as credible by the receiver*, which implies that the communicator is responsible for tailoring the message so that it is well received.

All interviewees generally defined hype and exaggeration as taking credit for more than you deserve by overstating the importance of science results e.g. by overly increasing visibility. The interviewees had different perceptions of when over-exaggeration affects the credibility negatively.

Finding 2: Credibility issues are ubiquitous and integrated into the public information officer (PIO)–Journalist interaction.

There is a general view that a certain amount of exaggeration of scientific findings is necessary in press releases is necessary to reach the general public (Schilling; Villard; Tyson). The media are used to and even expect a certain amount of overstatement, as stated by Schilling: *There is hype everywhere and everybody is doing it ... every serious science journalist knows that press releases are made by public information officers who emphasise their own organisation*.

Public information officers are juggling daily to find a sensitive balance between correctness and overstatement, and they constantly need to walk a tightrope to get news out to the media. If press releases are accurate but uninteresting, they will not receive media attention, but if PIOs sacrifice accuracy while injecting colour the press releases lose credibility with journalists and are not used (Watzke). Great effort is however put into producing science communication that is as accurate and as credible as possible (Watzke; Livio; Madsen; Hurt).

Finding 3: Credibility problems are most often caused by an intense need for visibility driven by personal or organisational desires for recognition or financial gain.
As stated by Heck: *Behind hype is the problem of visibility and recognition—the fight of organisations, laboratories or people for money*. This development inevitably leads to science communication with more spin, more push and a shorter elapsed time from scientific results to publicly communicated results.

The pressure is applied from different sides: from the organisation itself — often from management, from PIOs and also from scientists. While many scientists try to be modest when they publish their results, the increased competition in the scientific community may push them to overstate their results to become more visible (Leibundgut).

Finding 4: At least five separate factors may contribute towards credibility problems in press releases.
When trying to "dissect" the cause of credibility problems, we found that it is possible to list (at least) five different distinct, but related, causes with underlying motivations that generally fall into one of two categories: factors that contribute to making the organisation look better than it deserves and factors that make other organisations look worse than they merit. The causes are:

- **The level of communication effort**
  Using too high a level of communication effort for the level of scientific importance — that is the efforts to emphasise the finding and convince the media to run the story, by e.g. having a high-ranking political figure to endorse the release.
- **The wording of a press release**
  Using wording that does not correspond to the level of scientific importance, by e.g. omitting a question mark from the headline – *Alien life found* vs *Alien life found?*
- **Dictating the timing of a press release**
  Letting unscientific factors dictate the timing of the publication of a press release. A press release might be:
  - Politically motivated e.g. to secure funding.
  - Forced out before a peer-reviewed paper, and thus bypass the scientific process.
  - Timed to interfere with a press release or an event from a competing scientific organisation.
- **Omission of references to other scientists' work.**
- **Unjust comparisons with other facilities.**

All of the above factors may cause credibility problems in a press release, and raise concern about the real motives behind the press release.

Finding 5: Loss of credibility mostly affects the scientist

We find that individual scientists stand to lose more credibility than an entire institution, a reporter or a PIO (Schilling). So it is natural to find that scientists are more concerned about this topic than other actors. Scientists know that negative reactions from their peers can have devastating consequences for their career, as it might get harder to publish articles, find collaborators or get better positions (Livio; Tyson).

Finding 6: Refereeing either by the main scientist, an internal refereeing board or an external refereeing board can reduce the risk of credibility problems.

If a press release is run past an internal refereeing board before its public release, some factors that are known to increase inaccuracy can be eliminated. This means that there is less risk of oversimplified results, incorrect analogies, problems of a political nature and other factors that can harm credibility. Internal refereeing also helps scientists maintain credibility with their peers and thereby increase their willingness to communicate (Edmonds; Hurt; Madsen; Watzke).

Finding 7: The lack of a peer-reviewed scientific paper makes a press release more vulnerable to loss of credibility.

To all interviewees it is important that the result has been peer-reviewed prior to public dissemination, as this is vital to increase the scientific accuracy of the communication. The need for a refereed scientific paper backing a press release however also increases as the claims become more significant. If no paper is available to support significant scientific claims, it makes a press release more vulnerable to loss of credibility.

Conclusions

The main conclusion of the study is that major credibility problems for astronomy press release do not exist, though examples certainly exist. Credibility issues are found everywhere in scientist–PIO–journalist interactions and are deeply integrated into their workflow. Overstatements are, to some degree, accepted and recognised as a necessity for the communication process. All actors also recognise the sensitivity of the issue and know that the issue can have severe consequences for the actors. The real reason behind credibility problems is an intense need for visibility that is driven primarily by the desire for recognition or funding.

Credibility problems in press releases can be caused by using too high a level of communication effort, by overstating scientific claims, omitting qualifiers, by dictating the timing of a release for political motives, by announcing the finding to the public before the peer-reviewing process has had a chance to work or to time the issuing of a release in order to interfere with other press releases, by omitting references to other important work in the same field, or by making unjust comparisons with other projects.

Credibility problems often have the greatest negative implications for the scientists. However, internal refereeing and the peer-reviewing system can reduce the risk of credibility problems for all actors.

Please refer to Nielsen et al. (2007) for further details about this exploratory study.

Acknowledgement

We would like to thank our interviewees Dr Peter Edmonds, Dr Robert Fosbury, Prof. André Heck, Dr Robert Hurt, Dr Bruno Leibundgut, Dr Mario Livio, Mr Dirk H. Lorenzen, Mr Claus Madsen, Mr Govert Schilling, Dr Neil deGrasse Tyson, Mr Ray Villard and Ms Megan Watzke for participating in this study.

References

- Brumfiel, G. (2007). Is this the clearest picture of space ever taken? Nature News, 7 September 2007. doi: 10.1038/news070903-19.
- Dunwoody, S. (1986). The Scientist as Source. In Science and Journalists—Reporting Science as News, edited by S. M. Friedman, S. Dunwoody, and C. L. Rogers, pp 3-16. New York: Free Press.
- European Commission (2005). Eurobarometer 63.1 "Europeans, Science & Technology".
- Gregory, J., and S. Miller (1998). Science In Public: Communication, Culture, and Credibility. Cambridge, Massachusetts: Basic Books.
- Kiernan, V. (2000). The Mars Meteorite: A case study in controls on dissemination of science news. Public Understanding of Science 9:15-41.
- Madsen, C. (2003). Astronomy and Space Science in the European Print Media, in Astronomy Communication. Edited by A. Heck and C. Madsen, pp 67-120. Dordrecht: Kulwer Academic Publishing.
- Nelkin, D. (1995). Selling Science: How the Press Covers Science and Technology. New York: Freeman.
- Nielsen, L. H., N. T. Jørgesen, K. Jantzen and L. L. Christensen (2007). An Exploratory Study of Credibility Issues in Astronomy Press Releases. Communicating Astronomy with the Public Journal 1:5-9.
- Peters, H. P. (1995). The interaction of journalists and scientific experts: co-operation and conflict between two professional cultures. Media, Culture & Society 17:31-48.
- Robson, I. (2005). Credibility panel discussion, In Communicating Astronomy with the Public 2005: Proceedings from the ESO/ESA/IAU Conference 14-17 June 2005, edited by I. Robson and L. L. Christensen, 162-163. Munich: ESA/Hubble.
- Russell, C. (1986). The View from the National Beat. In Science and Journalists — Reporting Science as News, edited by S. M. Friedman, S. Dunwoody, and C. L. Rogers: 81-94. New York: Free Press.
- Shaefer, B. E., K. Hurley, R. J. Nemiroff, D. Branch, S. Perlmutter, M. W. Schaefer, G. J. Gonsomagno, H. Mcsween and J. Strom (1999). Accuracy of press reports in astronomy. Bulletin of American Astronomical Society 31:1521.
- Shortland, M. and J. Gregory (1991). Communicating science: A handbook. New York: Longman.
- University of Cambridge (2007). "Lucky Camera" takes sharpest ever images of stars (and it's 50,000 times cheaper than Hubble). Retrieved 9 October 2007, http://www.ast.cam.ac.uk/~optics/Lucky_Web_Site/LI_Press_Releases_0807.htm.

A website for astronomical news in Spanish

Amelia Ortiz-Gil
Astronomical Observatory, University of Valencia (amelia.ortiz@uv.es)

Abstract

Noticias del Cosmos[1] is a collection of web pages within the Astronomical Observatory of the University of Valencia´s website where we publish short daily summaries of astronomical press releases. Most, if not all of, the releases are originally written in English, and often Spanish readers may find them difficult to understand because not many people are familiar with the scientific language employed in these releases.

Noticias del Cosmos has two principal aims. First, we want to communicate the latest astronomical news on a daily basis to a wide Spanish-speaking public who would otherwise not be able to read them because of the language barrier. Second, daily news can be used as a tool to introduce the astronomical topics of the school curriculum in a more immediate and relevant way. Most of the students at school have not yet reached a good enough level in their knowledge of English to fully understand a press release, and *Noticias del Cosmos* offers them and their teachers this news in their mother tongue. During the regular programme of school visits at the Observatory we use the news as a means of showing that there is still a lot to be discovered.

So far the visits to the website have been growing steadily. Between June 2003 and June 2007 we had more than 30,000 visits (excluding 2006). More than 50% of the visits come from Spain, followed by visitors from South and Central America. The feedback we have received from teachers so far has been very positive, showing the usefulness of news items in the classroom when teaching astronomy.

The *Noticias del Cosmos* web pages

The *Noticias del Cosmos* web pages are a collection of web pages that are updated daily with astronomy and space-related news. Their simple design results in easy navigation and fast download speeds (see Figure 1). The site is divided into four main pages: today's news, this week's news, this month's news and an archive, where all the news items published since the site was started can be found. These pages are embedded in the official website of the Astronomical Observatory of the University of Valencia, Spain.

[1] http://www.uv.es/obsast/es/divul/noticias/

Noticias del Cosmos

Figure 1 – “Noticias del Cosmos” webpage.

Rather than providing translations of full press releases, abstracts of the releases are published, always trying to give all the relevant information to the reader: what, who, why, when and where. For those who are interested in finding about the details a particular item, or retrieving the accompanying pictures or multimedia material, a link to the original press release is always given.

Why are we publishing this website?

This site is addressed to the general public, although it is also being visited regularly by scientists. When we built the site we were thinking particularly of its use as an educational tool by teachers as a way to communicate to their students the thrill of discovery. Very often school books give children the feeling that scientists are really “so” smart that everything has been discovered and there are only a few, or even no, mysteries left, so it is not worth bothering about science. We certainly need to tell children that we are discovering many exciting new things right now, both here in the Solar System and at the remote edges of the young Universe.

We have often heard complaints from teachers that conveying the spirit of discovery is difficult when a particular curriculum must be followed. But there have been so many discoveries in so many fields in recent years that it is not difficult at all to find one suitable for practically any topic in the school curriculum. This is why we maintain the archive page, so that one can find the press release related to, for example, the discovery of Sedna, whenever it is needed.

As we have a dedicated page, and we are updating it daily, we can offer news that never makes it to the front pages (or indeed any page) of the main journals, but still is interesting, like new space mission images, the presence of large solar spots, the publication of new educational material on the web and so on.

The abstracts are selected by professional astronomers, so we publish what we consider interesting, only from reliable sources, and we always take care to get it right. Sometimes newspapers misunderstand or exaggerate some press releases and end up making some false assertions. This is dangerous because it can create false expectations and mistrust from the public in the future.

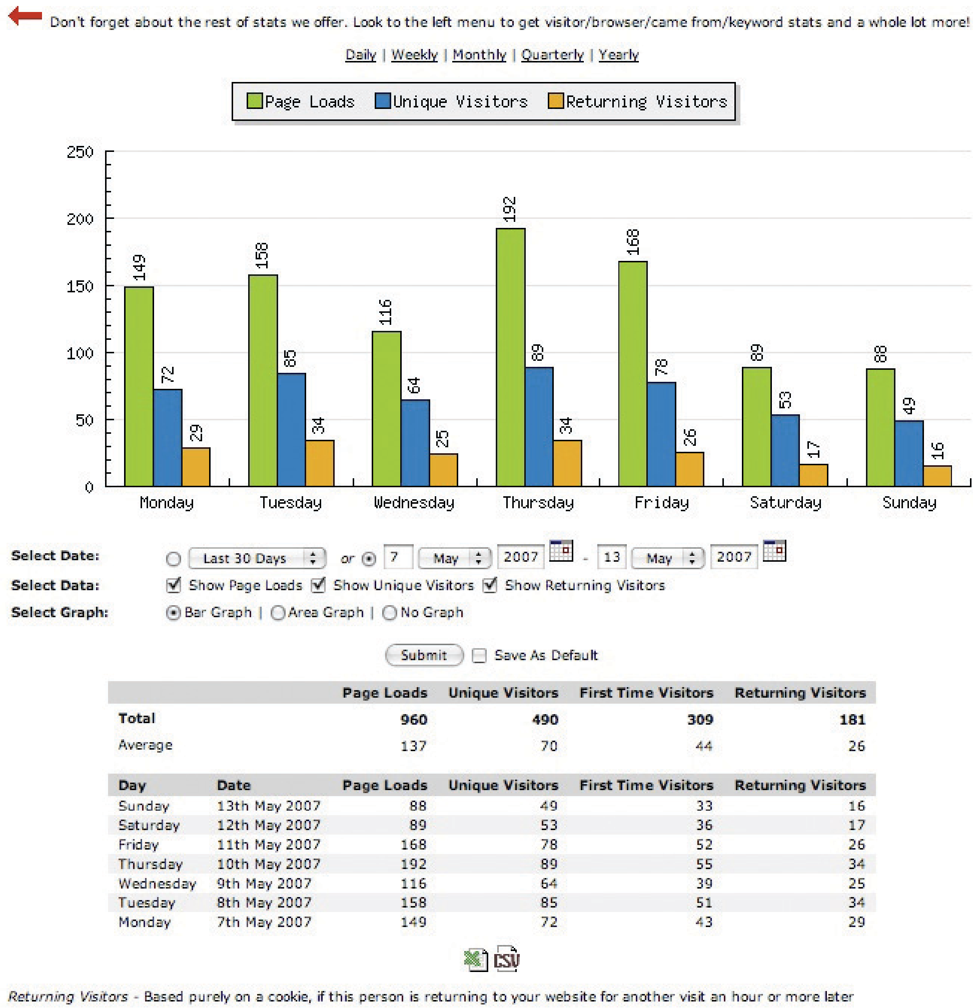
The sources we use for the news are mainly press releases from space agencies (ESA, NASA...), observatories (ESO, Hubble, Spitzer, XMM, Chandra, KECK, GEMINI...), research institutions (Max Planck, Science and Technology Facilities Council, Consejo Superior de Investigaciones Científicas, Istituto Nazionale di Astrofisica...) and universities and other similar institutions.

And last, but not least, we write them in Spanish, because it is the second most spoken language in the world, and it is easier for our teachers and students to read the news in their own language. Unfortunately, there are not that many pages of astronomy news updated daily in Spanish. Even those who are taking English courses at school find it difficult sometimes to understand the press releases as they are not familiar with many scientific terms.

How popular is the site so far?

We are currently using the Stat Counter program[2] to track the number of visitors to our page of today's news. A returning visitor is one who comes back to the site an hour or later after her/his last visit. It is a cookie based program, so if the visitor has the "cookies disabled" option on, their "hit" will always count as a first time visitor. In fact, from Figure 2 one can see that we have a pretty constant number of first visitors, which leads us to the conclusion that the sum of both, the total number of visitors ("unique visitors" in the Figure), can be considered to be the real number of regular visitors to the site.

[2] Stat Counter programme, http://www.statcounter.com



	Page Loads	Unique Visitors	First Time Visitors	Returning Visitors
Total	**960**	**490**	**309**	**181**
Average	137	70	44	26

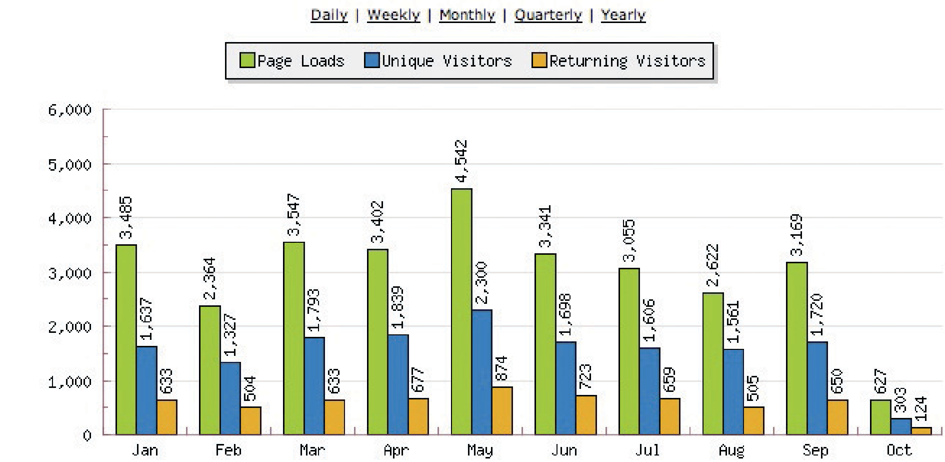
Day	Date	Page Loads	Unique Visitors	First Time Visitors	Returning Visitors
Sunday	13th May 2007	88	49	33	16
Saturday	12th May 2007	89	53	36	17
Friday	11th May 2007	168	78	52	26
Thursday	10th May 2007	192	89	55	34
Wednesday	9th May 2007	116	64	39	25
Tuesday	8th May 2007	158	85	51	34
Monday	7th May 2007	149	72	43	29

Noticias del Cosmos

Figure 2 – Daily page downloads during a typical week. Total downloads shown in green bars. Blue bars show unique visitors while yellow ones show returning visitors. Returning visitors are counted based purely on a cookie, thus visits from cookies disabled browsers are counted as unique visits instead of returning ones.

As the page is updated only during weekdays, numbers are a bit lower at weekends. On average, the number of visitors is over 70 on a regular weekday. During the present year, the site had more than 1500 visitors per month (see Figure 3). The site has received more than 30,000 visits since it was started back in 2003 (we had some trouble with the counter during 2006 so no statistics are available for that year).

More than 50% of the visits come from people based in Spain, and the rest mainly from other countries in Central and South America. But there has been an increase in the number of visitors from non-Spanish speaking countries, like Portugal.



Select Date: This Year or Jan 2007 - Oct 2007
Select Data: Show Page Loads Show Unique Visitors Show Returning Visitors
Select Graph: Bar Graph | Area Graph | No Graph

Submit Save As Default

	Page Loads	Unique Visitors	First Time Visitors	Returning Visitors
Total	**30,154**	**15,784**	**9,802**	**5,982**
Average	3,015	1,578	980	598

Month	Page Loads	Unique Visitors	First Time Visitors	Returning Visitors
Oct 2007	627	303	179	124
Sep 2007	3,169	1,720	1,070	650
Aug 2007	2,622	1,561	1,056	505
Jul 2007	3,055	1,606	947	659
Jun 2007	3,341	1,698	975	723
May 2007	4,542	2,300	1,426	874
Apr 2007	3,402	1,839	1,162	677
Mar 2007	3,547	1,793	1,160	633
Feb 2007	2,364	1,327	823	504
Jan 2007	3,485	1,637	1,004	633

CSV

Returning Visitors - Based purely on a cookie, if this person is returning to your website for another visit an hour or more later

Noticias del Cosmos

Figure 3 – Monthly page downloads from January 2007 till September 2007. Total downloads shown in green bars. Blue bars show unique visitors while yellow ones show returning visitors. Returning visitors are counted based purely on a cookie, thus visits from cookies disabled browsers are counted as unique visits instead of returning ones.

Astronomical news reaching far beyond the web

The news items that we publish on the web are intended to reach an audience far beyond those who have a computer and a network connection.

First, we have an ongoing collaboration with the Science Museum *Príncipe Felipe* of Valencia to publish a monthly leaflet about astronomy. One of the sections is devoted to the most interesting astronomical news published on *Noticias del Cosmos* during that month. This leaflet is handed out to all the visitors of the inflatable planetarium at the Museum. We are also distributing this leaflet to the, approximately, 2000 high school students that visit our observatory during each school term.

Second, to encourage the use of the news in school, we use the website during the regular visits of students to the observatory to engage their imaginations and to show them how lively and exciting the field of astronomy is. We propose them to the teacher as an imaginative way to introduce curriculum topics to the classroom. Those who have already introduced them in the classroom have told us they have found them very useful.

Conclusion

Noticias del Cosmos is a website of astronomical news in Spanish, updated daily, with more than 1500 visitors per month. Most site visitors are members of the general public, researchers and also teachers and students who find them useful as an educational tool.

To increase the number of visitors we will include an RSS feed in the site and an e-mail alert service.

The Langitselatan blog: A window for popularising astronomy in Indonesia

Avivah Yamani, Aldino A. Baskoro, Dewi Pramesti
Rigel Kentaurus, Langitselatan.com (avivah@langitselatan.com)

Abstract

The number of internet users is rising in Indonesia, even though it is still an expensive choice for most of our people. Some local astronomy sites exist, but foreign sources are preferred since sites on astronomy in Indonesian are a rarity. Current Indonesian sites on astronomy are either private sites or run by institutions. Langitselatan[1] is an educational service teaching a basic knowledge and understanding of astronomy to the people of Indonesia. In March 2007 we changed our service to a blog as this would give us the opportunity to discuss topics with our readers. Through the Langitselatan blog, we are also developing a community and making a collaborative network amongst the amateur astronomy community in Indonesia.

Introduction

Langitselatan.com is an astronomy blog in Indonesia. Indonesia is the world's largest archipelagic state with 17,508 islands and a population of over 234 million people.

Why do we need an outreach service for astronomy? In Indonesia, most daily newspapers have a science section, but print media that specialise in astronomy are virtually non-existent. Internet astronomy resources in Indonesian are also a rarity according to Nataresmi et al. (2005). Current Indonesian sites on astronomy are either private or supported by an institution. The need for an astronomy outreach service is increasing for several reasons. Firstly, visitor numbers to

Langitselatan

Figure 1 – *Centaurus* magazine, our first magazine published in 2005

Figure 2 – Langitselatan blog

[1] Langit Selatan means Southern Sky in Indonesian. Langit means sky and selatan means southern.

planetariums and observatories are rising, especially after special events like the Mars opposition in 2003, lunar eclipses and the like. Secondly, many false ideas about astronomy are still current and thirdly, a means to counter false information about certain events, such as the Mars Hoax is necessary.

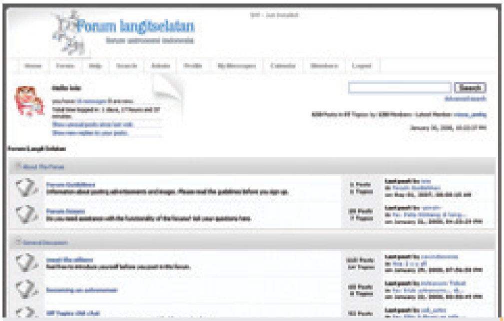
About us

Opportunities abound for the aspiring graduate with an educational background in astronomy to publish a popular astronomy magazine on the web. In 2004, five young astronomers started a group named Rigel Kentaurus as an astronomy resource in Indonesian, to act as an educational service to teach people a basic knowledge and understanding of astronomy, and to build awareness of astronomy in Indonesia. In the same year, Rigel Kentaurus started its first online venture, centaurusonline, and published its first magazine under the name *Centaurus*. Unfortunately, *Centaurus* failed in the market.

In March 2007, as blogs became more popular, we changed our service to a blog, and our name to Langitselatan (southern sky). We chose Langitselatan as a name as it is a familiar one and also the Astronomy Department, Bosscha Observatory and Rigel Kentaurus are located under the southern sky in Bandung, at 6° 57' S and 107° 34' W.

Why blog?

Internet use in Indonesia has increased significantly since 2002 from 4.5 million users to 20 million users[2] (Figure 3). Blogging is one of the most highly touted features of the Web 2.0 era, and is on the increase in Indonesia. According to blog-indonesia[3], the total number of registered blogs is 4408, mostly personal blogs (70.51%), while popular science blogs contribute only 2.63%. Among all popular science blogs, there are 30 astronomy weblogs, with 20 private blogs, four community blogs, six institution websites and one outreach service (langitselatan.com).



Langitselatan

Figure 3 – Langitselatan forum

Source : http://blog-indonesia.com/

Figure 4 – Number of blogs in Indonesia per category

2 http://www.apjii.or.id
3 http://blog-indonesia.com/blog_indonesia_statistics.html (4 October 2007)

A blog is the best way to share resources and information, because it can facilitate collaboration and sharing between users. Through our blog, we can communicate interactively with our readers and are building a community. Another advantage of the blog in popularising astronomy is that we can reach most people throughout the country at low cost. With RSS feeds, our readers are notified every time the page changes.

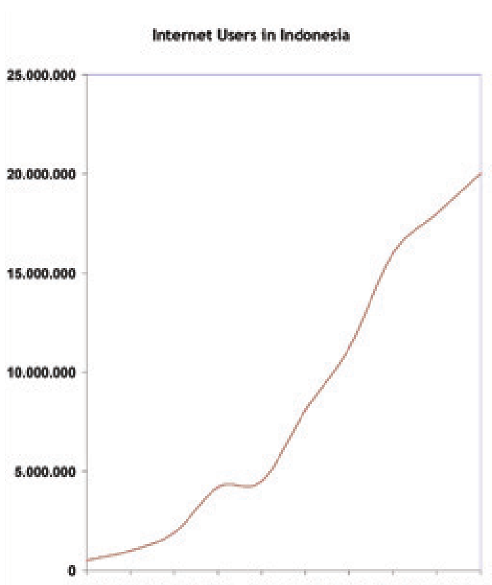
Indonesians will visit an astronomy website if there is an event or news about astronomy. In August, visitors came to Langitselatan to find out about the Mars Hoax and the total lunar eclipse Star Party. In September, our visitors were looking for the time of the crescent moon to predict the Muslim fast and also for the sun halo that appeared on 28 September. People in Indonesia still think of a sun halo as a sign of disaster.

Since March 2007, the top posts or topics in the Langitselatan blog have been the heliocentric vs geocentric question, the Mars hoax, the total lunar eclipse Star Party, the Moon hoax, the Islamic calendar, habitable planets, and why Pluto is not a planet anymore. In Indonesia, astronomy is the most searched topic on the internet to counter false explanations triggered by particular events, e.g. the Mars Hoax, or the heliocentric vs geocentric question, which are still hot topics.

Social impacts

As a result of Langitselatan, Rigel Kentaurus has also grown as an event organiser, including:

- Science Camp Salman ITB (Muslem Mosque Children Group in ITB).
- Rooftop Star Party at Mitra Hotel (7/7/07), with roof top café.



Source : Indonesian Internet Service Provider Association (http://apjii.or.id)

Figure 5 – The rise in the number of internet users in Indonesia with time

Source : http://langitselatan.com

Figure 6 – Visitor numbers by month to langitselatan.

Langitselatan

Figure 7 – Observing the sky at the Roof Top Star Party at the Mitra Hotel

- Astronomical Gathering: Southern Sky Star Party 2007 in cooperation with the student body of Astronomy ITB and Indonesian National Institute of Aeronautics and Space (LAPAN).
- Birthday star party.
- The star party goes to school and Aidil Fitri camp cooperate with Indonesia UNAWE.

At each event, the astrokids session is the favourite with several activities like origami, water rockets, drawing, and fizzing rockets. Langitselatan has also had publicity from several local and national newspapers. The papers have also chosen us as one of their resources for astronomy events, such as the total lunar eclipse and the sun halo. The publicity for Langitselatan in the national media has made people more aware of us and they come to our blog and have contacted us to arrange local events.

Challenge and problem

Being an educational service doesn't mean that we have no problems. Funding and human resources are our major problems. Equipment is also a problem, but it can be resolved by collaborating with several other institutions. Another problem for Langitselatan is to find the best methods to share knowledge with children. We are trying to make our own curriculum based on age and culture and linked to the Indonesian education curriculum. We also try to make all fields of astronomy interesting, and do not just concentrate on current issues.

Results, future work and conclusion

Since we changed our service to a blog, Langitselatan has tried to correct misconceptions and hoaxes, act as a reference for beginners, and as a resource of astronomy news and public education. The blog has also given us an opportunity to collate[4] other astronomy blogs and resources. Through Langitselatan, Rigel Kentaurus has a chance to be an astronomy educator and event organiser at schools and other venues.

Langitselatan

Figure 8 – People hang out at the roof top cafe during the Roof Top Star Party

[4] http://langitselatan.com/aggregator

This is just a beginning. In the future we plan to build an astrokids club to educate children about astronomy. To support our educational service, we will also make a mobile planetarium to visit schools and other locations, give telescope training, and collaborate with Indonesia Universe Awareness. Another project, in conjunction with Bosscha Observatory, is a planned Star Party in Indonesia in 2009 during IYA2009.

It all began with a blog, and this has opened up so many opportunities for us to communicate astronomy with the public. We have also learnt about the fundamental difficulties that many people in Indonesia have with astronomy. Without the internet and the blog we wouldn't have known that the heliocentric-geocentric question was still a problem in Indonesia.

Acknowledgement

Dr. Iratius Radiman, Dr. Cynthia L. Radiman, and Sungging Mumpuni for their help during the preparation of this material.

References

- Nataresmi A.H., Laksmana T., Yamani A., Satyaningsih R., Simatupang F.M. (2005), Building An Amateur Astronomical Community by Popular Astronomy Magazine Publishing. In: Sutantyo W., Premadi P.W, Mahasena P, Hidayat T, and Minishige S. (eds.) Proceeding of the 9th Asian- Pasific Regional IAU Meeting 2005. ITB Press. Indonesia. pp 358-359.
- O'Reilly Media – What is Web 2?, http://www.oreilly.com/pub/a/oreilly/tim/news/2005/09/30/what-is-web-20.html?page=1

Langitselatan

Figure 9 (a-c) – Astrokids and water rocket session in Astronomical Gathering: Southern Sky Star Party 2007 (SSAG)

Langitselatan

Figure 10 – Group photo in Astronomical Gathering: Southern Sky Star Party 2007 (SSAG)

Figure 11 – Observing the sky during Idul Fitri (Ied Mubarak) Star Party in At-Taqwa kindergarten.

Langitselatan

Figure 12 – Storytelling using stellarium and portable planetarium in a tent on Idul Fitri (Ied Mubarak) Star Party in At-Taqwa kindergarten

Figure 13 – Langitselatan in national newspapers and media

Credit: Gemini/Travis Rector, University of Alaska Anchorage.

Known as the N44 superbubble complex, this cloudy tempest is dominated by a vast bubble about 325 by 250 light-years across. A cluster of massive stars inside the cavern has cleared away gas to form a distinctive mouth-shaped hollow shell. While astronomers do not agree on exactly how this bubble has evolved over the past 10 million years, they do know that the central cluster

Session 13
Closing Remarks

of massive stars is responsible for the cloud's unusual appearance. It is likely that the explosive death of one or more of the cluster's most massive and short-lived stars played a key role in the formation of the large bubble.

Concluding remarks: Back to IYA2009

Catherine Cesarsky
ESO, the European Organisation for Astronomical Research in the Southern Hemisphere, IAU President
(ccesarsk@eso.org)

Introduction: CAP2007

The CAP2007 meeting was very well attended, with wide representation from all over the world. The enthusiasm was palpable everywhere. It has been a pleasure to see how this highly motivated assembly is wishing to exchange and share. We have heard about successful outreach programmes on astronomy at all levels.

Special thanks are due to Minella Alarcon for bringing UNESCO to our meeting.

The path to IYA2009

The CAP2007 conference also gave us a golden opportunity to have a side meeting with the numerous Single Points of Contact (SPoCs) for the IYA who were in attendance. From their reports, we have been reassured that the original concept of IYA2009, namely to organise a few global events and to establish guidelines for a number of independent national/regional activities and events, is working.

The emphasis is on history and culture, but mostly on the present scientific revolution. And of course the IYA2009 is not only about optical astronomy, but about ground and space astronomy at all wavelengths, and also about high energy particles (cosmic rays). Many new ideas have emerged, which we all now need to digest and bring to fruition. I will record some of them here, for future reference for the SPoCs, in alphabetical order.

- **Art:** Art should have a place. We could foster presentations of the *Life of Galileo* or other astronomy related plays, concerts with astronomy related music (Holst's *Planets*, Herschel's music, Mozart's *Jupiter* symphony, etc), visually outstanding astronomy related movies (e.g. the beautiful planet series of Jose Francisco Salgado shown at this conference), paintings (e.g. Van Gogh's Starry Night) or other art forms (e.g., batik, as we heard in this conference) which can be presented in conjunction with real astronomical images.
- **Asteroids** (to be discussed with the IAU Executive Committee): We could use the naming of asteroids as a prize for popular contests related to astronomy; also, we could name an asteroid "Galileo" on Galileo's birthday.
- **Astrology:** We should make clear the distinction between astronomy and astrology in an obvious way in our website.
- **Cartoons:** Some relevant cartoons have been created or are in preparation. We should

foster translations and exchanges among the participating countries, whenever possible.

- **Comet:** A periodic comet will become visible in 2009. We should capitalise on it, at least in the countries from where it can be seen.
- **Cornerstone *100 hours of astronomy*:** It was decided to extend the Cornerstone *24 hours of astronomy* over four days to become *100 hours of astronomy*, to take place over four days, from Thursday, 2 April, through Sunday, 5 April.
- **Children's books:** The IYA is a good opportunity to introduce children to astronomy through highly attractive books (e.g. those of Cecilia Scorza).
- **Developing countries:** There should be a special IYA Cornerstone, *Developing Astronomy Globally*, for countries and regions that do not have strong astronomy communities. The implementation would focus on fostering astronomy training and development of young people at the high school and/or university level.
- **Galilean moons:** Excellent community astronomical projects can be built around the theme of the Galilean moons.
- **Galileoscope:** Yes, but also foster gifts of bigger telescopes to schools, or to libraries for loans.
- **Indigenous populations:** Special projects could be created towards specific indigenous populations in different parts of the world.
- **New Year events:** There has been a fruitful exchange of ideas for national events at the 31 December/1 January level. In this context, it was suggested to emphasise the link between astronomy and time keeping.
- Opening event: The opening event is targeted to take place at UNESCO, in Paris, 19–21 January.
- **Pollution/dark skies protection:** In picture exhibits, show also pictures of light pollution. The protection of radio-frequencies should also be emphasised.
- **Solar eclipse:** Try to capitalise on the 2009 solar eclipse, even though it is difficult in places where it cannot be seen.
- **Sun:** An important part of astronomy, which should not be forgotten.
- **Tourism:** Organise tours to historic/current astronomy locations.
- **Culture:** Don't forget the cultural links to your own country.
- **Weather reports:** Weather reports on television: astronomy news and ephemerides could be added.

In conclusion, I wish to thank again the organisers of this meeting, and particularly Manolis Zoulias, for this extraordinarily fruitful exchange in preparation for the International Year of Astronomy 2009.

Credit: Ray Gralak

Comet C/2006 M4 is a non-periodic comet discovered in late June 2006. After crossing its perihelion, it flared dramatically from 7th magniture to 4th magnitude becoming visible with naked eye.

Posters

Credit: Ray Gralak

Comet McNaught swung by the Sun in mid-January 2007. Fierce solar heat turned it into the brightest comet in 40 years; for a few days it was actually visible in broad daylight. When McNaught emerged from the Sun's glare into the skies of the Southern Hemisphere, the tail alone stopped traffic and was mistaken for a brush fire, an explosion, a mysterious cloud and probably many other things never reported. This picture was taken on 20 January 2007 from Australia.

An open day for children: The *Bambineide* in Arcetri

Lara Albanese, Antonio Biolatti, Francesca Brunetti, Daniele Galli, Antonella Gasperini, Filippo Mannucci, Emanuela Masini, Franco Pacini, Francesco Palla, Guia Pastorini, Guido Risaliti, Marco Salvati, Eleonora Sani & Paolo Stefanini
INAF-Osservatorio Astrofisico di Arcetri (albanese@arcetri.astro.it)

Abstract
We briefly review the outreach activities at the Arcetri Astrophysical Observatory, and in particular the annual open day for children called *Bambineide*.

Visits and guided tours
For decades the Arcetri Astrophysical Observatory in Florence, Italy, has provided outreach and educational activities especially directed to students at the primary and secondary school level. School visits usually take place during the morning. After a tour of the observatory, young students can observe sunspots on the solar photosphere with a historical, but completely refurbished refracting telescope (36 cm diameter), solar protuberances with a solar telescope with a narrow-band Hα filter, cosmic-ray tracks with a cloud chamber, and hear a lecture on the scientific research carried out by staff astronomers. About three times per month, the observatory is also open to the general public at night. Night-time observations with the historical refractor telescope (assembled circa 1866) show the craters of the Moon, the rings of Saturn, the moons of Jupiter, the Orion Nebula, passing comets and much more. The total number of visitors exceeds 15,000 people per year.

The planetarium and the (planned) Museum of the Universe
In collaboration with the Museum of History of Science and the Science Foundation of the city of Florence, the Observatory also runs a planetarium. In addition, the observatory promotes visiting lectures to schools by professional astronomers, activities with a portable Starlab planetarium, science exhibits and laboratories. Some recent interactive exhibits are *Lights and Shadows of the Universe, Time in Nature, Interferometry* and *Adaptive Optics* (the latter especially designed for high-school students). On the occasion of the Galileo's celebrations during the International Year of Astronomy (2009), the Arcetri Observatory has proposed the construction of a Museum of the Universe. This would be an interactive science centre and planetarium, located in the Torre del Gallo, close to the observatory and to the house where Galileo spent his last years in exile.

The *Bambineide*
Once a year the Arcetri Observatory opens its gates to the children of Florence. The children are aged from four to eleven. This means the arrival of about 500 children and a comparable number of parents, an event called *Bambineide* (A Children's Epic). The *Bambineide* exploits the fascination of astronomy to attract primary school children to a scientific research institution, where they can familiarise themselves with astronomical instrumentation and ask professional astronomers

questions. During the visit, the children can take part in a show inside a Starlab planetarium, listen to stories about the constellations and their mythology, take part in scientific experiments and watch a scientific play (in 2007, dealing with the discoveries of Galileo). The programme is enlivened by readings of children's astronomy rhymes. In the evening, telescope observations become the main attraction. These activities for children, in addition to the day-time guided visits to the observatory, help and strengthen the scientific education offered by primary schools, promoting a hands-on approach to science.

Each edition of the *Bambineide* is focused on a different theme: in 2004, *The Realm of Stars;* in 2005, *Children on Mars;* in 2006, the *World of Black Holes* and in 2007, *The Life and Science of Galileo*. The *Bambineide* has become a cherished tradition in Florence, and it has been exported to several Italian cities.

All figures courtesy of the authors

Figure 1 (a - b) – Posters of the 2005 and 2007 Open Day at the Osservatorio Astrofisico di Arcetri (Florence, Italy), focused on black holes and the life and science of Galileo, respectively.

The TACOR educational telescope and the Italian RemoteLab Project - Learning tools for the International Year of Astronomy 2009

Aldo Altamore[1], Roberto Nesci[2], Corinne Rossi[2] & Silvia Sclavi[3]
[1] Dipartimento di Fisica "E. Amaldi" Università Roma Tre and SSIS Lazio (altamore@fis.uniroma3.it)
[2] Dipartimento di Fisica Università La Sapienza, Roma (corinne.rossi@uniroma1.it, roberto.nesci@uniroma1.it)
[3] Liceo Scientifico Statale "C.B. Cavour", Roma (silvia.sclavi@istruzione.it)

Abstract

The Department of Physics of La Sapienza University has installed a didactic remote controlled telescope (TACOR) which, in collaboration with the Department of Physics of University Roma Tre, is currently used by mid-level and high-school classes. TACOR operates in the framework of the National RemoteLab Project which is supported by Italian Ministry of Public Education. During the forthcoming IYA2009, TACOR and RemoteLab will be powerful online tools for an interdisciplinary teaching and public communication of astronomy.

The TACOR telescope

The Remote Controlled Telescope (TACOR) described by Nesci et al. (2007) is located on the roof of the Physics Department of Rome University, La Sapienza, and operates in the framework of the National RemoteLab Project. The telescope can be controlled directly from the schools through an ADSL connection. A live webcam allows the remote observers to follow the telescope operations. The CCD cameras and the telescope are controlled by a PC running Windows XP. Pointing is performed with the electronic planetarium SW Perseus. All operations are remotely controlled by the software VNC which is freely available for Windows, Linux/Unix and Mac OS. The main characteristics of the telescope are highlighted in Table 1.

Up to now TACOR has shown itself to be an efficient tool for meaningful learning (Novak J. 1998) in astronomy and in the natural sciences in general.

Location	Roma, Italy (long. 12 31 03 E; Lat. +41 54 05 N)
Mount	Bellincioni Omega
Motors	Astrometric Skywalker
Telescope	Celestron Schmidt-Cassegrain, diameter 235 mm f/10, camera Meade LPI
Auxiliary telescopes	Coronado PST40, H-alpha filter, webcam Philips Toucam Pro II
	Viewfinder Celestron 50 mm f4, webcam Creative EX Pro
	Viewfinder Yashica 135mm f/2.8, camera Mintron WTW-12V1C-EX

Table 1. Main characteristics of the TACOR educational telescope

During remote operations we currently perform the following observational activities.

Daylight:

a) The PST40 telescope shows nearly the whole solar disc in Hα line — solar prominences and sunspots are clearly seen.

b) The viewfinder (FOW~2°) allows the Moon's apparent diameter and its variation to be measured.

c) The Celestron telescope shows the phases of Venus — it is possible to repeat Galileo's observations of the phase changes, demonstrating that the planet orbits around the Sun.

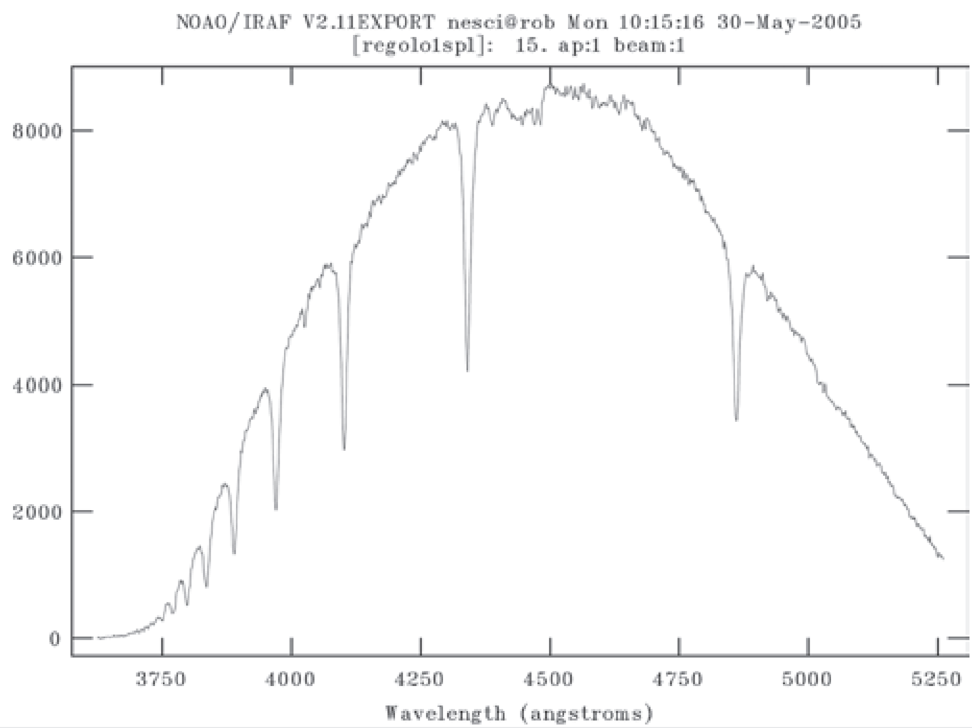
Night observations:

d) The Celestron telescope allows observations of Moon craters down to 4 km diameter — and, as in the case of daylight observations, the viewfinder allows a measurement of the lunar angular diameter with a relative error of about 1.3%.

e) Measurements of the diameters of the major planets can be made easily through the Celestron.

f) Activities on bright stars with Celestron: star colours can be detected; the angular separation of double stars can be measured from the images; optical spectra can be acquired (Figure 1).

•



courtesy Aldo Altamore

Figure 1 – The optical spectrum of Regulus (α-Leo) obtained with TACOR

Recently the National Television RAI produced an educational video about TACOR which has been broadcast (RAI-EDU Channel) and is now available on the web[1].

The RemoteLab National Project

RemoteLab is an opportunity offered to all Italian schools for studying different physical, chemical and biological phenomena by means of real, not simulated, remote experiments freely accessible through a dedicated website. The experiments are located at different sites: Bologna, Caserta, Milano, Roma and Torino. The system is mainly based on the Leybold Didactic control hardware and the software Cassy Lab. The website has been designed and is managed by Didattica Italia. The following institutes have collaborated in the project: Department of Physics, Turin University, Life Learning Centre, Bologna University, Department of Physics, University Roma Tre, Department of Physics, University La Sapienza, Rome, IPSIA A. Righi, S. Maria Capua Vetere (Caserta), National Association of Technology Teachers(ANIAT) .

The proposed experiments are the following: acid/base titration, remote Nikon Coolscope microscope, TACOR, centrifugal force, Lorentz force, electromagnetic induction, black body radiation, diffraction/interference of ultrasonic waves and basic electronic circuits.

Conclusions

During thousands of years of cultural evolution the presence of the starry sky has significantly influenced the psychic and intellectual structure of human mind. Also today, although the starry sky has been dimmed by indiscriminate light pollution, astronomy remains a strong stimulus for the intellectual curiosity — most particularly for children. Moreover modern astrophysics involves many topics in common with all natural sciences and mathematics. Therefore astronomy is very useful for formal and informal interdisciplinary learning of the sciences (Altamore et al. 2005). During the IYA2009 the TACOR telescope and RemoteLab will be powerful interdisciplinary tools for communicating astronomy and promoting the evolutionary nature of the cosmos to the public.

References

- Altamore A., Benvenuto G., Ghelardini S. (2005), Università e Scuola X, 1/R, 65
- Nesci R. (2007), http://astrowww.phys.uniroma1.it/tacor/tacor.html
- Novak J. (1998), Learning, creating, and using knowledge: Concept maps as facilitative tools in schools and corporations.Mahwah, New Jersey: Lawrence Erlbaum Ass.

[1] http://www.explorascuola.rai.it/online/Index.asp?azHome=DettaglioPuntata.asp&pun_id=1135 Explora Scuola, 26 June 2007, "Un telescopio per la scuola"


Credit: Sze-leung Cheung

Popularisation of astronomy in Estonia

Kalju Annuk & Mare Ruusalepp
Tartu Observatory, Estonia (annuk@aai.ee) (mare@aai.ee)

Abstract

We shall present a short overview about the popularisation of astronomy in Estonia. Because Estonia is a small country and there is only one professional astronomical institution — the Tartu Observatory — and few popularisation centres for astronomy.

Some historical points about astronomy in Estonia

Astronomy as a science has a long tradition in Estonia that goes back to the beginning of the 19th century. Recently the list of the ten most famous scientists from Tartu University of all time was published and two of them were astronomers!

- 1802: Tartu University reopened, and the first professional astronomer-observer (Ernst Knorre) started his work there.
- 1808: Construction of an observatory began and it was opened in 1812.
- 1814: F.G.W. Struve started regular observations. Thanks to Struve's work, Tartu Observatory became world-famous in the first half of the 19th century.
- 1824: F.G.W. Struve obtained the 9-inch (24 cm) telescope for Tartu Observatory. This telescope (a Fraunhofer Refractor) was the largest and the most modern in the world at that time.
- 1837: F.G.W. Struve was the first to measure the distance to Vega.
- 1922; E.J. Öpik determined the distance to the Andromeda Galaxy accurately.
- 1964: The new observatory was opened in Tõravere (~20 km from Tartu).
- 1975: The 1.5-m reflector began working, the largest telescope in Estonia and the Nordic Countries.

Astronomy: Science vs Culture

Astronomy is the oldest of the natural sciences and its influence on culture is marked. It is well known that the names of constellations and bright stars have been very different in different parts of the world. Often these names are connected with the characteristics and culture of the nation. Most of the constellations in the ancient Estonian sky represent agricultural tools and everyday scenes. The most well known names in the ancient Estonian sky are:

- The Big Cart (Suur Vanker) = Ursa Major
- The Small Cart (Väike Vanker) = Ursa Minor
- The Flail and the Rake (Koot ja Reha) = Orion
- The Great Cross (Suur Rist) = Cygnus

- The Bird's Way (Linnutee) = Milky Way
- The Sieve (Taevasõel) = Pleiades
- The North Nail (Põhjanael) = Stella Polaris
- The Slave Star (Orjatäht) = Sirius

Astronomical clubs and popularisation

The Astronomical Club at Tartu Old Observatory is the longest lasting, actively operated astronomical centre in Estonia. The club started its work in 1958 and it is the still place in Tartu where students of astronomy and other people who are interested in astronomy will meet nowadays.

The main activities are the following:
- Astronomical lectures take place almost every week (on Tuesday).
- The club organises public observing nights systematically.
- The club has published several items about astronomy; the most important are the planisphere and sky charts.

- In cooperation with the Science Centre AHHAA a number of exhibitions have been organised.
- The web magazine *Vaatleja* (Observer) is published periodically.
- A textbook of cosmology was prepared for high school children.

The Stellaarium has been funded since 1997 as an organised association at Tartu Observatory. During the last ten years we have received more than 2,000 groups and more than 60,000 visitors. About 85% of the visitors are schoolchildren. There are about 5,000-6,000 visitors every year; the most popular months are May and October. All excursions are pre-booked and the tour lasts 1.5 to 2 hours. The tour consists of:

- Overview of the ancient Estonian sky using the natural stone mosaic, located in the main building of Tartu Observatory.
- Overview of the Solar System, and the relative distances between planets during the short walk "through" the Solar System model. The scale is: 1 m in the model corresponds to ~40 million km in the real Universe.
- Demonstrating our largest (1.5 m) telescope and talking about modern observational techniques. If the sky is clear, it is possible to look through the telescope at the planets, Moon and other sky objects.
- Explaining how the seasons of the year change, why there is day and night, what causes solar and moon eclipses and how the Moon's phases change.
- Presentation of the virtual planetarium Starry Night.
- It is also possible to read several posters, view sky charts, admire a 270-kg iron meteorite, and other activities.

The Astronomical Club Ridamus connects amateur astronomers and people interested in astronomy who are living in the Estonian capital Tallinn. This club has been in existence for about ten years. The club organises public observing nights in several places in the city.

The Music Hall/Observatory at Jäneda is unique in that it combines music and the starry sky. The activities are based mainly on the enthusiasm of musician-composer and amateur astronomer Urmas Sisask. He has composed many compositions inspired by the sky. More than 1200 concert/lectures dedicated to the starry sky have taken place. On a clear night it is possible to watch the sky through the telescopes.

Printed materials and media

Books, periodicals, radio, television and the internet are very important tools in the popularisation of astronomy. As the population of Estonia is approximately 1.4 million, of whom less than one million are Estonians, publishing in our native language is very limited. However, in the last decade there has been some progress — more and more translated astronomy books have been published. At the same time Estonian astronomers have written many popular articles and some books. One of the most long-lived periodicals is *Tähetorni Kalender* (Calendar of the Tartu Observatory). This has been published since 1924 and it includes, besides the ephemeris, several articles about astronomy and space. Another important popular magazine in Estonia is *Horisont* (Horizon). In every issue there is at least one article about astronomy. From 2006 onwards we will publish the new calendar — *Tähistaeva Kalender* (Calendar of the Night Sky). It includes astronomical pictures and also the ephemeris and sky charts.

IYA2009 in Estonia

In the context of the International Year of Astronomy we plan to carry out:

- Special lectures for students, schoolchildren and teachers.
- Public nights in every month in the different places across Estonia.
- Planetarium shows using the mobile planetarium.
- Special numbers dedicated to IYA2009 in the magazine *Horisont*.
- Postage stamps: IYA2009 and 200 years of the Tartu Observatory.
- Multimedia programme, which describes how the constellations are known to different nations and peoples.


Credit: Sze-leung Cheung

The *Hunt for Black Holes*: A new concept workshop for high school students

Ilaria Arosio[1], Andrea Tiengo[2], Stefano Sandrelli[3]
[1] INAF — Osservatorio Astronomico di Brera (ilaria.arosio@brera.inaf.it)
[2] IASF Milano (tiengo@lambrate.inaf.it)
[3] INAF — Osservatorio Astronomico di Brera (stefano.sandrelli@brera.inaf.it

Abstract

This paper describes the *Hunt for Black Holes* project, a new workshop addressed to groups of about 30 secondary school students.

The *Hunt for Black Holes* is a new concept workshop addressed to groups of about 30 secondary school students, who have just finished their penultimate school year. Its main goal is to introduce the students to scientific research and industry in the field of space technology and applications. The formal goal of the students was to make a proposal for a high energy space telescope to hunt for black holes, taking into account both the scientific rationale, the industrial technologies and the actual assigned budget.

The workshop lasted eight days, a total of about 50 hours. From the very beginning the students were divided into six competing groups. Each day they attended laboratories and lessons given by scientific researchers and aerospace industry representatives, and gathered information about both black holes and space missions.

Each group had to formalise its choices on the last day by making a proposal for a high energy space telescope to study black holes. The groups had to specify the scientific goal of their missions (which aspect of black holes they wished to investigate), the energy ranges they wished to explore, the mirrors, the detectors, the spacecraft (solar panels and electronics all-included) and the launcher. They had 30 credits to buy the components and pay for the launch itself. The groups had to prepare a presentation and submit the project to a scientific panel. Just five minutes before the presentations were due to begin, the groups were told that the budget had been reduced to 23 credits because of a sudden change in the strategic decision of the space agency. They were given an extra 10 minutes to take this new piece of information into account. This was a very interesting moment in the workshop: the groups naturally joined forces, making every effort to maintain the scientific relevance of their missions.

At the end a panel of scientists chose the space telescope (or telescopes) that were worthy to fly into space. We monitored the results of the workshop afterwards by using self-evaluation questionnaires filled out by every student. According to the students, they developed skills in interaction knowledge, sharing knowledge and team-building, discussion and problem solving.

They also felt they had acquired a deeper knowledge of the Universe and the space technologies for observation and scientific research and a greater ability to focus on the main aspects of an astronomical space mission.

We strongly believe that this approach, which uses a combination of a role-play approach, hands-on strategy and some more formal education constitutes a format that can easily repeated in most European countries to fight the disaffection of secondary school students from science curricula at the university level.

The *Hunt for Black Holes* was organised at the end of the scholastic year 2006-07 by the Public Outreach & Education office (EPO) of the Astronomical Observatory of Brera (Milan) and the ASF Milano, the Milan Section of the Space Astrophysics and Cosmic Physics Institute. It was hold in collaboration with Thales Alenia Space (Milano, Italy) and Media Lario Technologies (Lecco, Italy) and coordinated by the onlus association Odisseospace. The workshop was financed by ASI (Italian Space Agency) and the National Agency for Education (ex IRRE). ESA (European Space Agency) supported the workshop as well.

Africa’s giant eye inspiring a nation: Communicating astronomy in South Africa

Isobel Bassett & Shireen Davis
South African Astronomical Observatory (isb@saao.ac.za)

Abstract

This poster reflects the increase in public awareness of the SAAO through media coverage and highlights the measures implemented by the SAAO to enhance public visits over the period 2002 to 2006.

Introduction

On 1 June 1998 the Minister of Arts, Culture, Science and Technology announced in Parliament that the South African Government would fund 50% of the total cost of the Southern African Large Telescope (SALT). While SALT is an inexpensive project by international standards, it was a huge undertaking for South Africa. The level of commitment to astronomy was such that much was expected in return. SALT stakeholders met in September 2000 to give shape to the goal of using the construction of SALT as a vehicle for educational, industrial and regional empowerment. The outcome was the SALT Collateral Benefits Programme. Developing the collateral benefits in parallel with the telescope and its instruments has been a major thrust at the South African Astronomical Observatory (SAAO) over the last six years.

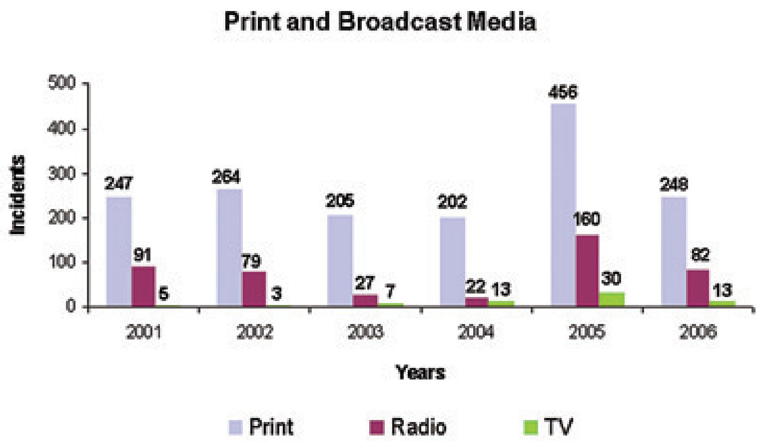
Media coverage

It became clear very early on that the tremendous interest in the progress of SALT among the media could be utilised for public awareness. Over this period under discussion, the main interaction with the press was through 133 press releases and numerous interviews for both print and broadcast media.

Although the SAAO subscribed to a local news service to monitor the extent of print media from very early in the SALT construction phase, it was only for 2005 and 2006 that this news service monitored broadcast media. All statistics of earlier broadcast media were reported by staff members who conducted interviews with both radio and television stations. The dramatic increase in 2005 reflects the high profile reached by the inauguration of SALT by the South African President Thabo Mbeki.

A media company was specifically employed to coordinate all media coverage around First Light and the inauguration of SALT. Special interventions were made to package the complex science matter for all target audiences, ranging from scientists and politicians to learners in rural areas.

For the launch event in November 2005, national and international media were accredited and transported to SALT. A media centre was set up in a nearby telescope dome overlooking SALT, to enable media to stream audio and video footage of the inauguration and President Mbeki's tour of SALT live to national and international audiences. For these efforts, the SALT media campaign received the Public Relations Institute of South Africa's PRISM Awards for Best Media Relations.



All pictures courtesy of the authors.

Figure 1 – Media monitoring of the SAAO for print and broadcast media.

Public outreach

The direct effect of the media exposure had a dramatic impact on visitor numbers to the SAAO, in particular to Sutherland.

The SAAO Cape Town hosts a monthly open night at its headquarters at the observatory. These open nights are conducted by astronomers living on the SAAO site. Day visitors are accommodated on an ad hoc basis. The public is often invited to the SAAO to observe special astronomical occurrences and these events are always very well attended.

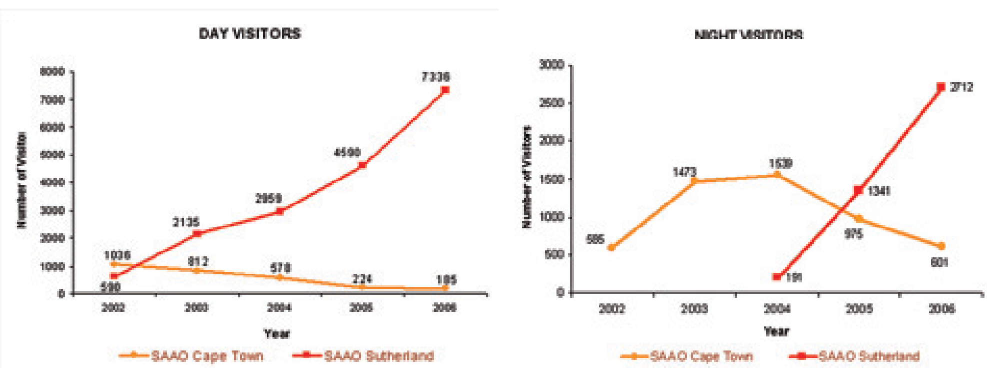


Figure 2 – Public visits to the SAAO sites in Cape Town and Sutherland.

In Sutherland, the SAAO operated three scheduled day tours per week by the start of the period under review. These tours were conducted by volunteer staff, working at the observing site for the particular week. By the end of the period under review, the Sutherland day tours had increased to 2 tours per day, Monday to Saturday and tour guides are employed to conduct tours. More tours are soon to be implemented to keep pace with the increased influx of visitors. Night tours were instituted in late 2004, as reflected in the above chart. These were initially conducted by observers. Today, the SAAO operates four night tours per week conducted by trained tour guides.

In order to enrich the visitors’ experience in Sutherland, the existing technical building was converted to a dedicated Visitor Centre. The astronomical exhibits were designed to take visitors to the edge of space and time by comparing with contemporaneous events in the fossil record. By 2006 the SAAO had also invested in two dedicated telescopes for visitors.

Conclusion

The SAAO has been able to develop a close relationship with specific science journalists to enhance media exposure of astronomical events. This will be vital in the build up to the International Year of Astronomy. The success of such a campaign will be evident in the increasing streams of visitors to the SAAO.

References

- Buckley et al. (2005), Africa’s Giant Eye: Building the Southern African Large Telescope. SALT Foundation, Observatory
- Whitelock P.A. (2004), Optical astronomy in post-apartheid South Africa: 1994 to 2004. In: Heck A. (ed.) Organizations and strategies in astronomy: Volume 5. Kluwer Academic, Dordrecht, pp 39–60

Credit: Raquel Shida

PARTNeR — Radio astromony for students

Carmen Blasco, Juan Angel Vaquerizo
LAEFF — INTA (Instituto Nacional de Tecnica Aeroespacial) (cblasco@laeff.inta.es, jvaquerizog@laeff.inta.es)

Abstract

PARTNeR[1] stands for Proyecto Academico con el Radiotelescopio de NASA en Robledo (the Academic Project with NASA's radio telescope at Robledo), and allows students to perform radio astronomy observations. High school and university students can access the PARTNeR radio telescope via the internet. The students can operate the antenna from their own school or university and perform radio astronomy observations.

What is PARTNeR?

The acronym PARTNeR stands for Proyecto Academico con el Radiotelescopio de NASA en Robledo (the Academic Project with NASA's radio telescope at Robledo). NASA has three satellite tracking stations across the world:

- CDSCC (Canberra Deep Space Communications Complex), Australia.
- GDSCC (Goldstone Deep Space Communications Complex), USA.
- MDSCC[2] (Madrid Deep Space Communications Complex), Spain.

One of the 34-m antennas located at MDSCC[2] (see Figure 1) is no longer used for satellite tracking and, thanks to an agreement between the Spanish space agency (INTA, Instituto Nacional de Tecnica Aeroespacial) and the American space agency (NASA), students can use it to perform radio astronomy observations. Comunidad Autonoma de Madrid and Fundacion Española para la Ciencia y la Tecnología (FECYT) are also PARTNeR sponsors.

Activities offered by PARTNeR: radio astronomy observations

High school and university students can access the PARTNeR radio telescope via the internet. The students can operate the antenna from their own school or university and perform radio astronomy observations. There are two scientific projects they can join:

- X-ray binary monitoring. An X-ray binary consists of a compact object (black hole or neutron star) and a "normal" star, swallowed by the compact object. Some of these systems show radio bursts and their study can give us information about the black hole/neutron star, accretion rate, etc. In Figure 2, components of a low mass X-ray binary are shown.

[1] http://www.laeff.inta.es/partner
[2] http://www.mdscc.org
[3] http://www.centrodevisitantes.com

- Galactic Plane maps. Most of the material in our Galaxy is located in the galactic plane and our students can map many of these sources (supernova remnants, i.e. the structure resulting from the gigantic explosion of a massive star; HII regions, i.e. a cloud of gas and plasma in which star formation is taking place; etc.). In Figure 3, you can see a Rosette Nebula map obtained with PARTNeR radio telescope (S band = 12cm).

Other projects may be done after an evaluation by the scientific committee.

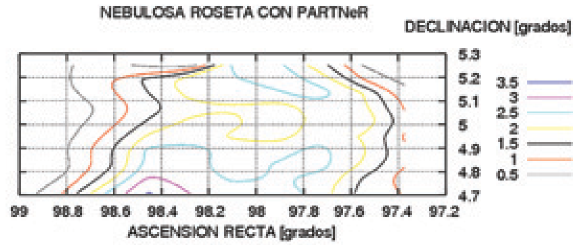
Activities offered by PARTNeR: Hands-on activities

For primary and secondary school students, astronomy hands-on activities are available at the training and visitor centre[3], attached to MDSCC. They last for 2.5 hours and the maximum number of students for a hands-on activity is thirty. They can be accessed according to the age of the students and topic selected by the teachers:

- The Sun. Students build Sun watches and learn how to use them. They also perform observations with a telescope to study sunspots.
- Rockets. Depending on the age of the visitors, our students build water rockets and study launch speed, height reached by the rocket, etc.
- Planets and planetary systems. Students learn how to use radar techniques to explore the surface of a planet and different methods to detect exoplanets.

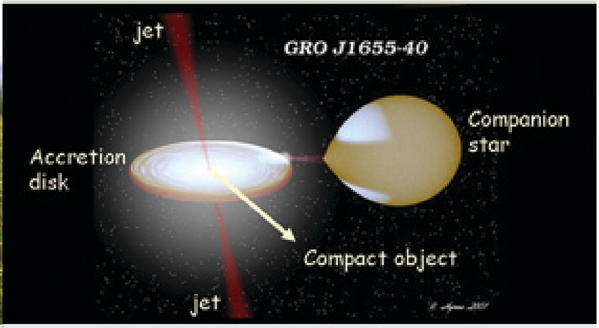
NASA/JPL

Figure 1 – PARTNeR radio telescope



INTA 2007

Figure 2 – Rosette Nebula map obtained with PARTNeR radio telescope



R.Hynes 2001

Figure 3 – Artistic view of a low mass X-ray binary

Activities offered by PARTNeR: Final projects for university students

In the Spanish educational system, it is compulsory for an engineering student to develop a Final Project carried out at university or within a company. PARTNeR also offers that opportunity. Currently, under an agreement between Universidad Miguel Hernandez (Alicante) and INTA, a telecommunication engineering student is designing and developing new software to control the PARTNeR antenna.

High school teacher training

Radio astronomy is not a common subject and high school teachers have to be trained and helped to spread the knowledge to students. We have developed teaching material adapted to the Spanish high school education system. At the moment there are three didactic units:

- Electromagnetic spectrum.
- Radio astronomy.
- Radio telescopes.

High school teachers interested in joining PARTNeR must attend a training course, usually at the beginning of the academic year, to learn more about:

- Radio astronomy.
- How to perform a radio astronomy observation.
- Techniques to implement PARTNeR as a different tool to fulfil the curriculum in their classrooms.

Conclusion

In the last three years, since PARTNeR was made available to high school and universities, about 50 teaching institutions have enrolled our project. This means 250 students have accessed the PARTNeR radio telescope.

More than 6000 people visited the training and visitor centre attached to MDSCC during 2006. We estimate that when hands-on activities are offered for the first time this year they will be accessed by at least 2500 students.

Credit: Dennis Crabtree

Displaying the diversity of the professions in astronomy

Thierry Botti
Observatoire Astronomique de Marseille Provence (OAMP/CNRS/Université de Provence) (Thierry.botti@oamp.fr)

Abstract

The popular appeal of astronomy allows us to share regularly the latest advances in our knowledge of the Universe with a large audience, via numerous and varied outreach activities. These activities is an opportunity for us to present the diversity of professions involved in this fabulous quest of knowledge, including technicians, engineers and scientists in numerous fields. We thus communicate an overview of the many players in the adventure of astronomy to the public, hopefully encouraging young people to choose scientific studies. Films, on-line videos, exhibition panels, round table discussions and press releases are among the many easily-implemented possibilities of attracting the attention of a local or even wider public.

Demonstrating the variety of astronomy's professions

The popular appeal of astronomy allows us to share the latest advances in our knowledge of the Universe regularly with a large audience, via numerous and varied outreach activities.

These activities are an opportunity for us to present the diversity of the professions involved in this fabulous quest of knowledge, including technicians, engineers and scientists in numerous fields. We thus communicate to the public an overview of the many players in the adventure of astronomy, hopefully encouraging young people to choose scientific studies.

Films, online videos, exhibition panels, round table discussions and press releases are among the many easily implemented possibilities of attracting the attention of a local or even wider public.

A favourable context for communication

We regularly share the latest advances in our knowledge of the Universe with a large public audience, via numerous and varied activities. Although we are accustomed to presenting our scientific results, we very rarely speak about the professions of the "players" involved. Astronomy is a science of observation which necessitates the production of increasingly high performance tools demanding the expertise of numerous engineers and technicians from varying fields in collaboration with the scientists. These "experts" are dedicated professionals who must regularly meet the technological challenge of developing the essential tools that scientific results depend on.

Credit: OAMP

Figure 1 – An optical engineer working on a new project of instrument

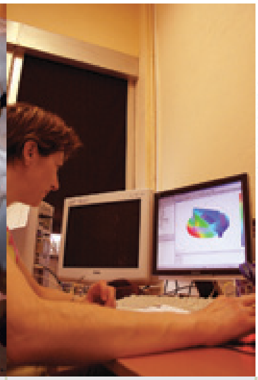


Figure 2 – A mechanical engineer designing the mechanical structure of an optical piece

Credit: OAMP

Figure 3 – This DVD, produced by a team of cinema students presents 6 scientific and technical astronomy professions. Each “profession video segment” can be presented individually (particularly for an online transmission). A bonus also enables you to follow the careers of the 6 people interviewed.

Distribution and usage: Regional secondary schools, internet, exhibition video space, conference projections, student laboratory tour.

Credit: OAMP

Figure 4 – Exhibition *Planètes d’ailleurs* created to accompany the launch of the Satellite Corot.

Credit: OAMP

Figure 5 – Round table discussions “Cassini Huygens” with the participation of ESA, OAMP, Polytech, CNRS, Alcatel Space and *Espace* Magazine.

Making the public aware of the different “players” associated with astronomy is a way of recognising the essential role each one performs. By showing the variety of exciting professions offered by the world of research we may steer today’s youth towards scientific studies.

With this in mind, we aim to incorporate into our communication activities information concerning the different professional skills and, when it’s possible, attempt to play on the notion of proximity. However, in astronomy, when we talk about a scientific result or a satellite launch, the scientific event itself is usually a great distance away. Communication has a greater impact on the public if we are able to give a local aspect to a remote scientific event.

Multiple opportunities to present our professions… some grounds for reflection

Films and videos

Producing digital videos to present the different professions in a dynamic way is an affordable and easy media choice. Since we are not producing a televised advertisement, it is possible to create quality film using groups of students and computer generated animations produced by agencies (CNES, ESA, ESO etc.) without having to resort to experienced professionals.

Furthermore, we can broadcast our video over the internet to a large audience via our own website and other well-known public sites, such as Dailymotion and YouTube.

In this case, small sequences (interviews and the important moments of a technical activity) can be easily filmed using a handheld video camera and streamed online to accompany a press release (for example, as the Hubble/ESA team does).

Exhibitions

Exhibitions on thematic research are also an opportunity to inform the public of our varied professional activity. For example, by allocating a certain number of exhibition panels to display a scientific instrument and the background relevant to its production (its history, creators etc.). Short narrated videos showing the intervention of an engineer, or a researcher working on a project can reinforce the message to the public.

Despite representing a human investment and sometimes requiring a relatively significant financial budget, exhibitions have numerous advantages. They can be presented successfully in different locations, reaching a wider public. They establish and encourage contact between students and teachers and create a pretext for organising conferences. They are very popular with the local press.

Round table discussions, conferences…

In the context of a scientific project the professions can be approached and presented in a dynamic way to awaken the interest of a younger audience. During the course of a conference it is always useful to show slides of the contributors to a project. However, when possible, a round table discussion with the participation of the various players has a far greater impact. In this case, throughout the major stages of a project (from the birth of a new observing tool to the first scientific results), it is possible to show the diversity of the skills, scientific and technical prowess necessary for a successful outcome. The joint participation of contributors from companies, agencies and laboratories is also a good means to underline the conditions in the international and economic research environment.

In situ activities

Another successful activity is a Discovery Course for college students. Students are immersed into the daily routine of a research laboratory for a week where they discover the range of our expertise and activities. We also invite teachers into the laboratory to familiarise them with our work, which may later lead to a discussion with their students.

How can a research library support the communication of science to the general public?

Francesca Brunetti, Antonella Gasperini
INAF — Arcetri Astrophysical Observatory Library, Florence, Italy (biblio@arcetri.astro.it)

Abstract

How can an observatory library support the communication of science to the general public? We will describe how a highly specialised astronomical library can also play a key role in disseminating astronomical knowledge, making scientific results available across a wide range of levels, from professional to public to educational. This outreach activity requires several steps, ranging from the preliminary identification and scrutiny of sources to the production of new information material (e.g. maps, brochures, and DVDs). In particular, we will describe some recent experiences in the dissemination of astronomical information to the general public, especially teachers and children, analysing some results of this activity, such as a bibliography of *Italian Astronomical Books for Children*, a review of scientific books and other multimedia products.

The context

Everywhere astronomical libraries have something in common: a high level of specialisation, an international network of information resources, often remote and very skilled users: professional astronomers, researchers and graduate students.

In Italy astronomy is the most popular science: children, students, families, teachers are eager for information and anything that can deepen their knowledge about this science (events, news, trends and discoveries). Often public libraries or schools can't satisfy these information needs. This is the reason why the Library of the Arcetri Astrophysical Observatory decided to collaborate in communicating science to the public. How can we reach a public of different ages, different skills and a non-homogeneous level of education in a local context? How do we make scientific results available across a wide range of levels? This specialist library is able to distribute scientific information and as a part of a research institution it offers a clear scientific validation to the public. The use of astronomical information resources and the collaboration with schools, public libraries, educational institutions (the local context) gives the library the opportunity to reach the general public.

Some projects

During the last few years the Arcetri Library has been involved in the following projects:

- The Bibliography of Italian astronomical books for children[1] was published, using the LiBeR

[1] http://www.arcetri.astro.it/BIBLIO/edu/librib.html
[2] http://www.liberweb.it/index.php?module=CMpro&func=viewpage&pageid=7

database[2], the archive which has held editorial productions for children since 1987. The bibliography is dedicated to teachers, parents and public librarians. It consists of all Italian astronomical books for children published since 2000. It is divided into four age groups: from 3 to 5 years old; from 6 to 8 years old; from 8 to 10 years old and from 11 to 14 years old and is updated every three months.

- The library is also involved in promoting specific scientific children's books by providing book reviews on its web page: every three months an astronomer is invited to review the book selected by the library staff[3].
- The Arcetri Library also maintains a special section for the public called *Astronomy for General Public* (Astronomia per il pubblico) on its web page. It presents some national information resources in astronomy (websites of planetariums, scientific museums and other Italian information sites on science) and offers a selection of international resources (from EDU SPACE to the NASA Educational Portal). Sky maps prepared by the Arcetri astronomers can be downloaded.
- At the end of 2005 the library was involved in a project called *Gianni Rodari e le stelle* (Gianni Rodari and the stars). Gianni Rodari (1920-1980) wrote extraordinary stories and rhymes using astronomical themes. The aim of this project was to consider the astronomical aspects of Rodari's works as a way to enter into the sky and to explore the Universe[4].
- The Arcetri Library took part in a project involving Italian and Chinese children named Skies of the world. A Starlab planetarium has been used to teach about the sky, constellations and myths, both in the Mediterranean and Chinese tradition. This project was presented at the Genoa Science Festival in the October 2007[5].
- The Library staff collaborates with the Arcetri public outreach activity producing multimedia tools for science educators and for the general public[6].

All figures courtesy of the authors.

Figure 1 – DVD Label of "The sky over China"

Figure 2– Postcard of "The Sky all over the world"

Figure 3 – Poster of the "Bambineide in Arcetri"

[3] http://www.arcetri.astro.it/BIBLIO/edu/rece.html
[4] A DVD of this project is available.
[5] http://festivalscienza.it/en/programma/evento_en.php?id=127
[6] See: http://www.arcetri.astro.it/cielidelmondo

PETER: Robots that watch the skies

Gara Mora-Carrillo[1] **& Alfred Rosenberg**[2]
[1] Instituto de Astrofísica de Canarias (garamora@iac.es)
[2] Instituto de Astrofísica de Canarias (alf@iac.es)

Abstract
We describe the user-access and analysis possible for a robotic telescope (the Liverpool Telescope) that can be used for educational and other use. Robotic telescopes operate with no staff on-site and the observations are remotely scheduled each night.

Introduction
PETER, the *Proyecto Educativo con Telescopios Robóticos* (Robotic Telescopes Educational Programme), will provide the tools necessary for schools to access and use a robotic telescope in the classroom or from home. A key objective of PETER is to encourage a sense of excitement about science and technology in young people by allowing them to use professional technology.

Recently, the BIA Project (Banco de Imágenes Astronómicas) has been launched. This consists of an astronomical image bank that school children, the media, amateurs, astrophysicists and the general public can take access. This project will complete the support provided for PETER users.

The instrument
The Liverpool Telescope (LT), sited at an altitude of 2400 metres at the Roque de los Muchachos Observatory on the island of La Palma in the Canary Islands, is a professional, 2-m, state-of-the-art robotic telescope used for astronomical research by astronomers from around the world. The IAC administers the observation time percentage that belongs to Spain, according to the Agreement on Cooperation in Astrophysics, and this is allocated by a Time Allocation Committee (CAT). Considering the importance of communicating astronomy to the public, it has been decided to reserve 5% of the LT´s time for Spanish pupils and amateur astronomers, with 15% of the time being assigned to astrophysical research.

Observing
In order to request an observation, users need to follow the following steps:

- Register through the website.
- Obtain a username and a password via e-mail.
- Access the main page to submit the observation. Options are:
    - Personal observing programmes revised and accepted by the Time Assigning Committee.

- Predetermined observing programmes: planets, nebulae, galaxies and the Moon.
- Download the observation when it is complete.

The software: LTImage

A modern telescope like the LT takes photographs of the sky with a detector called a CCD. The CCD generates digital data that can be stored in a computer. Once stored and processed, these images can be studied in more detail. For this purpose software has been developed to allow the images to be visualised, explored and analysed as part of a scientific investigation. Some of the tasks that can be carried out are:

- To determine the coordinates of stars.
- To find the distance between two parts of a galaxy.
- To make colour images using different colour filters.

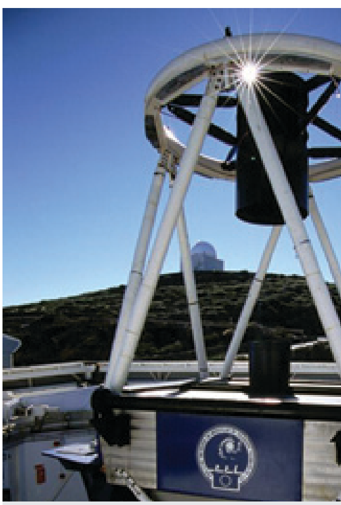


Figure 1

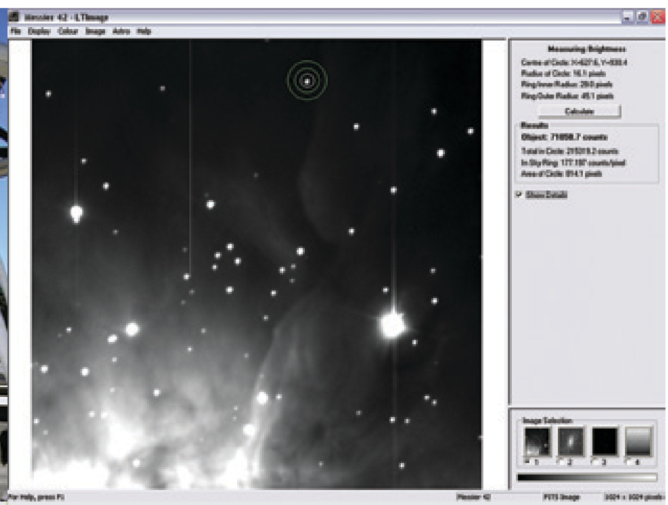


Figure 2

The Liverpool Telescope

The *Hubblecast* — The world's first full HD video podcast?

Lars Lindberg Christensen[1], Martin Kornmesser[2], Raquel Yumi Shida[3], Will Gater[2] & Joe Liske[4] (a.k.a. Dr. J)

[1] ESA/Hubble & IAU (lars@eso.org)
[2] ESA/Hubble (mkornmes@eso.org)
[3] IAU & ESA/Hubble (rshida@eso.org)
[4] IAU & ESA/Hubble (wgater@eso.org)
[5] ESO (jliske@eso.org)

Figure 1 – The Hubblecast Full HD logo

Credit: ESA/Hubble

Figure 2 – Hubblecast host Dr. J.

Abstract

In March 2007 the ESA/Hubble office of the Space Telescope European Coordinating Facility in Garching, Germany, embarked on the production of a video podcast; a production that aimed to reach out to a diverse and to some extent untapped audience in astronomy. The result would be The *Hubblecast*, a six-minute long video podcast. The *Hubblecast* would make use of the surge in popular on demand media to grab the attention of many who might have never come across Hubble's work. The aim was to explain the science and workings of the NASA/ESA Hubble Space Telescope through the use of animations and commentary alongside high resolution Hubble images. Today the *Hubblecast* is produced in Full High Definition, possibly making it the world's first Full HD video podcast. Today with well over 1 million downloaded episodes so far the *Hubblecast* is going from strength to strength as one of the most popular science vodcasts in the world.

Introduction

Video Podcasting, or "Vodcasting", is the latest evolution of the video on demand revolution of the past few years. Now on demand content is shifting from solely headphones and portable devices to computers, televisions and even portable video players. The appeal of accessing video content at will is growing and seems especially attractive to the young demographic segment; a demographic segment which science communicators are keen to enthuse, engage and inform.

Inspired by other leading science vodcast producers, such as the Spitzer Science Center's Robert Hurt (*Hidden Universe*[1]), The ESA/Hubble communication office in Garching was eager not to be left behind in this new revolution. So, in March of 2007 the first Hubblecast went online on the spacetelescope.org website[2]. By the end of March the brand new vodcast had been downloaded over 10,000 times. It was a great start.

Production

The *Hubblecast* is presented by Dr. Joe Liske from ESO. Hubblecast viewers will know him by his on-screen alias of Dr. J. Dr. J was cast from a group of ten scientists, both male and female, all excellent candidates for the job with a variety of backgrounds. Today Dr. J. receives fan mail on his MySpace page[3] and continues to front the ever expanding vodcast.

Credit: ESA/Hubble

Figure 3 – Dr. J with narrator Bob Fosbury in the studio.

Each vodcast lasts approximately five or six minutes and takes only about five days to film, edit and produce an episode; including the writing, refining and checking of the script. Each episode usually begins with a morning's filming at the Peter Rixner Studio[4] outside Munich in the foothills

[1] http://www.spitzer.caltech.edu/features/hiddenuniverse/
[2] www.spacetelescope.org
[3] http://www.myspace.com/jochenliske
[4] http://www.perix.de/

of the Alps. The studio is equipped with some of the latest recording equipment including green/ blue screens, high quality audio devices and High Definition video cameras. Recording of the narration is usually done by the head of the Space Telescope–European Coordinating Facility, Bob Fosbury.

Following filming each section is then taken back to the ESA/Hubble facilities where Martin Kornmesser, the main graphic designer, spends considerable time editing and bringing each episode to life. This includes post-processing of the green/blue screen footage to key out the background and insert images or animations, and also synchronisation between Dr. J's dialogue and any subsequent animations. The resulting combination of real footage, computer generated backgrounds and actual Hubble images makes for a dynamic and varied vodcast experience.

Content

Since its inception the *Hubblecast* has strived to explain the (often complex) science undertaken by European astronomers in an interesting and understandable way. This has been often aided by the use of lavish high resolution images, narration and the use of animations. Now with the addition of a High Definition channel (June 2007) to the vodcast's output the quality of animations and graphics has been taken to a new, often never before seen, level. In some episodes Dr. J has been joined by professional scientists who are able to explain some of the work they do on camera, enabling a direct connection between the audience and the work the *Hubblecast* is trying to communicate.

Format

The *Hubblecast* is provided in eleven formats across three different channels: standard definition (SD), High Definition (HD) and Full HD. This may indeed make it the world's first ever Full High Definition video-podcast. It can be downloaded easily from the *Hubblecast* website[5] as well as via numerous other online aggregators and video community sites such as iTunes (Apple's flagship music store). Viewers need not own an iPod or any other portable device as most media players on PCs or Macs can play the episodes. This means that the audience has the capability to watch the *Hubblecast* either sat at their computer or on their morning commute to work. Now with the advent of digital media receivers such as the Apple TV the *Hubblecast* can even be watched on a home television.

Summary

So far there have been ten episodes of the *Hubblecast* with many more in the production line. With total download numbers above the one million the *Hubblecast* has undoubtedly reserved its place as one of the most popular science vodcasts of recent years.

For more information about the Hubblecast please visit :
www.spacetelescope.org/videos/hubblecast.html

---

[5] http://www.spacetelescope.org/videos/hubblecast.html

Credit: Sze-leung Cheung

Robotic telescopes and their use as an educational tool

Luis Cuesta
Robotic Telescopes Group Centro de Astrobiología, Madrid (cuestacl@inta.es)

Abstract

Robotic telescopes are new tools that are changing many aspects of the way we do astronomy. The use of this type of telescope has been quickly adopted in some of the most prolific fields of this science, including searches for extrasolar planets. In this particular field, robotic telescopes have demonstrated an efficiency and agility that would hardly have been obtained with conventional telescopes. In addition to the typical scientific uses, robotic telescopes are being used as fundamental pieces in the practical education of astronomy. Numerous institutes and museums have begun to develop their own robotic telescopes to bring astronomy into the classroom; as a way to understand the Universe that surrounds us. By establishing collaborations between institutes in different countries observations can be made in the classroom without a change in school schedules, which has an enormous benefit to the education community.

The robotic telescope concept

Robotic telescopes are a new tool for astronomy. They are mostly destined to study nearby and brilliant objects but are perfect to support experiments that require constant monitoring of the sky. Also, robotic telescopes are very useful in routine observations that do not require an operator and for which a great amount of data is generated but can be reduced and analysed automatically.

Robotic telescopes in action

Taking advantage of the flexibility and versatility that characterise robotic telescopes, these instruments have become one of the most important tools in practical education and the teaching of astrophysics. They are a way to reach the public rapidly due to their particular configuration and the technical innovation that they represent. Impressive images and scientific results in top astrophysics are good examples of their potential.

Science with robotic telescopes

The study of extrasolar planets is in the vanguard of the present investigation of astrophysics and is of great interest to the field of astrobiology.

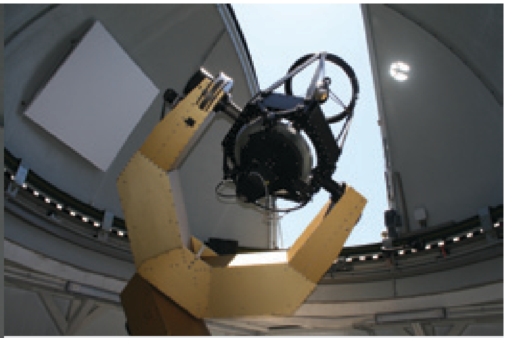
The method of transit detection is based on obtaining differential photometry to detect changes in the light curves of stars. For this type of study a great amount of observation time is required.

Robotic telescopes are very useful for discovering new bodies in the Solar System or tracking already discovered objects, in particular near Earth objects (NEOs). The study of NEOs is fundamental to increasing our understanding of the rates of impacts on planets, something clearly linked to the origin and the evolution of life.

The study of stars similar to the Sun is also important (particularly in terms of astrobiological implications) and has benefited from the use of these telescopes. A study that covers a wide range of star ages and metallicities can provide data that allow us to determine their zones of habitability. Photometric analysis of these stars will connect the microvariability with the chromospheric and magnetic activities of our star.

Systematic observation projects cover an important part of the time of observation with robotic telescopes, such as: search for extragalactic supernovae, astrometry of comets and asteroids, variable star and binary eclipsing photometry. Also, time is dedicated to targets of opportunity like novae, supernovae and gamma ray bursts.

Figure 1 – Interior shot of the robotic telescope located in Calar Alto Observatory.



Images © CAB

Figure 2 – Interior shot of the robotic telescope located in Calatayud.

Images © CAB

Figure 3 – Image of the galaxy NGC 253 taken with the CAB's robotic telescopes.

CAB's robotic yelescopes

The Spanish National Institute of Aerospace Technique, encouraged by the Centre of Astrobiology, promoted the creation of a network of three robotic telescopes, one in the Observatory of Calar Alto, one of the best astrophysical observatories, another on a mountain near Calatayud and a third in the campus of INTA. The three telescopes have a classic Cassegrain configuration, with an aperture of 40-50 cm and motorised and automated equatorial mounts and domes.

Astronomical sessions

In order to introduce astrobiology to the public, visits to the Centre of Astrobiology and its robotic telescopes are organised. During the past year the telescopes have been improved and are ready to begin a programme of visits that include astronomical observations. We will try to initiate the activity next winter, as we have several education centres that have already shown interest. The observation sessions, lasting between two and three hours, will consist of a guided visit to the installation, a talk about robotic telescopes and their use and finally the night observation that will include the viewing of several astronomical objects visible that night like globular clusters, planetary nebulae, hydrogen nebulae, galaxies and bodies of the Solar System.

Observation programmes

The planned programme of astronomy sessions is only an example of a much more ambitious project that includes a programme of direct observations and a complete educative project with practical sessions in the classroom. By means of this programme students will be able to make remote observations on subjects of general astrophysics that they themselves have prepared and requested. After the observations, they will have to analyse and report their results, receiving support and advice from the scientific staff of the CAB.

Credit: Raquel Shida

The network of INTA telescopes

Luis Cuesta
Robotic Telescopes Group Centro de Astrobiología, Madrid (cuestacl@inta.es)

Abstract

The Spanish Instituto Nacional de Técnica Aeroespacial has a network of three telescopes located at some of the best places for astronomy in mainland Spain. The first is at the Observatorio de Calar Alto in Almería, at an altitude of more than 2100 m. The second is near Calatayud in Zaragoza, at the summit of a 1400-m high mountain. The last is on the campus of the Instituto Nacional de Técnica Aerospatial (INTA), in Madrid. The three telescopes are either 40 or 50 cm in diameter and will be available for communications and educational projects.

Mechanics and optics

The three telescopes, built by Optical Mechanics Inc.[1], are classic Cassegrain telescopes with a parabolic primary and a hyperbolic secondary mirror. The telescopes at Calar Alto and Calatayud both have a diameter of 50 cm while the third, at INTA, has a diameter of 40 cm. All three telescopes are F/10.

The equatorial fork-mounted system is built from anodised aluminum. Right ascension and declination axes are driven by high-precision zero-lash drive systems. The relative pointing is less than 0.5 arcsecond and the final tracking resolution is less than 0.3 arcsecond using a closed-loop servo-actuated system. Non-sidereal rate tracking can be used.

All images courtesy of the author

Figure 1 – Exterior image of the Robotic Telescope at Calatayud showing the dome and the auxiliary building.

[1] www.opticalmechanics.com

Dome

Each telescope is housed in an automatic motorised dome that with a window opening from 0^{o} to 90^{o}. The domes are manufactured by Baader Planetarium[2].

Camera

Each telescope is equipped with a 1024x1024 24-μm Finger Lakes CCD camera (soon to be updated to a 4000x700 9-μm CCD). This is a cooled back-thinned array with high quantum efficiency (up to 80%) and a shutter capable of 0.05 second exposures. There is also a filter wheel for each telescope with the typical UBVRI Johnson photometry set, nebula filters (OIII, H$\alpha$and Hα) and red, green and blue filters.

Control system

The LINUX-based control system includes two computers per telescope, one dedicated to telescope control and the other for data analysis. There are some other facilities such as UPS, communications, GPS (for time synchronisation), a weather station, air conditioning to maintain the temperature inside the dome and a remote on-off system.

Control programs

To provide complete control over the observatory, some other applications are also available, including sky programs that are used interactively with the telescopes and web cameras to view the status of the telescope and dome remotely.

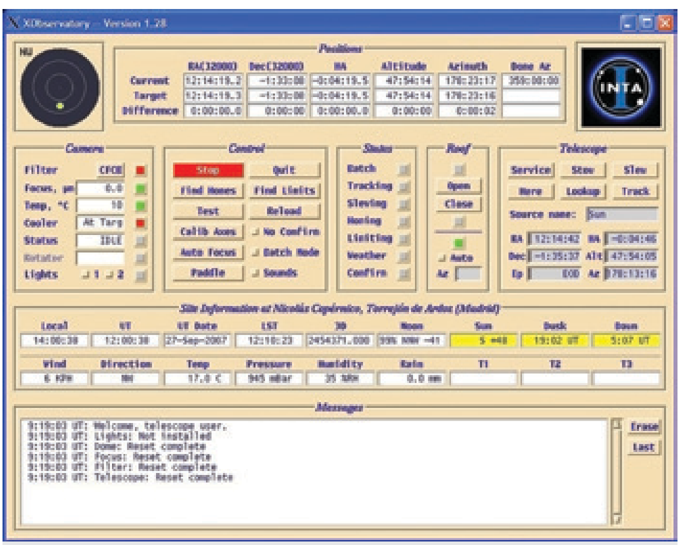


Figure 2 – Screenshot of the graphical user interface of the TALON control software.

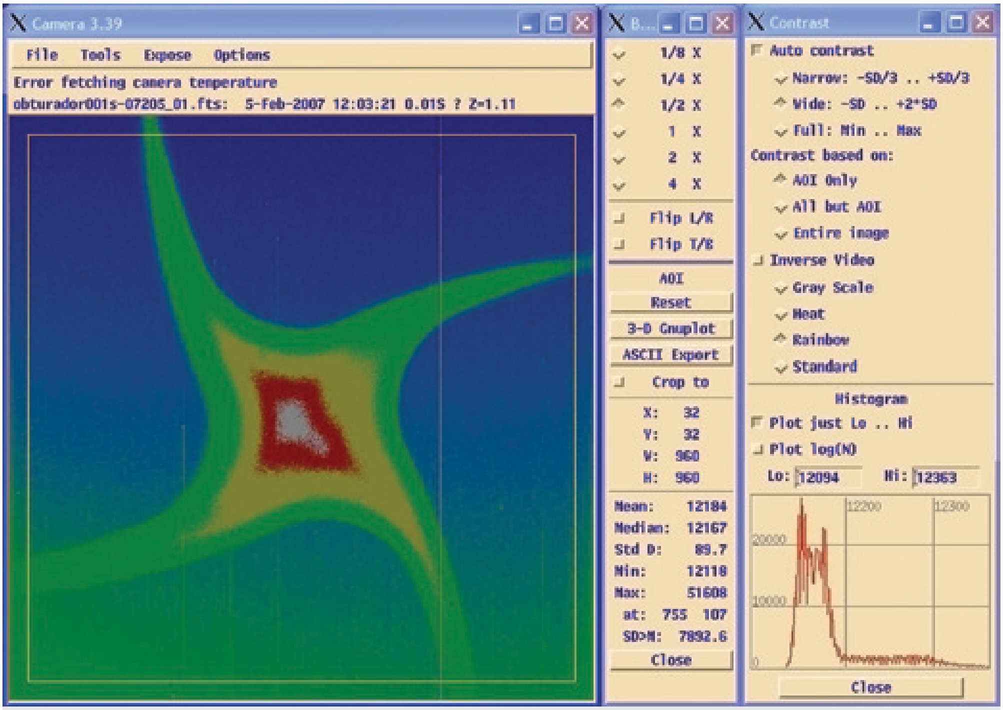
2 www.baader-planetarium.com

Graphical user interface

The observatories are controlled using LINUX-based Talon software from Optical Mechanics, Inc. This controls the entire observatory including the telescope and all its possible movements, the dome, the filter wheel, the temperature-corrected focus, the weather station and the CCD camera. There is a separate mode for data acquisition. Talon is operated by a very user-friendly graphical user interface.

Acquisition of data

A specific application in Talon is dedicated to the acquisition of data. It controls the important camera settings, including the exposure time, the status of the shutter, the binning factor, sub-images and the temperature. Other tools including photometry, statistics and a full-width half-maximum (FWHM) calculator are available.



All images courtesy of the author

Figure 3 – Screenshot of the graphical user interface of the camera control software.

Operation

There are three operation modes available:

- interactive and on site, via the console;
- interactive and remote via a login program;
- non-interactive and robotic, with automatic pre-programmed tasks.

Credit: Sze-leung Cheung

1967-2007: Forty years of outreach activity at INAF — Catania Astrophysical Observatory

Giuseppe Cutispoto[1], Giuseppe Leto[1], Giovanni Strazzulla[1] & Francesca Zuccarello[2]
[1] INAF-Catania Astrophysical Observatory (education@oact.inaf.it)
[2] Catania University, Dept. of Physics & Astronomy (education@oact.inaf.it)

Abstract

Outreach activity at the INAF-Catania Astrophysical Observatory (OACT) started about forty years ago both at the *M.G. Fracastoro* station on Mt. Etna and at the *A. Riccò* headquarters in Catania. In recent years the requests for visits, conferences and courses have steadily increased and about 9500 visitors per year have participated in the events we have organised. Here we present our activities, as an example of what can be accomplished in a relatively small institute (Researchers: 27, Technical staff: 40).

Introduction

The *M.G. Fracastoro* station of OACT (located on Mt. Etna at 1725 m a.s.l) was completed in 1965. Two years later a programme of night-time visits (for schools, organised groups and citizens) was started. Almost simultaneously, a programme of day-time visits (mainly for schools) was initiated at the *A. Riccò* headquarters in Catania. In 2003, as the number of requests for visits, conferences and courses was steadily increasing, the EPO (Public Outreach and Education) office was formed. Besides visits to *M.G. Fracastoro* and *A. Riccò* stations, the POE has organised a number of activities, including the so-called "Special Events" and, more recently, competitions for schools. As a result, in the last few years about 9500 visitors/yr (much less than the requests we received) have participated in the events that we organised. Activities are carried out in collaboration with the Deptartment of Physics and Astronomy of Catania University. Booklets on topics such as *The Sun* and *Solar and lunar eclipses* have been produced, and are both distributed free of charge and made available at the EPO web page[1]. At the OACT website[2] programmes such as *Sky Draw* (interactive images of the sky) and an astronomical almanac are available. It is also possible to download daily images of the Sun (white light and Hα) obtained at OACT and images of recent events (as solar eclipses and the Venus transit).

Night-time visits at the *M.G. Frascatoro* station

Visits begin at sunset, and consist of a guided tour of the 91-cm telescope followed by observations (typically the Moon and/or a planet). Weather permitting, visitors enter an open-air projec-

[1] http://www.oact.inaf.it/visite/
[2] http://www.oact.inaf.it

tion area where a slide show is presented. Booking is mandatory and up to 200 visitors, divided into four groups, have visited the station in one night.

Day-time visits at the *A. Riccò* station

Visits consist of a slide show (with topics such as *The Sun*, *The Solar System* or a subject requested by teachers) that is followed, weather permitting, by observations of the Sun with the 20-cm refractor. Booking is mandatory and about 80 schools/yr (far fewer than the number of requests we receive) have visited the headquarters over the last few years. Visits for groups or private citizens are organised, on request, during weekends.

Special events

Special events are organised when unusual astronomical events occur or in conjunction with national/international outreach activities (such as the *Week of Astronomy* and the *Week of Scientific and Technological Culture* organised by the Italian Ministry for University and Research). More recently, we have embarked on competitions for schools such as *Observe the sky and draw your feelings*. Here a short summary of some of the events we have organised.

Venus transit — Public observation of the transit of Venus on 8 June 2004 was organised at the *A. Riccò* headquarters and at the University of Catania main building in in central Catania. In both locations the images obtained with the 20-cm refractor were projected in real-time. Posters on the importance of Venus transits and a slide show with detailed transit explanations were presented. Further posters (about the Sun, Venus, the Solar System and astronomical distances) were also presented. Real time images of the Sun were distributed free of charge. The Hα images obtained at the OACT were available in real time on the web[3] (about 87,440 hits were counted during the day). The collection of the Hα and white light images we obtained (including a movie we created), the posters and selected printable images are available for free download.

Solar eclipse — Public observations of the solar eclipse on 29 March 2006 were organised at the *A. Riccò* headquarters. Catania was one of the best locations in Italy (maximum darkening of the Sun 65%) to observe the eclipse. Besides real-time observations, the programme included a slide show with information on the circumstances (and importance) of solar and lunar eclipses. Posters about the Sun, the Solar System and research at OACT were also on display. The Hα images were available in real time on the web[4] (about 200,000 hits were counted during the day). The collection of Hα and white light images (including a movie we created), the posters and selected printable images are available for free download.

Competitions for students — In 2007 we organised, in the framework of the International Heliophysical Year Outreach Activities, competitions for students from primary to high schools. *Observe the sky and draw your feelings* was a drawing competition for primary school students. It was very successful and a total of 256 drawings (all shown on the web[5]) were presented. Winners

---

[3] http://venere.ct.astro.it
[4] http://eclisse.oact.inaf.it
[5] http://www.oact.inaf.it/visite/Concorso_2007.htm

were chosen by a committee formed by astronomers and teachers and by members of the OACT mailing list for outreach activities. One of the awarding ceremonies included the dance exhibition *Sun mit*.

Astronomy Olympiad 2007

OACT was involved in the organisation of the regional (southern Italy plus Sicily and Sardinia) and national selections for the International Astronomy Olympiad 2007. This initiative was also very successful.

The website

Our outreach activities are described in the EPO webpage[1] and are announced by e-mail (we have a fast growing mailing list with more than 1500 addresses at present) and by local newspapers. Bookings are made mainly by e-mail; visitors receive confirmation and logistical information.
It is possible to find on the EPO web page:

- general information (dates, how to make a reservation, how to reach the observatory and practical suggestions to the visitors);
- short reports on our initiatives (including photographs);
- an “ask to an astronomer” on-line form.

Statistics

Number of events organised and participants for the year 2006 (we expect a slight increase on the 2006 results in 2007):

- Visits for schools: 101 — about 4200 students;
- Visits for citizens: 50 — about 2750 visitors;
- Special Events: 4 — about 1150 participants;
- Conferences and Courses (external locations): 31 — about 1600 participants.

Credit: Jan Warnstam, Jonas Lindqvist

Astronomia.pl: Ideas for the International Year of Astronomy 2009

Krzysztof Czart & Jan Pomierny
Astronomia.pl — Polish Astronomy Portal (k.czart@astronomia.pl, j.pomierny@astronomia.pl)

Abstract

Astronomia.pl is an internet portal for Polish-speaking people. As a website, most of our activities in IYA2009 will focus on the internet and other electronic media. We will prepare a content-rich website, in cooperation with the Polish committee for IYA2009. We present some extended suggestions for ideas proposed by the IAU, like postage stamps or mobile phone wallpapers, ring tones and themes and some original propositions like naming a small Solar System body for each country, a computer game, a stadium as a solar clock, a media event with thousands of amateur astronomers in one place and a network of cities.

About the portal

Astronomia.pl is the biggest astronomical portal[1] in Poland, active online since 2001 and partly translated into English[2].

The portal actively participates in the Polish preparations for the International Year of Astronomy 2009. We have registered the internet domains suggested for the event, which will be administrated by the Polish National Node of IYA2009. We are cooperating with the committee in the preparations. Our main focus is the internet and media, but we also concentrate on other areas.

Postage stamps

The idea of a stamp released in as many countries as possible was proposed by the international committee. We have added some suggestions to extend the idea. One option is to organise a big contest for children in each country to design a stamp. The winning drawing will be implemented in a stamp project. The second option is a poll to decide who or what should be shown on a stamp. The poll will be organised in cooperation with a big newspaper, popular radio stations or even with a TV channel. The national committee will choose a couple of ideas for which people can vote. If any national postal service decides to publish not only one stamp but a series of a few stamps, both ideas can be run simultaneously.

---

[1] www.astronomia.pl
[2] www.astronomia.pl/english

Mobile phones

A set of free astronomical wallpapers for mobile phones should be made available. Our portal is preparing a collection showing Polish astronomy subjects. For example, the biggest Polish radio telescope looks very attractive on a mobile phone screen and may be used as a "cool" image by young people. Mobile phone options are not limited to wallpaper. It might be a good idea to design so called "themes", which could include wallpapers and other elements of a mobile phone interface. They should be available to as many mobile phone models as possible. Ring tones are another possibility. Young people may find ring tones such as the Space Shuttle engine start or the voice of Neil Armstrong taking his first step on the Moon or titles of popular astronomy programmes from other countries attractive.

Name a small Solar System body

There are tens of thousands of small Solar System objects. Many of them do not have a name. Perhaps we might "use" some of them for IYA2009 purposes. Each country could name one planetoid. The name would be chosen by a poll organised by the leading media from a given country. It might be done in two ways: either using free suggestions of a name from the general public or by voting on names suggested by the national committee. Since we do not want to break the international rules on naming small Solar System bodies, the final approval of the chosen name should depend on the appropriate committee of the International Astronomical Union.

A computer game

Games are an important element of many children's worlds and in rich countries computer games have become particularly popular. A computer game called *Buzz Aldrin's Race into Space* (BARIS) was released in 1992. The idea of the game was to participate in the Moon race as one of the world's leaders — the USA or the USSR. The game was an interesting way to show that not everything was as simple as one might think from watching TV movies.

Polish Post

Figure 1 – Postage stamps about astronomy published by the Polish Post. A FDC envelope Cosmic history of the Earth with stamps number 4012 and 4013 is seen. Below it is stamp number 3786 with astronomers (Aleksander Wolszczan and Nicolaus Copernicus) and to the right is stamp number 3865 with the monument of Nicolaus Copernicus in Torun.

NASA/NEAR

Figure 2 – Asteroid Eros a name tag, symbolising the idea of allowing each country to name one asteroid for IYA2009.

Some of our friends who had no interest in astronomy or astronautics also liked the game and played it. They usually commented that the concept of the game was original and thus interesting, and different from all other games. The game is pretty old, but it would be interesting to release a renewed version of BARIS with modern graphics and modern game mechanics, extended beyond the Moon race to future missions, like a manned trip to Mars and with the addition of some astronomical aspects. If it is not possible to develop a good computer game within one year or if it is too expensive, perhaps a mobile phone version would be a good idea.

Here is a set of ideas that were "invented" by people not involved with the Astronomia.pl portal:

A stadium as a solar clock

Some ideas may look like crazy concepts, but in certain situations they can be realised. A stadium as a solar clock? The idea was proposed by Dr Maciej Mikołajewski from the Nicolaus Copernicus University in Torun and presented in a local newspaper. There is an opportunity to realise it, as the city of Torun is building a new stadium and it now selecting the design.

Thousands of astronomy amateurs in one place

Many groups of people who have something in common organise conventions, reunions, meetings. In Poland there was even a meeting of women named Catharine. So this idea is to gather as many astronomy amateurs as possible in one place — a big sports hall. As a one-day event it might attract the attention of TV stations. The action may be organised in cooperation with railways, as they sometimes provide special trains for big events, like music concerts (sometimes a ticket to a given concert guarantees free travel in such a special train). There must be an interesting programme to attract amateur astronomers, like exhibitions, shows and other events. This might also be a good chance for commercial astronomy companies to participate in a trade fair (in the broadest sense, including perhaps the photographic market for example). One of events could be a photo of all participants. This idea was suggested by one of the astronomy amateurs in Poland in 2006 before he had heard of IYA2009.

Network of cities

In Poland there is a network of Copernican towns, places where Nicolas Copernicus lived (Frombork, Grudziądz, Kraków, Lidzbark Warmiński, Olsztyn, Torun, Włocławek). The network was active for the 500th anniversary of Copernicus' birthday (1973), but now it is probably inactive and the young people who live in these towns do not even know that something like this has ever existed. The International Year of Astronomy is a chance to revive this link. There may be similar networks in other countries. The cooperation between cities should be at a cultural, educational and economical level. It may be even become an international cooperation, as Copernicus studied at Italian universities too.

Credit: Sze-leung Cheung

Astronomia.pl: Portal activity in 2006-2007

Krzysztof Czart & Jan Pomierny
Astronomia.pl — Polish Astronomy Portal (k.czart@astronomia.pl, j.pomierny@astronomia.pl)

Abstract

We present the latest activity of Astronomia.pl — the Polish Astronomy Portal, the most popular internet portal about astronomy in Poland. Astronomia.pl is a wide-ranging portal, covering news, a database of articles, books, lectures, an astronomical calendar, a newsletter, a virtual library of diploma theses, a discussion forum, chat, galleries, a catalogue of websites and other services. The portal also owns several additional services like an on-line lexicon with biographies of astronomers, a website about Polish planetariums and a server for websites created by astronomy amateurs. There is also small part of the portal in English.

About Astronomia.pl portal

The Astronomia.pl portal was created in 2001 as a non-profit initiative of people active in astronomy at both the professional and the amateur level. During its six years of activity the portal has become the most popular astronomical internet service in Poland. The name “Astronomia.pl” is a well known brand across a broad amateur astronomy community, as well as among journalists and teachers. However, it becomes particularly popular among the general public when an interesting astronomical phenomena or event is shown on TV.

In 2003 the portal was awarded with an honourable patronage of the Polish Association of Astronomy Amateurs, the oldest astronomical organisation in Poland.

The main portal[1] hosts several hundred thousand displays monthly. Beside this, the portal owns such services like Kopernik.pl with biographies of astronomers[2], Planetarium.pl — a website about all Polish planetariums[3] or AstroWWW.pl — a place to maintain the best websites created by astronomy amateurs[4].

More about the portal and its future

This poster presents a few examples of the portal’s activity. We haven’t presented such areas as the daily news service about astronomy and space exploration, the knowledge database, our

---

1 www.astronomia.pl
2 www.kopernik.pl
3 www.planetarium.pl
4 www.astrowww.pl

big discussion forum, work with the popular science and general media, support for astronomical organisations, youth camps, media support and more. A small part of the portal is available in English[5] where one can find news about Polish astronomy (amateur and professional). All the portal features are available round the clock. One of its goals is to offer users Web 2.0 ideas. We are also working on the creation of a portal environment, which can be easily adapted to multi-language projects, such as a portal proposed for the International Year of Astronomy. We have gained experience in such systems while working on the international Portal of Supernovae[6].

Portal of Supernovae

In summer 2006 the portal's team cooperated with EU-HOU to create the Supernovae Portal, a website where students all around the world can submit their observations of supernovae.

Prizes and honours for the portal

We received a diploma of honour in 2006 for our active support of the Interkl@sa Program, an educational project aimed at school students. In the same year the portal was awarded with a prize in the contest “Popularyzator Nauki” (“Science Communicator”), organised by the Ministry of Science and the High Scholarship and Science in Poland service of the Polish Press Agency.

SuperNova school

In 2006/2007 the portal, together with its partners, organised an interesting contest for students. As a prize four schools won access to telescopes of LCOGT (Las Cumbres Observatory Global Telescope Network). Students from Polish schools can do observational sessions over the internet, using real-time telescopes as big as 2 m, which are bigger than the largest professional telescope in the Poland area (0.9 m). Partners for this contest were: British Council, Hands-On Universe Europe (EU-HOU), Centre of Theoretical Physics of Polish Academy of Sciences.

Universe at InfoC@fe

The portal organises internet chats, called AstroCHAT, during which internauts have a chance to discuss astronomical issues with guests like professional astronomers, winners of astronomical contests and advanced astronomy amateurs. We have organised 60 chats so far. Sometimes guests from abroad take part in a chat. One of the examples is the chat on 1 February 2006 when people could ask Dr Paul Roche from the Faulkes Telescope project questions. Questions came from live participants at the lecture and from internet users of the chat.

---

[5] www.astronomia.pl/english
[6] www.euhou.net/supernovae

International actions

Astronomia.pl supports international quizzes and initiatives, like the *Globe at Night* or *Catch a Star!* programmes. The *Globe at Night* project is aimed at students of primary schools. Participants are supposed to find the Orion constellation in the sky and count how many stars they can see in it, and in this way they estimate maximum magnitude (and light pollution) as seen from their home. *Catch a Star!* is a contest for students organised by the European Southern Observatory ESO.

We are happy that due to our media promotion efforts in both projects, many Poles took part. In *Globe at Night* 2007, from 8491 observations from 60 countries, as many as 421 were from Poland (5%). Owing to the efforts of the Astronomia.pl editorial team, Polish was one of few languages in which the manual for the competition was prepared.

In the 2007 *Catch a Star!* contest ESO received 103 projects from 22 countries, including 10 from Poland (10%). In a separate category for "artists" there were 395 works. Unfortunately, the organisers have not revealed the nationality of the participants, but we received confirmation that participants from Poland were surprisingly numerous in this category as well.

Astronomical quizzes

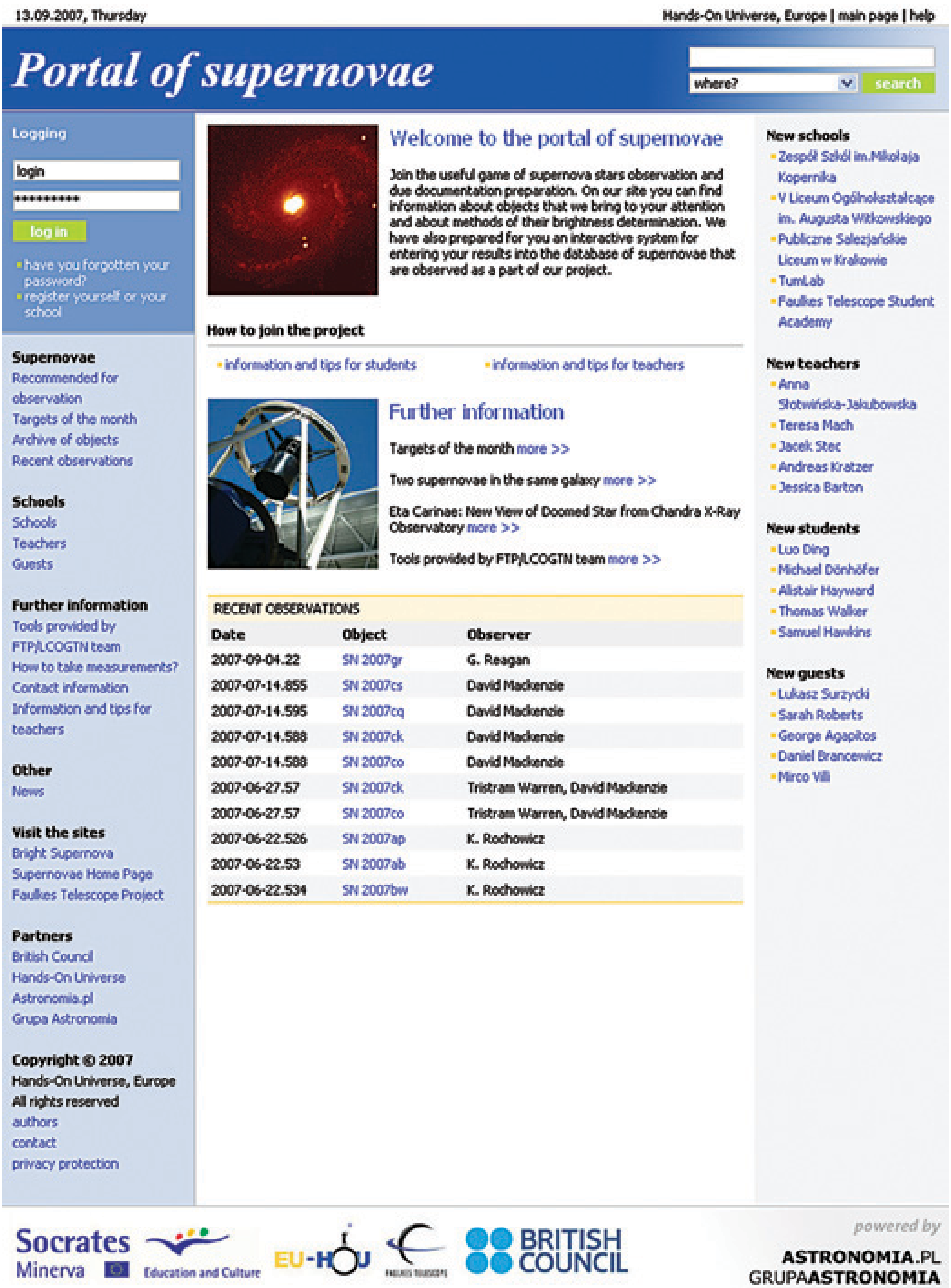
The portal organises many quizzes and contests each year. They are targeted at different groups and the level of difficulty also varies from quiz to quiz. We have had about 10-20 (and sometimes as many as 500) participants per quiz. We try to prepare interesting tasks to do and organise original prizes. For example, there was a quiz in which people could win real meteorites, donated by the Polish Meteorite Society. At the moment there is a big contest for teachers from school in Poland — *Astronomy in School* (September–December 2007), which we organise together with Interkl@sa and *Physics in School* magazine. The task is to create plans for classes, excursions or other activities, where students deepen their astronomical knowledge. We have gathered many attractive prizes for winners.

ASTRONOMIA.PL

Figure 1 – The logo of the Astronomia.pl portal.

ASTRONOMIA.PL

Figure 2 – The logo of Astronomia.pl portal. In the background an image of a nebula is seen.



Portal of Supernovae

Figure 3 – The main page of the *Portal of Supernovae* website for students participating in observing supernova project. The portal was created in cooperation between the Hands-On Universe, Astronomia.pl and British Council.

Obligatory course unit!
Trainee astronomers learn to communicate their future scientific results

Carmen Del Puerto
IAC/ULL (cpv@iac.es)

Abstract

A scientist must not only do science, but must also know how to communicate it. It is possible that he or she even ends up becoming devoted professionally either to outreach or to teaching. Therefore, the Master's Degree Course in Astrophysics[1], created by the University of La Laguna (ULL) with the collaboration of the Instituto de Astrofísica de Canarias (IAC), includes in its programme the four-month core course unit *Communicating Astronomy: Professional Results and Educational Practice* (in Spanish, *Comunicación de Resultados Científicos y Didáctica de la Astronomía*), that is worth three ECTs. In this poster, I present the results of our experience from the academic year 2006-2007, in which seventeen Master's students, in addition to learning the skills necessary to communicating their results within the scientific community, have also studied the language of popularisation in a practical and fun way through role-playing as science writers and schoolteachers in the classroom.

Profile of the lecturers

The course unit is distributed between three lecturers, each responsible for different aspects of the subject matter:

John E. Beckman: astrophysicist. Research Professor at CSIC and researcher at the IAC. He is responsible for dealing with communication in the scientific context: articles and research projects, research-workers' CVs and preparing scientific posters.

Inés Rodríguez Hidalgo: Astrophysicist. Lecturer at the ULL, researcher at the IAC, current Director of the Museo de la Ciencia y el Cosmos and science communicator. She is responsible for the part dealing with oral communication and for practicals at the museum.

Carmen del Puerto Varela: Journalist specialising in science and technology. She has a PhD in Information Science and is Editor-in-Chief of the IAC Press Room. She is responsible for the part dealing with the social communication of astrophysics in its journalistic and didactic aspects.

The course is given with the collaboration of Terry Mahoney, a researcher at the IAC, and the Museo de la Ciencia y el Cosmos of the local government of Tenerife.

[1] http://www.iac.es/ensenanza/master/

Aims and objectives of the course unit

The course covers the social communication of astrophysics in its journalistic and didactic aspects:

- To awaken a strong interest in the future astronomer in popular science communication, the final and necessary phase of the scientific process.
- To combat the prejudice that only failed scientists do outreach and that science popularisation damages research and is a needless distraction to the researcher.
- To acquire the tools necessary to make scientific results known to the mass media, while attending to the respective requirements of each medium (press, radio, TV etc.).
- To examine the working methods specific to journalism, and to identify how these differ from those of scientific research.
- To become familiar with the language of popular scientific communication and to improve, through practical exercises, levels of written and oral expression.
- To be familiar with current didactic projects and to design educational strategies in the field of astronomy.
- To make students aware of possible job opportunities in the areas of outreach and teaching.

Methodology and evaluation

The classes are primarily practical, although a theoretical basis is provided for the students. There is no examination, attendance at lectures is obligatory, and students must complete the practicals and demonstrate an active participation in the class to pass the course unit. A premium is set on clarity of exposition, sound argumentation and the correct form of expression, befitting the orthographic and grammatical rules of the language (Spanish).

Debates

We started by debating the scientific news of summer 2006 — the demotion of Pluto from planetary status — dwelling on the fact that virtually no actual research work presented at the General Assembly of the International Astronomical Union in Prague had filtered through to the mass media. We also spoke of the “very bad press” that journalists tend to receive among scientists. The students were urged to free themselves from this particular prejudice. It is not the function of journalism that should be called into question, but the professionalism of the journalists. It is impossible to imagine a world without mass media. We concluded that it was necessary to reconcile both groups —scientists and journalists — and that there could be different levels of scientific communication, each legitimate in its own way.

Comments on the language of science communication

The students read a number of articles and were asked to comment in writing on two of them in particular, one dealing with the expanding balloon/raisin cake analogy to the expanding Universe, and the other covering topics from the cometary collision on Jupiter to the spherical collapse of the Universe (a look at the challenges of outreach in a scientific institution such as the IAC).

Scientific news

It was necessary to invent a piece of news and to write it up within journalistic parameters. The story could be related to science fiction or a classic discovery, but had to be turned into a news item with headlines appropriate to the 21st century. The following examples were set: “Not so far away: a new device sounds the celestial depths”. “Why do apples fall? Isaac Newton publishes a theory of ‘gravitation’ in his book *Mathematical Principles of Natural Philosophy*”, and “Spanish scientist finally discovers the origin of mass. Fernando Buitrago (Master’s student) finds the Higgs boson with the European Particle Accelerator”.

The supersymposium

It wasn’t carnival time, but Archimedes appeared in class, with his Greek outfit and his lines learnt by heart. A student had chosen this notable scientist of antiquity for one of the practical classes. Each student reincarnated different historical scientists and had to submit himself to the questions of his partners, who played the role of journalists for one day. For this role-playing practical, marks were awarded for effort in sharing discoveries with society. Accompanying Archimedes, were Aristarchus of Samos, Ptolemy, Giordano Bruno, Christiaan Huygens, Edmund Halley, William Herschel, John Goodricke, Joseph Fourier, Lord Kelvin, Giovanni Schiaparelli, Edwin Hubble, Charles Townes, Andrei Sakharov, Stephen Hawking and Jocelyn Bell-Burnell. At the end of the performance, one of the students impersonated the South Korean scientist, Woo Suk Hwang, protagonist of one of the most scandalous scientific frauds in history involving the false cloning of human embryos. It was an entertaining way in which to assess critically the peer-review procedures of the journals in which scientists publish their research.

The didactic unit

As part of their deliverable input to the course, the students had to prepare a didactic unit on a theme or a specific aspect relating to astronomy or physics that had been covered in the mass media during the term. This homework involved pursuing a news story that had been published in the press and eliciting its potential utility in the classroom at a specified educational level. An example of the use of press coverage in the classroom, the handling of the Pluto debate by the astronomical portal COSMOEDUCA was given to the students. Organisation, fitting the facts to the story, written expression and, above all, originality and effort in communicating were valued. This project was part of the final evaluation of the student. The best contributions were included in the portal. A student made use of press clippings of a discovery concerning rubidium stars made at the IAC to prepare a didactic unit on stellar evolution. Another student proposed teaching scientific concepts with help of comics and superhero movies. Further topics included the Theory of the Special Relativity, black holes, star clusters, Mars and space missions, the Sun, the Hubble Space Telescope, meteor showers and meteorites, exotic meteorology in the Solar System, and the life beyond the Earth.

Putting it all into practice

Some students volunteered to help in the journalistic coverage of two meetings organised by the IAC in September, 2007: the 30th Spanish Relativity Meeting, in Tenerife, and the HELAS NA3-2 of Helio- and Astroseismology workshop, in La Palma.

English: translation Terry Mahoney (IAC)

On the road to the IYA: Update on US plans and programmes

Susana Deustua[1] **& Douglas Isbell**[2]

[1] American Astronomical Society; co-chair, US Program Committee for IYA2009, and member of the US Development Committee (deustua@stsci.edu)

[2] National Optical Astronomy Observatory; co-chair, US Program Committee for IYA2009 and US Single-Point-of-Contact [SPoC] for IYA (disbell@noao.edu)

Abstract

As the US representative to the IAU, the American Astronomical Society (AAS) has established two committees to plan for the US effort for the International Year of Astronomy 2009: a Program Committee to develop the ideas for key programmes and activities, and a development committee to seek funding for the best ideas.

This presentation reports on the programmes and activities under development by the Program Committee, and related efforts by NASA.

Introduction

The 17 members of the US IYA2009 Program Committee cover the spectrum of astronomy outreach in the country, including representatives from NASA (National Aeronautics and Space Administration) the Astronomical Society of the Pacific, the National Radio Astronomy Observatory (NRAO), the National Optical Astronomy Observatory (NOAO), the astronomy media, the planetarium community, and representatives from Mexico and Canada. Development Committee members are drawn from industry, observatories and the private sector.

US Program Committee Members

- **Doug Isbell** (NOAO) co-chair disbell@noao.edu
- **Susana Deustua** (AAS) co-chair, deustua@stsci.edu
- **Doris Daou** (NASA Headquarters) Doris.Daou-1@nasa.gov
- **Craig Deforest** (SWRI and AAS Solar Physics Division press officer) deforest@boulder.swri.edu
- **Chris De Pree** (Agnes Scott College) cdepree@agnesscott.edu
- **Mary Dussault** (Harvard-Smithsonian CfA) mdussault@cfa.harvard.edu
- **Jon Elvert** (International Planetarium Society) jelvert@lasm.org
- **Rick Fienberg** (Sky & Telescope) rfienberg@skyandtelescope.com
- **Dave Finley** (National Radio Astronomy Observatory) dfinley@nrao.edu
- **Andrew Fraknoi** (Foothill College), Secretary, fraknoi.andrew@fhda.edu
- **Hashima Hasan** (NASA Headquarters) hhasan@nasa.gov

- **Jim Hesser** (Canada representative) James.Hesser@nrc-cnrc.gc.ca
- **Omar Lopez-Cruz** (Mexico representative) omarlx@inaoep.mx
- **Terry Mann** (Astronomical League) starsrus@infinet.com
- **Jim Manning** (Astronomical Society of the Pacific) jmanning@astrosociety.org
- **Aaron Price** (American Association of Variable Star Observers) aaronp@aavso.org
- **Denise Smith** (Space Telescope Science Institute) dsmith@stsci.edu

US IYA2009 Development Committee

- **Chair – Peter Stockman** (Space Telescope Science Institute) stockman@stsci.edu
- **Mark Adams** (NRAO) mtadams@nrao.edu
- **Kelly Beatty** (Sky and Telescope) beatty@skyandtelescope.com
- **Rolf Danner** (Northrup Grumman) rolf.danner@ngc.com
- **Susana Deustua** (AAS) deustua@stsci.edu
- **Jay Frogel** (Association of Universities for Research in Astronomy) jfrogel@aura-astronomy.org
- **Michael Gibbs** (Astronomical Society of the Pacific) mgibbs@astrosociety.org
- **Terry Mann** (Astronomical League) starsrus@infinet.com
- **Domenick Tenerelli** (Lockheed Martin) domenick.tenerelli@lmco.com

The US goal and major themes for IYA2009

US Program Committee Co-chairs Isbell and Deustua were appointed in mid–February 2007. Upon review of existing material and consultation with the Program Committee, a central new US Goal for IYA2009 was presented at the March 2007 meeting of the IYA SPoCs in Garching, Germany, and since modified to include nurturing existing relationships:

To offer an engaging astronomy experience to every person in the country, nurture existing partnerships and build new connections to sustain public interest.

To achieve this goal, seven major US themes have been established:

- Looking Through a Telescope (star parties and sidewalk astronomy);
- Dark Skies Are a Universal Resource (citizen-science campaign and related educational activities);
- Astronomy in Arts, Entertainment & Storytelling (ideas include a Rose Parade float and *Astronomy Goes to the Movies* at the 2009 Oscar Awards, cultural astronomy);
- Research Experience for Students, Teachers, and Citizen-Scientists (observations of variable star Epsilon Aurigae and more);
- Telescope Kits & Optics (hands-on activities tied to new inexpensive telescope kits);
- Sharing the Universe Through New Technology (blogs, podcasts, webcasts, social networking sites…);
- The Universe for Classrooms and Families (a booklet of follow-on activities for children, teachers and families, supported by a Galileo Club Card and related website).

Each theme is supported by at least one working group, Each theme is also responsible for reaching out to specific under-served audiences, and for building in an evaluation function for their proposed activities. Altogether, the themes now involve more than 70 astronomy outreach professionals, amateur astronomers, educators and volunteers.

US IYA2009 US Working Group Chairs

- **Rick Fienberg** (Sky & Telescope, rfienberg@skyandtelescope.com) *Looking Through a Telescope*
- **Andrew Fraknoi** (Foothill College/ASP, fraknoiandrew@fhda.edu) *Classrooms and Families*
- **Pamela Gay** (SIUE/AstronomyCast, pgay@siue.edu) – *New Media*
- **E.C. Krupp** (Griffith Observatory, eckrupp@earthlink.net) – *Arts & Entertainment*
- **Dennis Lamenti** (Indiana University, dlamenti@astro.indiana.edu) – *Storytelling and Cultural Astronomy*
- **Peter Michaud** (Gemini Observatory, pmichaud@gemini.edu) – *Science Centers, Observatory Visitor Centers and Planetaria*
- **Stephen Pompea** (NOAO, spompea@noao.edu) – *Telescope Kit and Optics Challenges*
- **Aaron Price** (AAVSO, aaronp@aavso.org) – *Research Experiences for Students, Teachers and Citizen-Scientists*
- **Connie Walker** (NOAO, cwalker@noao.edu) – *Dark Skies Are a Universal Resource*

NASA plans for IYA2009

Led by NASA SPoC Hashima Hasan, NASA is developing a set of IYA programme ideas that is aligned with this architecture, including early seed funding for the podcast "Are We Alone?" and a multi-wavelength image release from the Hubble/Spitzer/Chandra space telescopes. Major NASA-related events in 2009 include the outcome of the HST Servicing Mission-4, the launch of the Kepler exoplanet-hunting spacecraft, the impact of a probe released by the Lunar Reconnaissance Orbiter, first light for the SOFIA airborne infrared observatory, and the 40th anniversary of the Apollo 11 moon landing on 20 July.

The US Role in IYA Cornerstone Projects

The United States has taken a leadership role in three of the major Cornerstone Projects envisioned at the world level by the IAU IYA2009 Executive Working Group:

The Galileoscope: An inexpensive (less than $4 per copy) kit-based telescope of sufficient quality to view craters on the Moon and the moons of Jupiter, capable of being mass-produced by the millions (with a commercial sponsor) and distributed in a controlled fashion, primarily through established outreach networks and programmes, workshops and public events. [International Task Group Leader: Rick Fienberg].

Dark-Skies Awareness: A multifaceted programme of public education and citizen-science activities, including observations (GLOBE at Night [classic and digital] and the Great World Wide Star Count), small exhibits, new media, connections to star party activities, and urban "lights out" events. [International Task Group Leader: Connie Walker].

Image Exhibition: "The Universe from Earth" concept would assemble 100 of the best astronomical images produced by observatories, spacecraft and amateurs from around the world, and create a public display at one of three levels, depending on funding support – platinum level (outdoor, weatherproof), gold level (indoor), or silver level (downloads in standard format for local do-it-yourself). Candidate images are being collected via an ftp site at the Chandra Science Center [International Task Group Leaders: Kim Kowal Arcand and Megan Watzke].

Recent accomplishments

The US IYA2009 website[1] has more information on all of the themes and working groups, along with forums for public input and discussion, and related US talks, presentations and materials. The general e-mail address for ideas and comments is US2009yearofastronomy@gmail.com.

A MySpace page[2] for the US programme has been established and a Facebook site (*I'll be celebrating the International Year of Astronomy in 2009*) has been created.

The US Program Committee will submit a proposal to the US National Science Foundation division of astronomical sciences in late 2007. Private fundraising efforts are also underway, led by the Development Committee. It is hoped that these efforts will lead to a small grants programme whereby public groups in the US will be able to submit proposals (< $1,000) for a moderate amount of funding support to hold events and distribute materials.

Major US IYA2009 planning meetings were held in May 2007 in conjunction with the AAS meeting in Honolulu, and in September 2007 as part of the annual meeting of the Astronomical Society of the Pacific (ASP).

As part of the summer AAS Meeting in St. Louis, Missouri, 1–5 June 2008, the AAS and the ASP are sponsoring a symposium focused on the International Year of Astronomy. This symposium will serve primarily as the major organising conference and training workshop for national and regional (North American) efforts related to IYA2009.

Key challenges

- Establishing and staffing a national program office;
- Obtaining funding for the Key Projects;
- Increasing community involvement;
- Spreading the word!!!

---

[1] www.astronomy2009.us
[2] www.myspace.com/2009yearofastronomy

What the Universe has done for us: A global project on education and culture as a legacy for IYA2009

Francisco Diego
Dept. Physics and Astronomy, University College London (fd@star.ucl.ac.uk)

Abstract

Recent discoveries about the Universe reveal an amazing panorama of great relevance to the culture of the 21st century. However, as the amount of information and the variety of topics are overwhelming, it is important to capture the essence of these discoveries. I propose here a careful selection of simple and fundamental themes on the nature, distant origin and long term evolution of the Universe, that could be included at all levels of formal education and popular culture worldwide, as a legacy of IYA2009.

The four themes that follow address a fundamental question: what do citizens of planet Earth need to know about the Universe?

I Building blocks

This is based on the idea that absolutely everything we see in the Universe, from a flower to a giant star is made out of the very same tiny building blocks. The concept could be introduced to audiences as young as five. All things are made out of smaller things put together, which in turn, are made from even smaller things. A useful analogy is a city made out of houses, which are made out of bricks, themselves made out of sand.

No need (it could be even counterproductive) to go into details, just leave the concept as an amazing fact to be explored in the future, like a seed of knowledge. An interesting consequence of this is that the big things may look very different from each other, while the smaller ones are more alike.

The concept of an atom could follow for older kids (from 8 years old), using building blocks like plasticine balls or magnetic marbles to assemble the nuclei of atoms of well known chemical elements like hydrogen, helium, carbon, oxygen, calcium and gold. The topic can be expanded to include a very simple periodic table, where the positions of selected elements are enhanced.

II Evolution of the Universe

There cannot be big things without having small things first. The Universe started with the smallest things possible called fundamental particles. There was nothing else. Far from being in chaos, the early Universe was very simple and ordered for a very long time. Then, those particles kept joining together to assemble gradually the atoms that make absolutely everything around and above us, including stars, planets, flowers and people.

Assembling or fusing together fundamental particles into the nuclei of atoms needs the very high temperatures found only deep inside stars. This fusion also produces the heat that keeps the stars and the Sun shining for a very long time. Once again, no need to go into details, just leave this seed to grow.

III The scale of the Universe

To have a rough idea of our physical place in the vast oceans of cosmological time and space is fundamental in modern culture. Our senses are more receptive to this information if it is presented in a linear way as follows:

Linear space model: Think of the Sun as a football, the Earth as a peppercorn 25 m away, Jupiter a plum 150m away, the nearest star another football 6,500km away, nothing in between. An immediate conclusion is that the Universe is mainly vast empty space.

Linear time model: Use a rope stretched 14 m as a time line. Any millimetre along it would represent one million years. Hang pictures from it illustrating the Big Bang, the first stars, the origin of the Solar System, the emergence of life on Earth, etc. The entire lifetime of humanity would fit in less than the thickness of a sheet of paper. Debate about the wide empty spaces along the rope and how recent the Solar System and life on Earth are.

IV The rainbow, or how do we know?

The main concept here is that across the wide ocean of empty space, light has been our only link with the Universe. Light is made out of colours and astronomers make rainbows with the light from stars. By just measuring these colours, they have found the age of the Universe, its chemical composition and hundreds of solar systems. One conclusion is that, thanks to the rainbow, we know that the chemistry of the Universe is the same everywhere.

Conclusion

The project, *What the Universe has done for us* would seed fundamental concepts about the Universe in the cultural fabric of our society. The selected themes are very simple and specific, but they could expand according to the type of audience. For example, more mature audiences would welcome a wider cross-curricular approach and deeper information without losing focus on the essence.

The project will seek IAU endorsement and involvement. It is open to suggestions and collaboration with institutions and individuals, some of whom are already involved in similar projects. The ideas are being piloted as part of visiting lectures at schools in the UK. Additionally, there are plans to include school groups in Cuba and Venezuela during 2009. The resulting feedback and evaluation will be published soon elsewhere, together with a more detailed version of this paper.

Galileo and Darwin 2009: A Universe for life?

Francisco Diego
Dept Physics and Astronomy, University College London (fd@star.ucl.ac.uk)

Abstract

The year 2009 offers a unique opportunity to celebrate some of the greatest achievements of humankind to unravel the secrets of nature. It will be 400 years since Galileo extended the human senses by opening a wider window to the Universe; it will be 200 years since Charles Darwin's birth and 150 years since the publication of The Origin of Species by Means of Natural Selection. It will also mark the 40th anniversary of the first human steps on the lunar landscapes discovered by Galileo.

Galileo and Darwin 2009 is a journey exploring different possible ways of bringing together astronomy and biology. Topics are based around the scientific revolutions that expanded our perception of the Universe and follow the general principle identified by the Copernican proposition that humankind does not occupy any privileged position in the Universe.

The underlying theme is the universality of evolution, from simplicity to complexity, both environmental and biological. It also implies an evolution in the human perception and understanding of the Universe, which brings the following ideas for debate and discussion:

1. Our senses clearly indicate that the Earth is a flat environment at the centre of a Universe that rotates around it. The Copernican model (proposed initially by Aristarchus nearly 2000 years earlier) told us that it was the Sun, not the Earth, at the centre of a system of planets. This model was taken forward by the visionary Giordano Bruno who, before being captured, tortured for seven years and burnt at the stake in 1600 by the Italian inquisition, predicted a Universe with an infinite number of worlds like the Earth. In the years that followed, Galileo's telescopic observations came with a clear proof that Copernicus was indeed right; even so he was threatened and his discoveries were still censored for centuries. Why was this model so difficult to accept and its supporters persecuted so violently in Europe?

2. The universality of evolution had its first and most important impact on society with the publication of the Origin of Species by Means of Natural Selection by Charles Darwin in 1859. This work has been at the root of severe discussions and violent debates — mainly in the western world — ever since. Once again; why is it that these ideas, so well supported by evidence, are so difficult to accept?

3. Only five years later, in 1864, the universality of evolution was implicit in a publication by Huggins and Miller (1864), during the development of spectroscopic techniques that gave birth to astrophysics, where they wrote:
….a community of matter appears to exist throughout the visible Universe for the stars contain many of the elements that exist in the Sun and Earth. It is remarkable that the (chemical) elements most widely diffused through the host of stars are some of those most closely connected with the constitution of living organisms of our globe, including hydrogen, sodium, magnesium and iron. May it not be that at least the brighter stars are like our Sun, the upholding and energising centres of systems of worlds adapted to be the abode of living beings?

The quote has strong links to the ideas of Giordano Bruno, now expanding the Copernican principle by their discovery that the chemistry of life appears everywhere in the Universe, suggesting an evolutionary process from simple inorganic chemistry to the complexity of primordial life and beyond. Would Darwinian processes be applicable on a cosmic scale?

4. Primitive, bacterial life appeared on Earth very early. However, along most of the Earth's history, life on it was bacteria and nothing else. The environmental conditions required for the evolution of complex life, were the result of an amazing chain of chance events, coincidences and processes in which life itself played a fundamental role. The main steps along this environmental evolution are summarised as follows:

- the right star at the right distance;
- terrestrial planet with iron outer core molten by radioactive decay for:
  - magnetic field as a shield against cosmic radiation;
- accidental cataclysmic collisions producing:
  - accumulation of water by cometary impacts;
- massive collision produced a large moon, essential for:
  - tides to create pockets of primordial soup;
  - stable, tilted polar axis for long-term weather stability;
- primordial photosynthesis producing:
  - oxygen rich atmosphere, essential for:
    - conservation of liquid water, necessary for:
      - biochemical evolution, eukaryotic cells;
- plate tectonics, basic for:
  - dry continents, diversity of species, Darwinian processes;
- massive periodic biological extinctions that became important for:
  - emergence of intelligent mammals and eventually, a technological civilisation.

Lack of space prevents the necessary elaboration on these bullets. Nevertheless, they are useful to establish the following themes for discussion.

Are these conditions essential for the Darwinian processes to produce complex life and intelligence? Could complex life evolve under different circumstances? If so, given the fact that there is extrapolated evidence for billions of solar systems in our Galaxy; can we expect more technological civilisations similar to ours? Would they necessarily be similar to ours? Is the Darwinian natural selection of living species a universal process?

Conclusion

Following what happened on Earth, bacterial life may be abundant in the Universe. However, the conditions for further evolution and operation of Darwinian processes seem almost impossible to replicate elsewhere. Is our very presence a violation to the Copernican principle? Do we occupy a unique, privileged position in the Universe after all?

At the moment of this publication, the ideas for possible events during 2009 are still taking shape. There are obvious links to philosophy and religion that could result in engaging public activities such as: exhibitions, lectures, debates, café-scientifiques, essays, TV programmes, etc. all within the framework of IYA2009 and Darwin 2009.

Galileo and Darwin 2009 will be published in more detail elsewhere.

Reference

- Huggins W., Miller W.A., 1864, On the spectra of some of the Nebulae. Philosophical Transactions of the Royal Society of London, Vol 154 (1864), p.437-444

Credit: Sze-leung Cheung

IYA2009 in Portugal

João Manuel Fernandes[1], Rosa Doran[2], Filipe Pires[3], Máximo Ferreira[4] & António Pedrosa[5]
[1] Coimbra University (jmfernan@mat.uc.pt)
[2] Interactive Nucleus of Astronomy (NUCLIO) (rdoran@netcabo.pt)
[3] Centro de Astrofísica da Universidade do Porto (pires@astro.up.pt)
[4] Lisbon Science Museum (mferreira@cienciaviva.pt)
[5] Navegar Foundation, Espinho (apedrosa@multimeios.pt)

Abstract

Here the general guidelines of the Portuguese organisation, past, present and future, regarding the International Year of Astronomy 2009 are presented. The work started in July 2006, with the goal to define the general guidelines for the IYA2009.

Organisation

A commission was established by the Portuguese Astronomical Society to start preparing for IYA2009:

- João Manuel Fernandes — Coimbra University — SPoC
- Rosa Doran — Interactive Nucleus of Astronomy (NUCLIO)
- Filipe Pires — Centre for Astrophysics, Porto University
- Máximo Ferreira — Lisbon Science Museum
- António Pedrosa — Navegar Foundation, Espinho

Goals of this commission:

- Present a plan of activities.
- Establish a budget.
- Promote an open national discussion.
- Create a web page[1].

The plan was made public on the website on 23 July and was discussed publicly in four different meetings. Twenty five institutes have already expressed an interest in participating. In January 2008 an executive committee will take over, with responsibility for organising and supervising all the activities of the IYA2009.

Goals for IYA2009 in Portugal

- Full compliance with the IAU goals.
- Reach all areas of the public, with special emphasis on the younger generations.
- Involve amateur and professional astronomers alike.
- Promote partnerships and collaborations between institutions.

[1] http://www.iac.es/ensenanza/master/

- Give opportunities for activities not promoted under the IYA organisation.
- Fill gaps regarding Portuguese literature in astronomy, both in history and teaching.
- Create the necessary conditions for the IYA projects to be preserved well beyond 2009.

Activities organised by the commission

National level activities, which will be organised by the executive committee:

- Night of Astronomy — lights shutdown in the major cities for a short period of time.
- Talks — organise talks around the country in all districts.
- Planetarium show — create a planetarium show involving all the Portuguese planetariums.
- *I'm Galileo Galilei* — activity dedicated to young students with the goal of reproducing the observations made by Galileo.
- Astronomy kit — a kit with several hands-on experiences related to astronomy.
- Contests — scientific and artistic contests for different publics. Workshops for high-school teachers.
- Travelling exhibition — a large exhibition regarding Portuguese astronomy and its history that will travel around the country.
- Videoposts — a set of short movies to be placed in the website (or on TV?) concerning different astronomical subjects.
- Network resources — make a network of resources available, that all can share, mainly schools.

Activities to be organised by third party institutions

These activities include a set of activities that will be organised by third party institutions in close cooperation with the IYA2009 organisation. These activities are mainly proposed by the IYA organisation and include:

- Music concerts;
- Postage stamp collection;
- Exhibitions;
- Edition of books of reference;
- Fireworks;
- TV Shows.

A fraction of the budget will be used in another set of activities and events, organised outside the IYA2009 committee. Financial support will be granted according to a selection made in a call for proposals.

Summary

The organisation of the IYA2009 in Portugal is well underway, and it is expected that the new executive committee will start working at the beginning of 2008, in order to start executing the detailed plan. Many institutions/organisations have already expressed their willingness to join this celebration in order to make 2009 a start for an even better promotion and awareness of astronomy.

Looking through a telescope during the International Year of Astronomy 2009

Richard Tresch Fienberg[1], **Douglas Isbell**[2], **and Susana E. Deustua**[3]
[1] Sky & Telescope (rfienberg@SkyandTelescope.com)
[2] National Optical Astronomy Observatory (disbell@noao.edu)
[3] American Astronomical Society (deustua@stsci.edu)

Abstract

The main goal of the US IYA2009 effort is to offer an engaging astronomy experience to every person in the country. Since the IYA is a celebration of the 400th anniversary of Galileo's introduction of the telescope to astronomy, the key engaging experience we'll offer is the opportunity to look through a small telescope at the celestial targets Galileo looked at. Another goal of the US IYA effort is to cultivate sustainable partnerships. In addition to their own programmes, local amateur astronomers will set up their scopes at events held by professional organisations, including NASA, universities, observatories, planetariums, and museums of science. The relationships forged during this large-scale collaboration for public outreach in astronomy will continue beyond 2009. Our "telescope amnesty" programme will invite people to bring their little-used telescopes to IYA2009 events, where astronomers will teach them how to use them and offer advice on repairs, improvements, and/or replacements, encouraging more people to stay involved in the hobby.

International Year of Astronomy 2009

The main goal of the US IYA2009 effort, led by the American Astronomical Society, is to offer an engaging astronomy experience to every person in the country. Since the IYA is a celebration of the 400th anniversary of Galileo's introduction of the telescope to astronomy, one of the key engaging experiences we'll offer is to give as many people as possible the opportunity to look through a telescope.

Accordingly, the AAS has established the *Looking Through a Telescope* Working Group, chaired by Rick Fienberg (Editor in Chief, Sky & Telescope). Naturally, we'll focus on the celestial targets that Galileo himself looked at, most of which are visible even from light-polluted cities: The Moon, Venus, Mars, Jupiter, Saturn, the Pleiades, Praesepe, the Trapezium, Mizar/Alcor, the Milky Way, and the Sun. We want to offer more than a "gee whiz" experience. We want people (especially kids) to experience firsthand how observations lead to an understanding of the natural world.

Another major goal of the US IYA effort is to cultivate sustainable partnerships. *Sidewalk astronomy* is an ideal vehicle for astronomy clubs and individual amateur astronomers to participate in IYA2009. In addition to their own programmes, local amateurs will be encouraged to set up their scopes at events held by professional organisations, including NASA, universities, observatories, planetariums, and museums of science or natural history. The relationships forged during this large-scale collaboration for public outreach in astronomy will continue beyond 2009.

We aim to give 10 million people a good look through a telescope in 2009. This is achievable if, for example, 100,000 amateur observers each show the sky to 100 people. We plan to set up an area on the US IYA2009 website where people can comment on their telescopic observations — especially their reactions to “first looks”. We hope to collect the comments on a disc or chip and launch them into orbit on a NASA space telescope, most likely the Wide-field Infrared Survey Explorer (WISE).

Telescope amnesty programme

Millions of small telescopes are sold every year, but anecdotal evidence suggests that most are rarely used for astronomy, if at all. Our “telescope amnesty” programme will invite people to bring their little-used telescopes to IYA2009 events, where astronomers will teach them how to use them and offer advice on repairs, improvements, and/or replacements, turning bad astronomical experiences into good ones and encouraging more people to stay involved in the hobby.

Some highlights of the IYA2009 observing calendar

Since the most impressive telescopic object is the Moon, and since the Moon figured prominently in Galileo’s work, the ideal time to hold monthly sidewalk-astronomy events is on Friday and/or Saturday evenings near first-quarter Moon, which occurs on the following dates in 2009: Sun., 4 Jan.; Mon., 2 Feb.; Wed., 4 Mar.; Thu., 2 Apr.; Fri., 1 May; Sun., 31 May; Mon., 29 June; Tue., 28 July; Thu., 27 Aug.; Sat., 26 Sept.; Mon., 26 Oct.; Tue., 24 Nov.; Thu., 24 Dec..

Mercury’s best evening apparition for the US is on Sunday evening, 26 April, when the planet sits just below the thin waxing crescent Moon (making it easy to find). Some other parts of the world will enjoy better visibility.

Venus is at greatest elongation in the evening sky in mid-January 2009. The main attraction of Venus is its full cycle of phases, which showed Galileo that it orbits the Sun, not the Earth.

Unfortunately, Mars doesn’t reach opposition till 29 January 2010, and it will then be only 14 arcsec in diameter, so it’s not a very good evening target in 2009. Still, Mars will be in the news during IYA2009, thanks to ongoing exploration by current missions and the launch of Mars Science Laboratory in the fall.

Jupiter and its Galilean satellites come to opposition on Friday-Saturday, 14–15 August. Note that Neptune reaches opposition on 17 August, and that the two planets are just 3° apart that week. This offers a wonderful opportunity to tell people how Galileo missed the chance to discover Neptune when, in December 1612 and January 1613, he observed it near Jupiter and mistook it for a star. Most people, of course, have never seen Neptune (let alone Jupiter) in a telescope. Here’s a chance to see two planets at once! Bonus: Jupiter and Neptune will be less than 1° apart and will fit together in a low-power eyepiece on three occasions in 2009: late May (morning sky), early July (late evening, early morning sky), and late December (evening sky).

Saturn's opposition is 8 March, but note that Saturn's rings are nearly edge-on, with a ring-plane crossing on 4 September, when the planet is only 11° from the Sun. Saturn won't look as "telegenic" as usual, but this does offer a chance to talk about how the changing aspect of the rings made it impossible for Galileo to figure out what was going on there.

The year's best meteor showers in 2009 are the Leonids in mid-November and the Geminids in mid-December (unfortunately the Perseids in mid-August, when the nights are warmer, will be drowned out by moonlight).

The total solar eclipse on 22 July is the longest of the 21st century, lasting 6m 39s at greatest eclipse in the Pacific Ocean. The centreline goes right through Shanghai, China, where totality lasts 5m 56s. Thousands of astronomy enthusiasts will travel to China or the Pacific to see this eclipse, but millions (billions?) more can watch online during the Mother of All Webcasts.

The Moon will just nick the northern edge of Earth's umbral shadow on the last night of the year, Sunday, 31 December. This partial lunar eclipse isn't visible in most of the Western Hemisphere, but we include it here as icing on the cake of IYA2009 for observers in the East.

Credit: Sze-leung Cheung

Do-it-yourself astronomy

Maria Teresa Fulco
INAF — Capodimonte Astronomical Observatory, Naples (mtfulco@na.astro.it)

Abstract

Do-it-yourself astronomy is an educational project conceived and developed by the INAF–Capodimonte Astronomical Observatory at Naples, Italy. Based on the manufacturing of a small astronomical mirror by high school students, it is aimed at stirring up the interest of youngsters for modern science by applying the logic of "doing" as opposed to that of just "listening" and/or "watching".

Figure 1 – Do-it-yourself table holding the blank to be manufactured

Figure 2 – Introductory demonstration of the complete procedure by an expert

All pictures courtesy of the author.

Introduction

Today modern science is ever more confined to large and inaccessible laboratories, and scientists are perceived by the general public, and often presented by media, as aliens with unattainable qualities. This, together with the poor salaries, is one of the reasons for the present lack of interest for scientific disciplines by western European freshmen.

Do-it-yourself astronomy is intended to recover the flavour of "doing" science, and astronomy in particular, through a straightforward technological activity — the manufacture (in the literal sense of hand-made) of an astronomical mirror. This is a simple and classical operation that helps stimulate a deeper interest for the related physics (e.g. optics). It may also promote the observation of the actual night sky which, for various reasons, is more and more replaced by a "virtual" one.

Description of the project

Our primary targets are small groups of high school students. However, in view of its simplicity and of the limited cost, the project can be effectively exported into poor/underdeveloped countries with the purpose of promoting science and technology.

Each group of participants to the project is provided with the complete set of instruments and with all the materials needed to carry on the work under the guidance of a coordinator. The basic kit contains:

- two glass blanks with a typical size of 20 cm;
- a set of chemical powders for grinding and polishing;
- a spherometer to measure the radius of curvature of the worked surface;
- a Ronchi grating to test the optical quality;
- small tools to handle the mirrors and to spread the powders.

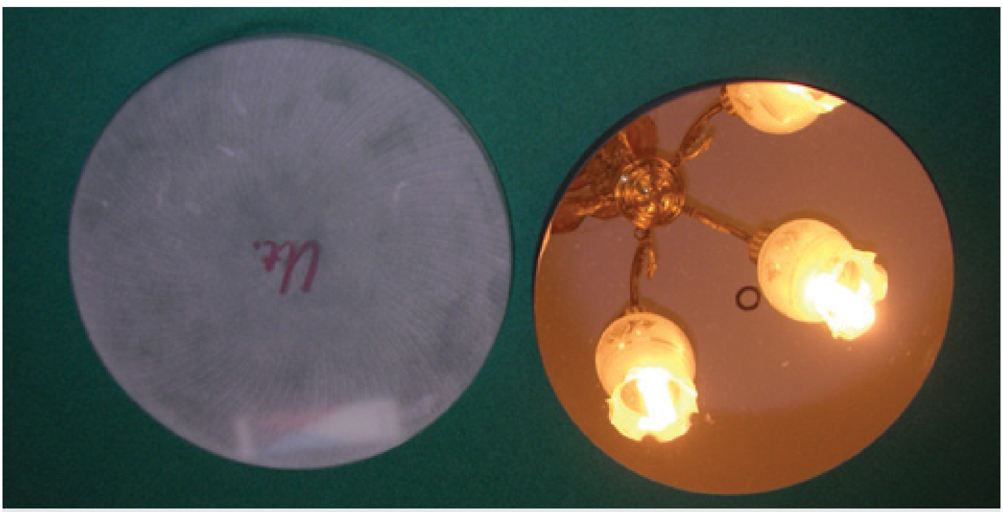


Figure 3 – Left: the blank – Right: the final manufactured mirror

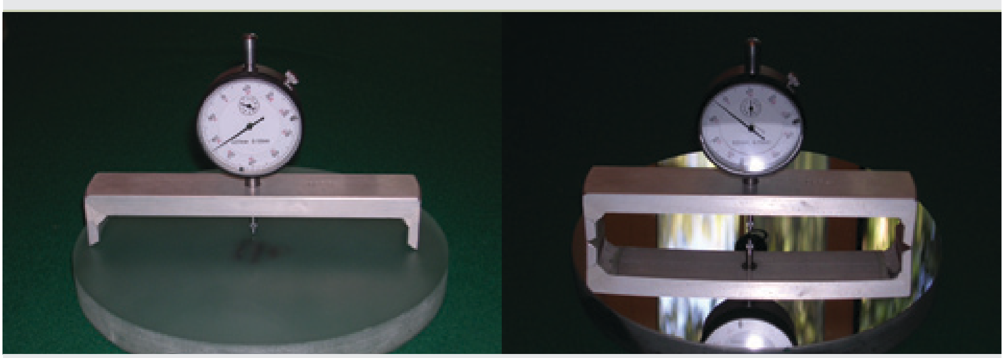


Figure 4 – The instrument to measure the curvature of the mirror: for the blank (left) and for the final manufactured mirror (right)

A printed guidebook and a film on DVD, illustrating the various steps of the work (both already available in Italian), complete the set. The cost of just one kit is of the order of 100 EUR, but this figure can be significantly lowered by ordering a large enough number of kits.

A typical team is composed of a teacher coordinating some (5-10) students. The workplace can be any room large enough to accommodate all the students around a simple, small and solid table, as round as possible. Water must be made available and the floor has to be easily cleaned. At the beginning of the project all the selected groups should be given a demonstration of the work performed by an expert. It may be also desirable to stimulate competition among the various groups by offering a final prize for the best product.

Each group should be checked periodically by an expert advisor, possibly an astronomer, who will also be able to answer technical and scientific questions that have arisen during the work.

The project has already been implemented twice, in the years 2004 and 2007, with excellent results. The necessary funds were made available to the INAF — Capodimonte Astronomical Observatory respectively by the Provincia di Napoli and by the Italian Ministry of University and Research. A report of these two first runs may be found at the link for *Astronomia fai da te*[1].

---

[1] http://www.oacn.inaf.it/pubout/progetti.html

Credit: Sze-leung Cheung

Ukrainian network of internet telescopes: Addressing multiple audiences

Vera G. Godunova[1], **Yaroslav O. Romanyuk**[2], **Boris E. Zhilyaev**[2]
[1] International Center for Astronomical, Medical, and Ecological Research (godunova@mao.kiev.ua)
[2] Main Astronomical Observatory of the National Academy of Sciences of Ukraine (romanyuk@mao.kiev.ua, zhilyaev@mao.kiev.ua)

Abstract

The UNIT project (Ukrainian Network of Internet Telescopes), which started in December 2006, aims to use new technologies to demonstrate modern astronomy to the general public better. UNIT should be completed by small robotic telescopes installed at remote sites; their work will be synchronised to within 1 ms by means of GPS technology. The philosophy of UNIT is to develop an instrument to perform observations over the internet from a PC at any location. UNIT is designed for both professional and educational applications. It can be employed by students, schools and amateurs to look at anything they want in the sky via an internet gateway.

Introduction

During the past 10 years, astronomical education has been subject to systematic and intensive improvements in Ukraine. Since 2000, astronomy has been a required course in general schools and in lyceums. Several planetariums are open to the public. Among the tasks still waiting to be tackled are the following:

- to increase the number of new textbooks;
- to organise regular training of astronomy teachers;
- to integrate research into teaching and education;
- to raise the prestige of the scientific profession, etc.

Scientists from the National Academy of Sciences play an important role in improvement of astronomical education. In 2006 the UNIT project was initiated. The project will use new technologies and new systems to promote modern astronomy and to create an interactive interface between society and science. The use of practical observations is a powerful tool for attracting young people to scientific and technical careers.

One more problem of great importance is manmade light pollution, which has already made large areas of the world unsuitable for astronomical observations. Within this project, scientists and amateurs will work together to monitor and quantify the level of night sky brightness and to promote public understanding of the problem of light pollution.

A new observational and educational tool

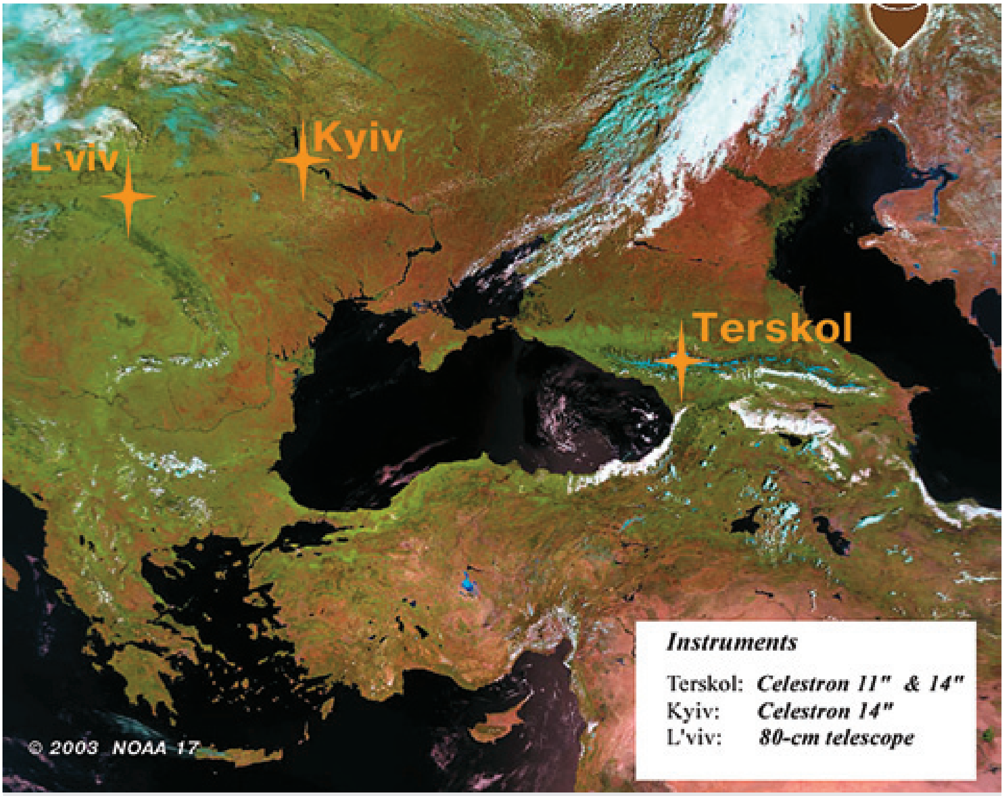
The Ukrainian Network of Internet Telescopes (UNIT), which is now being developed, includes four small telescopes installed at different sites in south-eastern Europe (Figure 1): two telescopes in

Ukraine and two telescopes at the Ukrainian observatory Terskol in the northern Caucasus. The telescopes are robotic; their work will be synchronised to within 1 ms by means of GPS technology. The number of telescopes in operation should increase in the near future as other interested parties from Ukraine and abroad become involved.

The main objectives of UNIT are as follows:

- to familiarise young people with modern experimental facilities and information technologies;
- to involve students and educational staff of universities in the research work in astronomy;
- to inform the public about current research;
- to contribute to a complete time coverage and follow-up of variable astronomical objects.

This project comprises the development of a website[1] with an extensive set of background information and guides to observation and data processing. One segment of the site will allow the users to perform near-real-time astronomical observations with robotic telescopes. Another segment will be useful for scientists, who require specialised, value-added information.



NOAA 17 & Vera Godunova (ICAMER)

Figure 1 – Observing sites and instruments of the UNIT Project

[1] http://www.unit.univ.kiev.ua

Science applications of UNIT

A distinctive feature of UNIT described by Zhilyaev et al. (2003) is an opportunity to study transient events and variable stars using small telescopes located at remote sites. Synchronous observations with the aid of distant telescopes can give information that reveals much about physical behaviour that cannot be obtained in any other way as discussed by Nogami et al. (2000) and Zhilyaev et al.(2006, 2007).

The UNIT instruments are sensitive down to magnitude V $\sim$ 18 and require about one minute to obtain the first images of transient object after the alarm or GCN notice (slew speed up to 3° per second). The study of variables at magnitudes U $\sim$ 12 on a timescale of 1s could also be accomplished with UNIT. The telescopes are equipped with fast CCD cameras to study astrophysical events on the timescales of up to tens of Hz. By using GPS receivers, we can synchronise all exposures at the remote telescopes with an absolute accuracy of better than 1 millisecond. UBVR filter-sets also are used. The CCD software operates in Windows-based systems and gives a complete control over image capture functions. To observe transients, which are typically at magnitudes 10-14^{m}, we can use the coincidence technique for synchronous observations within the UNIT network and in that way obtain a time resolution of about 0.1s.

Conclusions

There are several advantages in the continuous operation of UNIT. A key focus of UNIT is to establish the link between the researchers and general public using a web-based information and online access to astronomical instruments. Online education in space sciences can be delivered through the internet to remote locations, and, the available expertise of Ukrainian scientists could be utilised to inform the public about current research. The UNIT team will update and expand the network capabilities continuously to meet the needs of its users and to encourage people to be involved in scientific work. UNIT will operate from in mid-2008.

Acknowledgements

This project is supported by the Science and Technology Centre of Ukraine (project #4134).

References

- Nogami D., Kato T., Yamaoka H, Uemura M. (2000), International cooperation on transient object observations: its importance and recent results. Kinematics and Physics of Celestial Bodies (Suppl.) 3: 333-338
- Zhilyaev B.E., Romanyuk Ya.O., Svyatogorov O.A. (2003), Principles and Applications of the Synchronous Network of distant Telescopes. Baltic Astronomy 12:561-567
- Zhilyaev B.E., Romanyuk Ya.O., Verlyuk I.A., Svyatogorov O.A., Petrov M. I., and Lovkaya M.N. (2006), Fast Optical Photometry of Galaxies: Observations of Short-Lived Flare Events. In: Gaskell C.M., McHardy I.M., Peterson B.M., and Sergeev S.G. (eds.) AGN Variability from X-rays to Radio Waves. ASP Conference Series, Vol. 360, pp 61-64
- Zhilyaev B.E., Romanyuk Ya.O., Svyatogorov O.A., Verlyuk I.A., Kaminsky B., Andreev M., Sergeev A.V., Gershberg R.E., Lovkaya M.N., Avgoloupis S.J., Seiradakis J.H., Contadakis M.E., Antov A.P., Konstantinova-Antova R.K., and Bogdanovski R. (2007), Fast colorimetry of the flare star EV Lacertae from UBVRI observations in 2004. A&A 465: 235-240

Credit: Jan Warnstam, Jonas Lindqvist —

CAP in the UK

Paul Haley[1,2]
[1] Spacewatch
[2] Share the Initiative, UK (PAHAstro@aol.com)

Abstract

This poster highlights some of the experiential learning activities used by *The SHARE Initiative* (TSI) in the UK. Past, present and future projects are described and the possibility of linking up internationally with other projects is invited. Digital media, scientific heritage and solar physics are three areas which Paul Haley (Director — TSI) is particularly keen to develop. Operating as a community interest company TSI outreaches astronomy activities directly into rural areas in the UK.

Projects completed

The *Venus Transit in the Golden Valley* DVD won the prize for the best community event film in Europe. Twenty schools were involved and 400 children participated in a wonderful morning of activities in the depths of rural Herefordshire. A live link with North Loburn School in New Zealand enabled young people there to also participate — at night!

The SHARE Initiative is a social enterprise formed in 2006. It focuses on partnership building, learning, heritage, special needs and international projects. *SpaceWatch* celebrated 50 years of space exploration and was funded by the Science & Technology Facilities Council (formerly PPARC). Since 2005 over a dozen two-day events for families have been delivered across Herefordshire. Activities have included planetarium shows, observatory visits, magic planet workshops, arts and crafts, film-making and links with other outreach projects. Work with deaf and hard-of hearing families, visually impaired learners and adults with acquired brain injuries has been especially rewarding.

New projects

Webb-SHARE: Celebrating our Victorian astronomy heritage is funded by the Heritage Lottery in the UK. It celebrates the lives of three amateur astronomers who lived in Herefordshire during the mid-nineteenth century: Rev Thomas William Webb (1806-1885), Rev Henry Cooper Key (1819-1879) and George Henry With (1827-1904). Webb's famous book *Celestial Objects for Common Telescopes* was published in 1859; Cooper Key produced the first silvered glass mirror

[1] www.spacewatch.co.uk
[2] www.the-share-initaitive.co.uk

in the UK for reflecting telescopes and soon after began producing more than two hundred mirrors for amateur astronomers.

Webb-SHARE runs from 2007-09 and will include: training workshops for volunteers researching local history, building replicas of Webb's telescopes, re-enacting Victorian star parties, creating museum loan boxes for schools, resources for visually impaired learners, family events, a touring exhibition and a DVD. TSI would particular like to hear of any international links to Webb — perhaps letters in archives abroad?

Magic Planet workshops using a digital globe feature in several TSI outreach events. Animations and global perspectives can be quickly shown through this portable 3D projection system which provides a complimentary approach to planetarium shows. A popular activity involves children and young people role-playing as space journalists — using the magic planet to report back from different worlds — and filming each other to produce a simple vodcast.

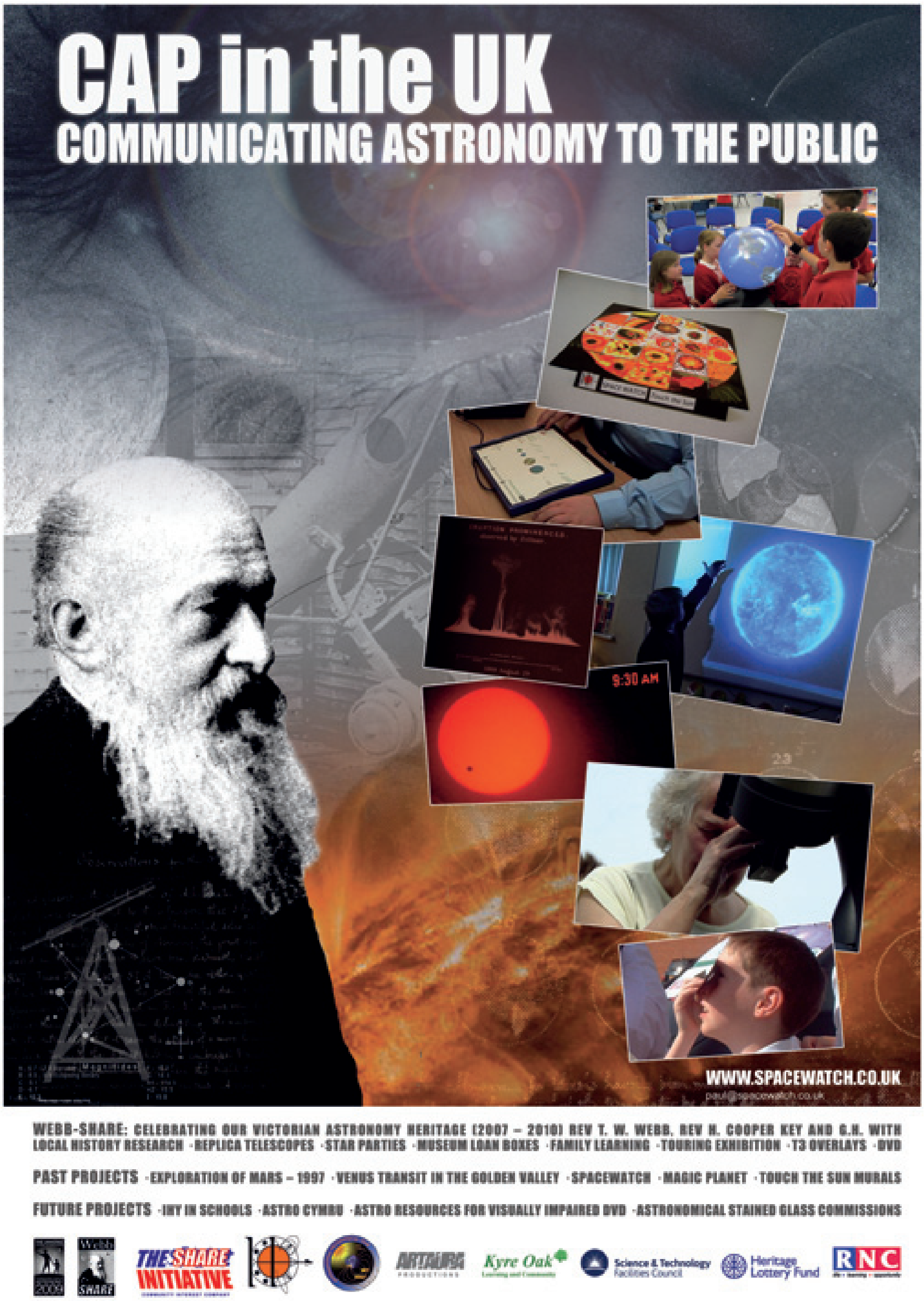
Future plans

IHY: Frontier Science through Arts is a project celebrating the International Heliophysical Year 2007-09 and the study of solar physics. Initial plans involve special schools and older learners with a limited number of stained glass exhibits being produced on commission.

Astro-Cymru is an exciting opportunity to celebrate the contributions of Welsh astronomers over 400 years. This science heritage project is being developed with three Welsh Universities — Aberystwyth, Cardiff and Glamorgan — and is planned to complement UK plans for IYA. Interested in Welsh astronomy — please get in touch!

Grundtvig European funding will be targeted for a lifelong learning project involving Polish and Portuguese immigrants in Herefordshire. Working with partners in their home countries, including the Astronomia portal in Poland, an IYA project aimed at sharing cultural ideas is being planned. A Grundtvig Learning Partnership is being planned (European Union funding) for a lifelong learning project called AURORA POLARIS. This project aims to link several European organisations specialising in astronomy outreach together by enabling them to exchange best practice in designing astronomy resources for older learners. *Partnership Opportunities for Learning: Astronomy Resources for Inspiring Seniors* will link with IYA and run over two years. Each participating country will need to apply to its national Grundtvig agency before 15 February to participate.

Special needs DVD — TSI are interested in producing a DVD showcasing global resources for outreach work with special needs groups. We already have partners for the visually impaired community and would like to expand these to also support other learning difficulties. We aim to facilitate a web download in different languages to enable any country in the world to share resource ideas for disadvantaged learners involved with IYA. So if you have resources — please let us know!



Credit: The SHARE Initiative — UK.

Figure 1 – Webb-SHARE


Credit: Sze-leung Cheung

Careers and interactive technologies at Gemini Observatory

Janice Harvey
Gemini Observatory (jharvey@gemini.edu)

Abstract

Gemini feels it is important to let the public know that there is a wide range of astronomy related careers that most people are not aware of. We hope to accomplish this by providing a video that profiles the different job opportunities available at Gemini. The video will be included on our next CD-ROM/internet-based Virtual Tour and will also eventually be available over Gemini's website.

The Gemini Observatory is now offering a new educational programme designed to share live science with educational audiences using the Internet2 (I2) educational/research network. Called *Live from Gemini*, the programme allows audiences to join a Gemini Observatory astronomer live from the control room and experience real science in a genuine observatory environment. In 2007 the programme is expanding into the international partnership of the Gemini Observatory (US, Canada, UK, Australia, Brazil, Argentina and Chile) and will be offered to educational institutions in these countries with I2 capabilities on a first-come-first-served basis. The programme consists of a multi-media overview of the observatory (complemented by an interactive CD-ROM/internet-based Virtual Tour which is sent in advance of each session), followed by recent science highlights and ends with a live Q&A session with a staff astronomer. This session will provide an overview of the programme, details on how to participate and will feature a live link to the Gemini control rooms in Hawaii and Chile.

Figure 1

Recent advances in software, hardware, and the availability of internet connectivity at a reasonable bandwidth provide a unique opportunity for the application of web-based technology to university and K-12 education.

Modern astronomy is flourishing. Interplanetary spacecraft have observed eight of the nine planets in phenomenal detail, and mapped and landed on the surface of the moon. Orbiting observatories scrutinise star clusters, nebulae, the violent cores of galaxies, and distant quasars.

Meanwhile, astronomers are using ground-based telescopes, equipped with the latest electronic light-gathering instruments, to measure the chemical composition of stars, the mass of galaxy clusters, and search for planets around other stars. Future years will see an armada of new large telescopes attack some of the most important astronomical questions being asked today. How old are the oldest stars? How did the first galaxies form in the Universe? Why is most of the mass in the Universe not directly observable? What is the nature of this “dark matter”? Will the Universe expand forever?

Why study astronomy and become an astronomer?

First, because astronomy is intrinsically fascinating. But also because it is “useful” in a variety of senses: it is deeply rooted in culture and philosophy; it has obvious practical applications; it is a forefront science that contributes to mathematics, computation and other technologies; it reveals our cosmic roots, our place in time and space, and a Universe that is wondrous and beautiful; it excites curiosity and imagination. It also contributes to education in many ways, and attracts young people to science and technology.

Sharing images intelligently: The Astronomy Vizualisation Metadata standard

Robert L. Hurt[1], Adrienne J. Gauthier[2] Lars Lindberg Christensen[3] & Ryan Wyatt[4]

[1] Spitzer Science Center (hurt@ipac.caltech.edu)
[2] Steward Observatory, University of Arizona (agauthier@as.arizona.edu)
[3] ESA/Hubble (lars@eso.org)
[4] California Academy of Sciences (rwyatt@calacademy.org)

Abstract

High quality astronomical images, accompanied by rich caption and background information, abound on the web and yet prove notoriously difficult to locate efficiently using existing search tools. For instance, “flat” searches will return dozens of hits for low-quality images and miss more important related images from large observatories. The Virtual Astronomy Multimedia Project offers a solution via the Astronomy Visualization Metadata (AVM) standard. VAMP manages the design, implementation, and dissemination of the AVM standard for the education & public outreach (EPO)/press astronomical images that observatories publish.

Problems with web images: search and context

The astronomical EPO community plays a key role in conveying the results of scientific research to the general public. A key product of EPO development is a variety of non-scientific public image resources, both derived from scientific observations and created as artistic visualisations of scientific results. Images are generally made available in formats such as JPEG, TIFF, PNG, and GIF (i.e., not scientific FITS datasets). Such resources are currently scattered across the internet in a variety of galleries and archives, but are not searchable in any coherent or unified way (nor via machine-generated queries). This issue is described in detail in Gauthier et al. (2007).

A second problem is that once a search engine retrieves the resources, they are often without the descriptive information (metadata) that can put them into context. It can be difficult or impossible to identify the intended meaning of the image or what is happening astronomically. The image, more often than not, has been ripped away from its original source and thus lacks contextual information such as a headline, description, telescope facility, sky position, etc. The situation is exacerbated if one does not know the originating website of an image file. What object is pictured? What telescope made the observation? How should the colours be interpreted? Where on the sky should it be placed?

Metadata is the solution

Metadata is a set of data that describes and characterises another set of data, for instance an image. Such a set of descriptors forms the basis for any structured method for cataloguing content in a database.

The Virtual Astronomy Multimedia Project (VAMP) has at its core the Astronomy Visualization Metadata (AVM) standard. This comprises a set of tags to fully describe astronomical imagery, particularly the wealth of high-end image products intended for the non-technical user. The current scope includes telescopic observations, photography (e.g. of telescopes, astronauts, technology, etc.), illustrations/diagrams, and data visualisations. Eventually it will include tags for video and other multimedia content. We are currently working with planetarium professionals to make the AVM accessible and useful for their needs.

The categories for AVM tags span the needs for astronomy images, ranging from the general to observation-specific information:

1. Creator: The identity and contact information for the original source of the image.
2. Content: General information about the image including title, subject, and caption.
3. Observation: Source telescopes, instruments, and mappings for colour composites.
4. Coordinates: Sky projection information (World Coordinate System).
5. Publisher: Information on the institution/body providing online access to the image.
6. File: Image dimension, size, format (native information for the file type).

The AVM uses the XMP standard from Adobe Systems, a variation of XML. This is the same technique a digital camera uses to record time, date, and exposure information in photographs. AVM builds on the IPTC metadata standards that are widely used in image software and in the publishing industry. The most beneficial aspect of the XMP standard is that the metadata is stored directly in the image header. Therefore, the metadata is attached to the image, regardless of whether it sits on the original source server or has been uploaded elsewhere. Much of the metadata will be immediately available to a casual user: the more general tags under Content and Creator can be accessed by many existing image management programs (e.g. iPhoto, Picassa, etc.). In addition to the general metadata, the astronomy-specific tags are defined as XMP extensions which may currently be read in using custom panels in Adobe Photoshop and Bridge. Developers are currently working on a “Photoshop free” method to creating, editing, and attaching AVM metadata to non-FITS images (e.g. JPEGs, TIFFs, PNGs, etc.). The VAMP Archive will house

Tag Name	Format	Example Metadata
Version Metadata		
MetadataVersion	string	1.1
Creator Metadata		
Creator	string	Spitzer Science Center
CreatorURL	URL	http://www.spitzer.caltech.edu
Contact.Name	string, list	R. Hurt
Contact.Email	string, list	example@ipac.caltech.edu
Contact.Telephone	string, list	555-555-5555
Contact.Address	string	1200 E. California Blvd.
Contact.City	string	Pasadena
Contact.StateProvince	string	California
Contact.PostalCode	string	91125
Contact.Country	string	USA
Rights	string	Public Domain
Content Metadata		
Headline	string	NGC 1566
Subject.Category	string, list, CV	C.5.1.1;C.5.3.2.2
Subject.Name	string, list	NGC 1566
Description	string	This beautiful spiral galaxy NGC 1566, located approximately 60 million light-years away in the constellation Dorado was captured by the Spitzer Infrared Nearby Galaxies Survey (SINGS) Legacy Project using the telescope's Infrared Array Camera.
ReferenceURL	URL	http://gallery.spitzer.caltech.edu/imagegallery/image.php?image_name=sig05-013
Credit	string	NASA/JPL-Caltech
Date	string	2005-09-15
ID	string	sig05-013
Type	string, CV	Observation
Image.ProductQuality	string, CV	Good
Observation Metadata		
Facility	string, LO	Spitzer;Spitzer;Spitzer;Spitzer
Instrument	string, LO	IRAC;IRAC;IRAC;IRAC
Spectral.ColorAssignment	string, LO ,CV	Blue;Green;Red;Red
Spectral.Band	string, LO CV	Infrared;Infrared;Infrared;Infrared
Spectral.Bandpass	string, LO	Near-Infrared;Near-Infrared;Near-Infrared;Near-Infrared
Spectral.CentralWavelength	float, LO	3600;4500;5800;8000
Spectral.Notes	string	The SINGS image is a four-channel false-color composite, where blue indicates emission at 3.6 microns, green corresponds to 4.5 microns, and red to 5.8 and 8.0 microns. The contribution from starlight (measured at 3.6 microns) in this picture has been subtracted from the 5.8 and 8 micron images to enhance the visibility of the dust features.
Temporal.StartTime	float, LO	2;2;2;2
Temporal.IntegrationTime	float, LO	10;10;10;10
DatasetID	URI, LO	a1;a2;a3;a4
Spatial.CoordinateFrame	string, CV	ICRS
Spatial.Equinox	string	2000.0
Spatial.ReferenceValue	float, list(2)	65.0696476555;54.9319798442
Spatial.ReferenceDimension	float, list(2)	974;974
Spatial.ReferencePixel	float, list(2)	616.293197632;346.155345917
Spatial.Scale	float, list (2)	-0.000208670950176;0.000208670950176
Spatial.Rotation	float	-124.205032386
Spatial.CoordsystemProjection	string, CV	TAN
Spatial.Quality	string, CV	Full
Spatial.Notes	string	FOV: 12.19 x 12.19 arcminutes; Ref coordinate: 4h20m16.72s -54d55m55.13s; derived from astrometry.net file sig05-013.fits
Publisher Metadata		
Publisher	string	Spitzer Space Telescope
PublisherID	URI	1
ResourceID	URI, list	http://gallery.spitzer.caltech.edu/imagegallery/image.php?image_name=sig05-013
File Metadata (implicit, not user entered)		
File.Type	string, CV	JPEG
File.Dimension	float, list(2)	974;974
File.Size	float	180
File.BitDepth	float	16

Figure 1 – The AVM version 1.1 (alpha release) metadata tags.

the AVM metadata and online image locations that reside on the content providers servers. The VAMP Service allows for intelligent search strategies of the database that utilise the full contextual information captured within the metadata. Proposed search techniques include cone/positional searches based on WCS information, keyword/text searches, and semantic methods using the controlled vocabularies to find related imagery.

The AVM/VAMP Server model will allow dramatic new ways to utilise imagery in innovative applications. For instance, images tagged with sky coordinates could be placed automatically into desktop or planetarium software with the contextual information shown alongside the image or on a planetarium lecturer's console. Custom web or museum kiosk applications could employ dynamically-updating content based on queries to the VAMP server, drawing on new images as quickly as they are released to the web.

Use AVM now!

The architecture for AVM is in place and tools now exist in Adobe Photoshop and FITS Liberator for tagging image libraries. Anyone interested in increasing the flexibility of their image archives is encouraged to start tagging their images now and contact the VAMP team for ongoing collaborative efforts. Current progress includes recruiting Spitzer Space Telescope, Hubble Space Telescope (NASA/ESA), and Chandra X-Ray Observatory to tag image collections; agreeing with the IRSA group at Caltech to design, build, and maintain the VAMP Archive and Service; and prototyping using an open source desktop planetarium program (Stellarium, see Kapadia et al, 2007). Growing VAMP partnerships include a cross section of observatories, data centres, application developers and planetariums.

For more information about VAMP and to download the most current Astronomy Visualization Metadata standard (Version 1.1) visit our website[1]. You can also view our IVOA Note, *Astronomical Outreach Imagery Metadata Tags for the Virtual Observatory Version 1.00* at Hurt et al. (2006)[2].

References

- Gauthier A.J., Christensen L.L., Hurt R.L., Wyatt R. (2007), Virtual Astronomy Multimedia Project. In Christensen L.L., Zoulias M. & Robson I. (eds.) Proceedings from Communicating Astronomy with the Public 2007
- Hurt R.L., Christensen L.L., Gauthier A. (2006),Astronomical Outreach Imagery Metadata Tags for the Virtual Observatory Version 1.00. http://www.ivoa.net/Documents/latest/AOIMetadata.html (2006).
- Kapadia A., Chéreu F., Christensen L.L., Nielsen L.H., Gauthier A.J. Hurt R.L., Wyatt R. (2007), VAMP in Stellarium/VirGO: A Proof of Concept. In Christensen L.L., Zoulias M. & Robson I. (eds.) Proceedings from Communicating Astronomy with the Public 2007

[1] www.virtualastronomy.org
[2] http://www.ivoa.net/Documents/latest/AOIMetadata.html

Advanced amateur astronomy: An effective link between science and the public in Greece

S. Kleidis[1,2], N. Matsopoulos[2] & A. Mylonas[1]
[1] Hellenic Astronomical Association (steliosklidis@gmail.com, milonasastro@hotmail.com)
[2] Zagori Public Observatory, Epirus, Greece (matsop@astro.noa.gr)

Abstract

The advanced activities of two amateur organisations that provide informal education in astronomy, by filling a gap in the Greek educational curriculum and serving as an important link between science and the public are described.

Introduction

The Hellenic Astronomical Association (HAA) was established in 2002, succeeding the former Greek Amateur Astronomers' Society (GAAS). GAAS was one of the first amateur astronomy clubs in Greece. It concentrated on elementary observational and educational activities. HAA aims to improve Greek amateur astronomy by providing outreach at an advanced level, serious informal astronomical education and by initiating amateurs in modern astronomical techniques and scientific observational methodology.

Zagori Public Observatory (ZPO) is a non-profit private organisation that shares the same goals as the HAA. ZPO, established in 2005, has its own facilities and works mainly in public outreach and informal education within Epirus in northwest Greece.

HAA and ZPO are working in close collaboration and organise common educational and observational projects.

Outreach activities

HAA focuses on the following activities:

- Arranging sidewalk astronomy.
- Organising Star Parties.
- Organising open nights with lectures, multimedia presentations and telescopes, in schools and cultural centres.
- Organising observing sessions on remote mountaintops with dark skies.
- Providing information to the mass media.
- Maintaining a very informative website[1].

[1] www.astronomia.org.gr

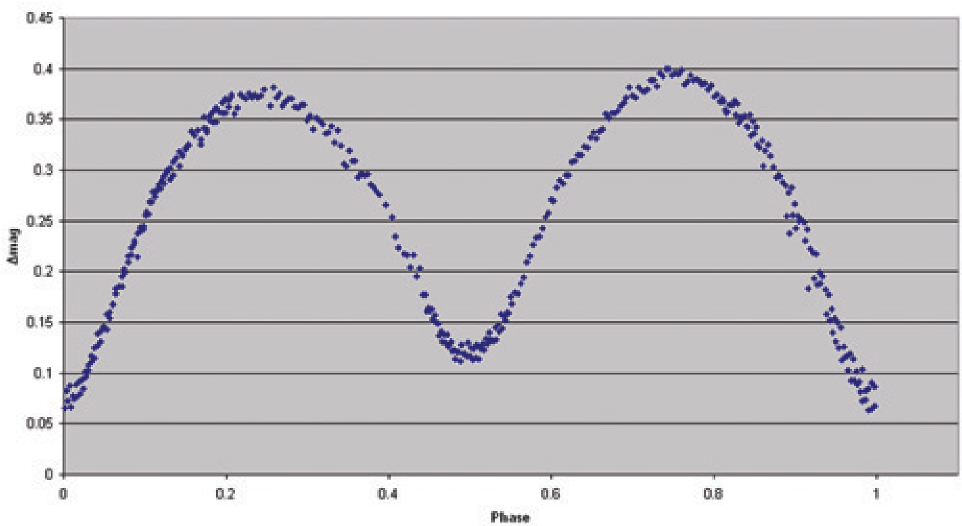
ZPO has facilities that include a lecture hall and six telescopes at a dark site (1000 m above sea level) and has similar activities to the HAA.

Advanced amateur astronomy

Both organisations are active in the fields of:

- Astronomical Observations. Besides trivial amateur activities such as astrophotography, they are active in scientific observations on short period variable stars, planetary transits, occultations, NEOs and comets.
- Design and construction of amateur telescopes and auxiliary astronomical equipment.
- Production of supporting educational material as star charts, planispheres, posters, DVDs, booklets etc.
- Organising seminars on regular basis at two levels:
    - Introductory courses in general and observational astronomy;
    - Advanced level seminars in astronomical observational techniques and data reduction.

Our experience reveals that high quality astronomical activities can recruit serious amateurs into scientific research and attracts the interest of the general public to astronomy and related scientific disciplines. Private institutions and amateur clubs are trying to fill a gap in the Greek educational system, since astronomy is almost ignored in the elementary and high school curriculum.



S. Kleidis

Figure 1 – Binary star light curve in Ic filter.

Visiting the top modern observatories

Nataliya Kovalenko
Kiev Planetarium (kievplanet@ukr.net)

Abstract

The lecture entitled *Visiting the top modern observatories* has been prepared for the coming International Year of Astronomy 2009 and covers such topics as:

- what one can see through a telescope;
- the thrills of using a telescope;
- the basic principles of telescope construction;
- the history of the telescope: its invention and development through 400 years;
- Earth's atmospheric transparency;
- radio telescopes;
- the top 10 optical telescopes of the planet;
- Ukrainian observatories;
- large telescopes of the near future;
- space telescopes and their discoveries.

We present some parts of the script from the Kiev planetarium lecture *Visiting the top modern observatories.*

Telescopes

What purpose does the telescope serve? Many people believe that the most important characteristic of a telescope is its magnification. But this is not the case. First of all the value of the telescope depends on the size of its objective, or the light collecting area.

Astronomers used to have only one kind of light detector before the telescope was invented – the human eye. Stars down to magnitude six can be seen with the naked eye. This natural optical device allows us to resolve two objects which are separated by 1 arc minute.

Our vision is limited by the diameter of our pupil. A telescope is an "eye" of much larger size. It collects much more light and allows us to observe the object in detail. Faint objects up to magnitude 30 are seen through the best modern telescopes. These are objects billions of times fainter than those visible with the unaided eye.

Thus, the telescope is used for collecting as much light from an object as possible, and for studying the finer details.

Who invented the telescope? We use this invention for astronomy mainly thanks to the Italian scientist Galileo Galilei. In 1609, at the age of about 40, he heard that a Dutch optician had made a telescope. It consisted of two lenses and increased the apparent size of distant objects. Then Galileo made his own version, and directed it on the sky.

Galileo saw a stunning picture through his telescope. He saw craters on the Moon, observed the changing phases of Venus similar to the lunar ones. Saturn had a look of a disc with fattened sides along its equator – such was the look of the rings known today. He also discovered the four biggest satellites of Jupiter. On the disc of the Sun he observed spots and at night the starry sky looked absolutely different. Stars which no one had seen before became visible as well.

Galileo's telescope was only 3.5 cm in diameter and magnified by a factor of thirty. It could be held in the hands or mounted on a support. As time passed bigger telescopes appeared. They had lengths of 30 and even 40 metres. They had to be lifted by means of ropes and blocks. Telescopes were becoming more sharp-sighted, and larger lenses were required. To produce a good big lens was very difficult and skilled process. Only the most skilful masters could make good lenses for greater telescopes.

The American Alvan Clark became especially famous. Back in 1897 he made a lens of 1.02 metres in diameter. It was necessary to grind it manually for about five years. Clark's record has still not been beaten. Nobody has made larger lenses, but they are not necessary any more. Telescopes of other types – mainly reflectors – have taken their place. A concave mirror – spherical or parabolic – is used in reflectors. To make a mirror, even a big one, is much easier than the day by day grinding of glass to make a lens.

One of the first reflecting telescopes was constructed by English scientist Isaac Newton in 1668. It had a mirror of 3 cm in diameter, and the magnification was 40 times. Almost two centuries later an Englishman, the Earl of Rosse, built a giant telescope on his estate in Ireland. Its mirror was 2 metres in diameter. A person with an umbrella could pass freely through the tube of this telescope.

From the end of 19th century the best telescopes in the world were established at the American observatory on Mount Wilson. The 2.5-metre reflector of this observatory heralded the beginning of the great telescopes of the 20th century. For a long time it was unequalled, but in 1948 the Hale telescope was built at Mount Palomar. It sported a 5-metre mirror. And in 1976 the Bol'shoy Telescope Altazimutal'niy (BTA) – a large altazimuth – was constructed in the Caucasus BTA. This instrument allows stars millions of times fainter than visible to the unaided eye to be observed.

In the four centuries since Galileo's time the size and capabilities of telescopes have changed significantly. Modern telescopes have mirrors several metres in diameter. And in our virtual tour I invite you to the Special Astrophysical Observatory – the largest in the territory of the former USSR. It is situated in the Northern Caucasus, at a height of 2100 metres above sea level.

SAO is the main organisation of the Russian Academy of Sciences for carrying out astronomical observations. The BTA is placed on the top of Pastuhov Mountain in Nizniy Arhyz, near Zelenchukskaya village. This giant has a primary mirror of 6 metres in diameter.

The cabin where the astronomers/observers used to settle down is the height of the 15-storey house. The 6-m mirror of the BTA weighs more than 40 tons! It certainly wasn't easy to make! Firstly, the 70-ton casting had to be cooled over 2.5 years. Then the glass surface had to be ground and polished. Finally a very thin layer of aluminium was applied using a special device, and the mirror was complete.

It is hard to make such a huge mirror, and transporting it from a factory to the Caucasus wasn't easy either. The mirror was carried on water and then in a space special lorry convoy, slowly, cautiously, and smoothly. The telescope was established on the mountaintop, in a tower of the same height as a 20-storey building. The weight of the whole telescope is almost one thousand tons, and its height is more than 40 metres!

The BTA telescope held first place in the world for 16 years, but now the Caucasian giant holds is only 11th on the list of the largest telescopes on the Earth. Let's get acquainted with the top ten telescopes of the planet.

Credit: Sze-leung Cheung

The International Sidewalk Astronomy Handbook

Alberto Krone-Martins, on behalf of the International Sidewalk Astronomy Handbook collaboration
Universidade de São Paulo (algol@astro.iag.usp.br)

Abstract

In this article we present the project management of a work of international collaboration organised to produce a handbook aimed at improving sidewalk observations around the globe.

Introduction

It is expected that a great number of sidewalk observations will be organised by amateur astronomy groups during 2009. Aiming at improving the quality of these public events, two organisations experienced in promoting sidewalk observations, the Clube de Astronomia de São Paulo (São Paulo Astronomy Club, BR) and the Los Angeles Sidewalk Astronomers (USA), began to work together to create a Sidewalk Astronomy Handbook.

The goal is to write a comprehensive guide to help bring the observation of celestial objects into public places. Participants will share their experiences and expertise, so that the handbook covers as many issues related to sidewalk observation as possible. For example, there will be tips for holding sidewalk observations of the Sun at the beach, as well as tips for holding night observations at 0° Celsius (32° F). Special emphasis will be placed on ideas for groups just starting to organise sidewalk events. Every aspect of sidewalk observations will be included: planning, logistics, promotion, observing, education (speeches, banners, folders, etc.), documenting (video, photography, audio/video-recorded interviews, guestbook, and people-counting), and common ideas that work or don't work.

The collaboration

Anyone with at least some experience in sidewalk observations and from any country can participate. Participants need a basic command of the English language and internet access. At this moment the collaboration has 73 members from regular astronomical associations that perform sidewalk observations in the US, Brazil, Ukraine, Mexico, the UK, Philippines, Canada, New Zealand, China, Malaysia and India.

There will be a spokesperson, acting as a single point of contact for formally administering information for publication. Occasionally, other members of the collaboration may assume this status temporarily.

Since we are an international group, it is natural that as the project evolves, translation subcommittees will be organised to create translated versions of this handbook.

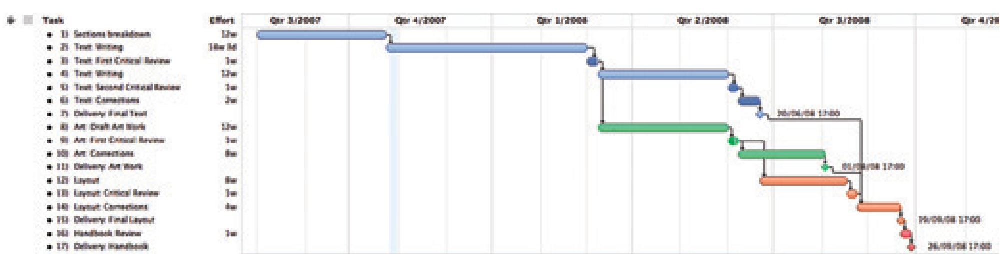
The tools of the job

The original version of the handbook will be written in the English language. In order to reach the broadest audience possible, the language will be kept simple. Keeping the language simple requires less effort when translating, and allows a greater number of people to get involved in the project.

Being a worldwide collaboration, the most natural way of communicating is via the internet. We've chosen to use an e-mail group, since this is a very efficient way to exchange ideas and record them automatically at the same time. We are using the Yahoo!Groups infrastructure for the polls, databases, scheduling, file sharing and bookmarks. As far as text production is concerned, we will be using Google Docs, an online environment for text editing in a collaborative way that also includes a document versioning tool – so one can always see how, when and by whom, something was changed. The document will be continuously improved, universally tested and dynamically updated – while our collaborators are conducting public observation sessions, they will also be testing the handbook's recommendations and recording session experiences for future updates.

Project schedule

We intend to have the handbook ready by the end of September 2008. At this date we plan to have two different layouts: one to be freely distributed through the internet in a PDF file designed to be printed on any A4 compatible colour printer, and another prepared for CTP printing, to be published on book format – should this project find a sponsor.



Alberto Krone-Martins

Figure 1 – Project tasks in form of a Gantt chart.

The project is divided into four production cycles with well defined deliverables. In every cycle there will be a critical review and analysis phase, where the production of that cycle is revised and discussed in a rigorous way.

Cycle 1 will have the draft text of the book as a product at the end of February 2008. At the end of the Cycle 2, by end of May 2008, a second version of the draft text and the draft of the artwork will be delivered. The delivery of the final text, the final artwork and the draft layout marks the end of the Cycle 3, in mid–August 2008. Finally, at the end of the Cycle 4, at the end of September 2008, the International Sidewalk Astronomy Handbook will be ready for web distribution. The printed version of the book will also have the files ready to be sent to CTP printers by this date.

Gathering the forgotten voices: An oral history of the Canada-France-Hawaii Telescope's early years.

Mary Beth Laychak & Liz Bryson
Canada-France-Hawaii Telescope (laychak@cfht.hawaii.edu, bryson@cfht.hawaii.edu)

Abstract

They came to the Big Island from as far away as Murrumbeena, Australia, and as near by as Hilo, Hawaii. They were the progeny of Scottish coal miners, French physicists, Chicago truck drivers, Japanese samurai and Big Island cane workers. Together, these men and women would build and commission one of the most dynamic and productive 3.6-m telescopes in the world and one that remains at the forefront of science and technology. The CFHT oral history DVD preserves the stories of the first decade and a half of the observatory.

Goal of the project

Saving the oral history of CFHT… for posterity.

Motivation

Liz Bryson, the Canada-France-Hawaii Telescope librarian, was inspired by Peter Hingley's 2002 paper at the Library and Information Services in Astronomy Conference (Hingley, 2002). The value of preserving the oral history of the telescope was confirmed in January 2003 when the Mount Stromlo Observatory in Canberra, Australia was destroyed by fire. All of the recorded history of the observatory also perished.

Scope

The original plan was to document CFHT's history from 1980-1989. As the interviews began, it became clear that the beginning of the telescope would provide the basis for the study. Thus, the decision was made to include 1972-89; chronicling the first international collaboration, the construction of the telescope and dome, first light, and the early instrumentation.

Interviews

Selecting who to interview for the project was difficult. The initial list was based on recommendations from past and present employees, including CFHT's directors. The final list was whittled down to a total of thirty five persons, including astronomers, administrators, technicians, researchers, engineers and Liz. The average interview spanned one to two hours. Prior to the interview, each subject was sent a list of biographical questions; however, the final interview was conducted with blind questions. On the basis of the biographical questionnaire, each interview began with personal anecdotes and reminiscences, essential for encouraging an atmosphere of trust and collaboration. In addition, since Liz Bryson, the interviewer, has worked at CFHT for the past twenty-seven years, she was able to participate in the recreation of CFHT's unique history. Much more footage was taken than was used in the DVD itself. The transcripts and full footage of each interview will be available on the web.

Timescale

The video camera was purchased in 2002, and the DVD was completed in late 2006. At the peak of work on the DVD, the staff hours involved came to at least two days a week for two years. While the interviews were time consuming, the most time was spent in converting tapes from VHS and 8mm to DVD.

Budget

The funding for the project came directly from the CFHT library budget. The start-up costs included the purchase of a digital video camera and accompanying equipment. It was also necessary for Liz to travel to both Canada and France to conduct some of the interviews. Other expenses included professional transcription of the interviews, colour processing of old film and pictures and the actual production of the DVDs. Fortunately, all of the music and sound was done by a CFHT staff member at no additional cost. The largest expense was the professional editor hired to help complete the final version. The final expenditures totalled almost $20,000. This figure represents an expenditure of approximately $20.00 per 1000 DVD units; however, the cost does not include staff time, most notably Liz's.

Conclusions

After the success of the initial project, talk has begun of creating a second DVD to chronicle the 1990s, an era of unprecedented scientific success. As with the first DVD, the project will enlist significant people with first-hand knowledge of special historical developments and experiences at CFHT from 1990 until 1999.

…I would wonder what kind of present you could possibly have without knowing the stories of your past. From *The Lost: A Search for Six of Six* (Mendelsohn, 2006).

References

- Hingley, 2002: http://www.eso.org/sci/libraries/lisa4/Hingley.pdf
- Mendelsohn, D. 2006, The Lost: a Search for Six of Six Million, Harper Collins

[1] http://cfht.hawaii.edu/Reference/Library/Oral_History/oralhist.html

Visualising the invisible

Mary Beth Laychak
Canada-France-Hawaii Telescope (laychak@cfht.hawaii.edu)

Abstract

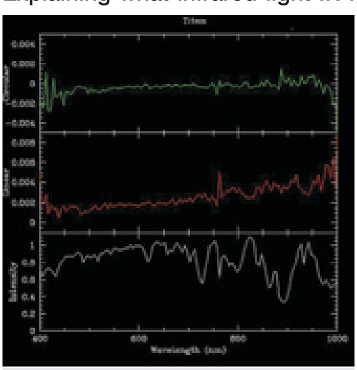
In addition to the optical camera Megacam, the Canada-France-Hawaii Telescope operates a large field infrared camera, Wircam, and a spectrograph/spectropolimeter, Espadons. When these instruments were commissioned, the challenge arose to create educational outreach programmes incorporating the concepts of infrared astronomy and spectroscopy. We integrated spectroscopy into discussions of extrasolar planets and the search for life, two topics routinely requested by teachers for classroom talks. Making the infrared accessible to students provided a unique challenge, one that we met through the implementation and use of webcams modified for infrared use.

Understanding spectra

Extrasolar planets and extraterrestrial life are two topics commonly requested by teachers for classroom talks. Reduced spectra, like the one of Titan, demonstrate how astronomers actually look for planets and life. Classroom talks start off by talking about handwriting and how we are able to recognise the handwriting of people that we know. Next we equate the handwriting of friends to the unique signature of the elements and compounds in the Universe. Much as the student can be confident who sent a note from the handwriting, an astronomer can be confident of an object's composition based on its spectra despite their inability to travel to the object that they study. This analogy makes astronomical spectra more understandable to middle school age children. Once they understand the basics of spectra, the leap to shifted spectral lines and planet hunting is much smaller.

Infrared light

Explaining what infrared light IR is proves challenging. We found that while many children understand the individual components of optical light, microwaves, radio waves, and X-rays, they do not have a great grasp of the entire electromagnetic spectrum. The idea that all of those known quantities are the same, just with different wavelengths, is a leap that the children have not yet made. With the commissioning of Wircam, our wide field IR camera, we felt the need to create a simple, portable and cost effective way for children and adults to grasp the world that exists just beyond what we can see. To that end, we built an IR webcam. The directions were found on wikiHow[1]. The steps are quite simple and we purchased the most inexpensive webcam available at the local electronics store.



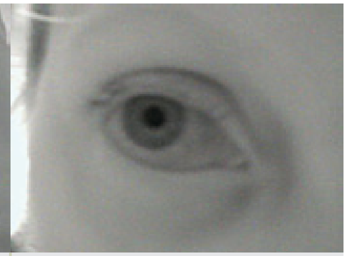
Nadine Manset

Figure 1 – Example Titan Spectra

[1] http://www.wikihow.com/Make-a-Webcam-Into-an-Infrared-Camera

Figure 2 – Organic dyes in the optical

Figure 3 – Organic dyes in the IR, note the absence of color and pattern. Non organic dyes, silkscreening and embroidery are still visible



Mary Beth Laychak

Figure 4 – Eyes and skin coloration in the IR, note the absence of skin coloration and eyelashes. Dark eyes show less of a differentation between iris and pupil.

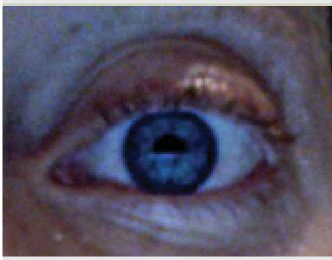


Figure 5 – Eyes and skin coloration in the optical

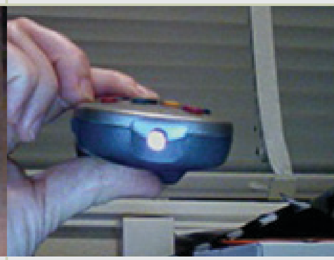


Figure 6 – Remote control. Some light is visible on the optical webcam because of the sensitivity of the ccds. To the human eye, it's undetectable.

Mary Beth Laychak

Figure 7 – Remote control in IR. Note the large flash of light.

The camera sees in the near IR, but not at the level of night vision. At wavelengths just outside our own visual limit, the difference between what we see and what the camera sees is striking. The light from the IR LED at the end of a television remote control is clearly seen at the peak wavelength of the camera. Skin coloration, organic dyes, colour differentiation between iris and pupil, and the lenses of sunglasses are invisible in the near IR. These differences, especially the remote control LED, make an impact on children of all ages.

Another benefit of the IR webcam is its portability. A basic demonstration can be done with one computer and the webcam. However, our display is slightly larger. We begin the demonstration by showing the children a diagram of the electromagnetic spectrum. Next, the children then look at themselves using an optical webcam. We then have children look at themselves using the IR webcam. Once they see the obvious changes to their appearance, we give the child the remote control and have them point it towards the camera. When the child sees the bright flash of light emitted by the IR LED, they are astonished. Without fail, children who participate in the activity ask why they cannot see the light with their eyes. And every child points the remote control in the direction of the optical camera after our explanation. By having both webcams available, the children are able to test what we are telling them. We end the demonstration by showing the children side-by-side IR and optical images from CFHT in order to show the benefits of the IR to astronomy.

Conclusion

Infrared astronomy and spectroscopy are areas of astronomy that often get short-changed in education outreach. By creating a few simple demonstrations, we have been able to help students see beyond the optical, into the invisible.

A pinch of salt goes a long way in communicating astronomy

Sivuyile Manxoyi
South African Astronomical Observatory (sivuyile@saao.ac.za)

Abstract

The building of the Southern African Large Telescope not only revolutionised the methods of data collection in astronomy as a science in South Africa, but also changed the face, approach and impact of astronomy communication in our country. This presentation examines the various ways in which SALT has been supporting and continues to drive astronomy communication with the public. These include the following strands: learner activities, educator programmes, special events and national events as well general public programmes. The learner activities include SALT tours, space camps, stargazing, astronomy quiz, workshops, science clubs and job shadowing. The educators' strand includes workshops, projects, mini conferences, tours, team and co teaching. The public is catered for through special events, national events, exhibitions, star parties and festivals.

Shireen Davis/SAAO

Figure 1 – SALT dome taken in Sutherland.

Introduction

The African Astronomical Observatory, since its inception in 1972, has always implemented outreach in the form of public lectures and stargazing. The building of SALT raised the level, depth and breadth of outreach by engaging the educators, school learners, university students as well members of the general public. This was done in the following manner: increasing the number of beneficiaries, increasing the number of platforms of interactions, creating international partnerships, introducing astronomy in rural and underdeveloped areas, bursaries for high schools and university students, creating links of cooperation among professional and amateur astronomers. Herein, attention will be on the platforms as well as the beneficiaries (educators, students, learners and the general public).

Educator programmes

Astronomy was not part of school curriculum prior to 1995. It was only after SA entered into democracy that astronomy was introduced to primary and high school learners. The strategic objective of our educator programmes is to empower educators in understanding "Our place in Space" as well as "Earth and beyond". Secondly it is to demonstrate how astronomy can be used as context to teach physics, chemistry and mathematics. The educator programmes include the following:

Educator workshops

These last three or four hours and deal with specific topics as requested by educators. Educators are supplied with relevant material and resources. Our approach is hands-on, hearts-on and minds-on and we use simple, accessible and cheap materials to demonstrate and model astronomy related tools and phenomena. (See Figure 2 above, a refractive telescope, binoculars and spectroscopes).

Educator projects

These consist of a series one day workshops, excursions, development materials and talks by professional astronomers and physicists. These have resulted in the production of educational resources, which are distributed nationally. These projects have been funded by the private sector (Telkom, Murray and Roberts) and by the Department of Science and Technology. This has

Cedric Jacobs/SAAO

Figure 2 – Educators participating in the workshop "Tools of astronomy" on telescopes and spectroscopy.

also involved institutions of higher education like University of Cape Town, Stellenbosch and Cape University of Technology.

Miniconference

This is a platform to create space for interaction between professional astronomers and educators. It also involved teacher trainers who came to demonstrate how the astronomers' ideas could be implemented in the classroom. Miniconferences were held in 2003, 2004 and 2005. Each year they extended over two days and reached 452 educators in total.

Learner programmes

The learner programme's objectives are to expose learners to career opportunities in astronomy and space science, to demonstrate the astronomical roots of science and mathematics, to showcase the relevance of astronomy as well as to portray the beauty and exciting nature of astronomy. The programmes have the following strands:

Career focused activities: This is an opportunity for grade 10 or 11 learners who are interested in astronomy to do some job shadowing at the Sutherland or Cape Town site. They spend two to three days working with professional astronomers. They are exposed to all aspects of astronomers' work from collection of data, interpretation and publication. This is further supported by complementary programmes such as a role modelling event in which astronomers address

Cedric Jacobs/SAAO

Figure 3 – Westpoort Primary school learners looking through their refractive telescope.

learners on their jobs as well as *Take a Child to Work* event in which learners spend a day in the observatory working with astronomers.

Space camps: Between 2003 and 2005, six space camps were held, two annually for grade 9 and grade 11. Learners are selected from various schools in various provinces and accommodated in Sutherland. They engage in stargazing, were addressed by astronomers, watched space movies and were encouraged to participate in various workshops e.g. building telescopes and launching model rockets.

Astronomy Quiz: This is an annual event for grade 6 and grade 7 learners. A team of four learners represents schools and the quiz is divided into four rounds. All questions in the quiz are multiple choice and learners are supplied with relevant reading material as preparation for quiz. All learners who participate are winners as all get prizes.

Learner workshops: These workshops complement the educator workshops. They are focused on "Earth and beyond" as well as astronomy as a context for learning science. See Figure below, learners build and use their telescope to observe the craters on the Moon.

National, special and public events: The general public is catered for via national, special and public events. South Africa is probably the only country in the whole world that has dedicated the whole month in celebration of astronomy. This is a national event and takes place in October. It is called Astronomy Month. All efforts are undertaken to take astronomy to all during this month.

Special events such as the appearance of Comet McNaught, transits and eclipses are all observed and are taken to the public.

Public lectures as well as stargazing are held on the second Saturday of every month and the public is welcome to participate in the events.

Astro-tainment: Using modern and indigenous games to communicate astronomy

Sivuyile Manxoyi
South African Astronomical Observatory (sivuyile@saao.ac.za)

Abstract

Games are by their nature interactive, informative and developmental and in many cases full of fun and entertainment. SAAO has used modern and indigenous games to communicate astronomy to learners, educators and members of the public. These games include board, card, stone, pen and paper, domino, singalongs, ball and computer games. The use of games serves to simplify, demystify and communicate hard concepts in a fun way. They extend beyond the confines of institutions as games can be played at home and school. There is also no need for supervision when rules are mastered. This presentation also examines the principles (racing, collection, simulation and placing) which underpin our games as well seeking to demonstrate how simple materials can be transformed into communication and educational tools by infusing relevant astronomical knowledge.

Introduction

Our country is facing a huge challenge in communicating science. There is an even harder challenge in dealing with astronomy communication and education because of the peculiar history of astronomy in South Africa. Modern astronomy in our country is inextricably linked with the beginning of colonialism; astronomy was not even part of the school curriculum prior to 1995. Astronomy was only offered at postgraduate level in some universities and the isolation of our country from the world also affected astronomy as a field of study.

The introduction of democracy concomitantly with the building of the Southern African Large Telescope has changed the landscape positively. The bidding for the Square Kilometer Array Telescope has put astronomy on the public agenda. The launching of Sunsat, a South African microsatellite as well as the soon-to-be launched Sumbandilasat satellite has generated interest in astronomy and space science. Mark Shuttleworth's space tour and the development of science centres have raised people's interest in astronomy. SAAO facilitates a number of events such as workshops, tours, exhibitions, star parties and public lectures as part of communication strategy. Games are one of the ways of communicating astronomy.

Motivation for using games

Games are a form of edutainment as they bring enjoyment to the players while also ensuring the transfer of knowledge and information. Games simplify, demystify and communicate hard concepts in a hard way. They extend beyond the confines of institutions and there is no need for supervision when the rules are mastered. Games also create a platform of interaction among players of different ages, experiences and levels of knowledge and understanding. They can also be used to challenge misconceptions, preconceptions as well as alternative conceptions. Games can cover one concept as well as introduce new concepts to players.

Figure 1 – A compendium of different astronomy based games.

Figure 2 – Student teachers playing astronomy board games at SAAO.

Different types of games

Board games: There are quite number of these games. We have used South African designed games such as the Solar System game, Space Trek, planet games as well ASP's Moon Chase.

Observational games: Isilemela, a game named after the Pleiades and usually played by Xhosa and Ndebele initiates undergoing the circumcision tradition of manhood. Constellations, is a game based on a challenge to try to identify the various constellations in the night sky.

Card games: Cosmic Decoders; Astrobingo.

Physical games: Shadows, this is a game that can be played during solar-based activities and when introducing sundials. In this game participants have to predict the length and positions of shadows and draw them using chalk. The exciting part is to compare the size and position of shadows at different times as well as during different seasons.

Stone games: These are indigenous games that have been infused with astronomy knowledge. Puca is a girls' stone game that has been adapted by painting the stones different colours to represent the different colours and temperatures of stars. Nkwenkwezi, is a boys' game based on a Xhosa idiom that "as above so below", this is an observatory building game in which participants use stones aligned to constellations on the ground.

Pen and paper games: These are suitable for adult and teenage learners and demand some basic astronomy knowledge. The rules of the game can be changed by the participants to make the games more challenging and interesting. We have also used puzzles with great success, especially with the younger learners as they particularly enjoy them.

We have also explored domino games such the Moon Phase game, computer games, singalong games and ball games.

Principles of Design

Like all games, astronomy based games make use of the principles of racing, simulation, placing, collection and battling. The strategy is to infuse astronomy knowledge into already existing games. The familiarity with the rules of the game makes it easier for the participants to play and to focus their attention on the new content.

Challenges

Most of the board and card games are in English and this has been a challenge for young learners whose first language is not English. Lack of understanding of astronomy concepts can be an obstacle, as some games demand a certain level of knowledge. The changing nature of astronomy knowledge means that the games have to be adapted to any revisions, e.g. the reclassification of Pluto. Computer games prove to be a challenge to those who lack basic computer literacy. Contextual issues such as culture, availability of resources and nature of players (age, grade and homogeneity of group) also need to be taken into account in selecting and playing the games.

Figure 3 – Sivuylie Manxoyi conducting a workshop entitled “Exploring the Universe through games” at SAAO.

Conclusion

Games can be used as an introduction of new concepts or consolidation of understanding. If used as an introduction, there needs to be a follow up activity such as stargazing or a hands-on activity. Games have to be part of a variety of approaches for maximum impact.

Credit: Dennis Crabtree

The Virtual Telescope Project: Enjoy the Universe from your desktop

Gianluca Masi[1,2]
[1] The Virtual Telescope Project, Italy (gianluca@bellatrixobservatory.org)
[2] Planetario di Roma, Italy

Abstract

The Virtual Telescope is a new robotic facility that makes possible for people worldwide to participate in real-time observations of the sky. Complete scientific instruments are made available, matching the needs of researchers, students and amateur astronomers. Instruments are controlled live and in real time by the remote user while qualified assistance is made available from a professional astronomer, to assist and address the observing experience. The project consists of several remote controlled and independent telescopes, including solar scopes for daytime observations. Their diameters range from 40–360 mm. The project and the technology involved are presented here, as well as the peculiar benefits for students and other users.

Introduction

Technology is changing the way we do and communicate astronomy. While telescopes, detectors and the instrumentation involved are making it possible for scientists to push their view out further, both in space and time, science communicators are experiencing new tools to carry these concepts and ideas to a wide public.

As part of this revolution, it is now possible to access and control a remote observing facility through the internet, slewing a telescope that is thousands of kilometres away. While this is a great simplification for astronomers (they can avoid expensive long trips), it also offers a chance for lay people to use state-of-the-art instrumentation to discover the Universe. Schools and students are the primary targets for these remote observatories but a wider audience can definitely enjoy them.

The Virtual Telescope Project is a new remote robotic facility available to anyone with an internet connection. It offers different telescopes and auxiliary instruments for observing the sky, both at day and night and of course in real-time. It also offers complete, live professional assistance to the user, to get the most from the observing experience as described by Masi(2007a). The integration of technology with such a support makes the Virtual Telescope an outstanding case study. Scientists, amateur astronomers, students and curious people can ALL use the Virtual Telescope being confident that they will understand what they are doing and that they will enjoy a satisfying observing experience.

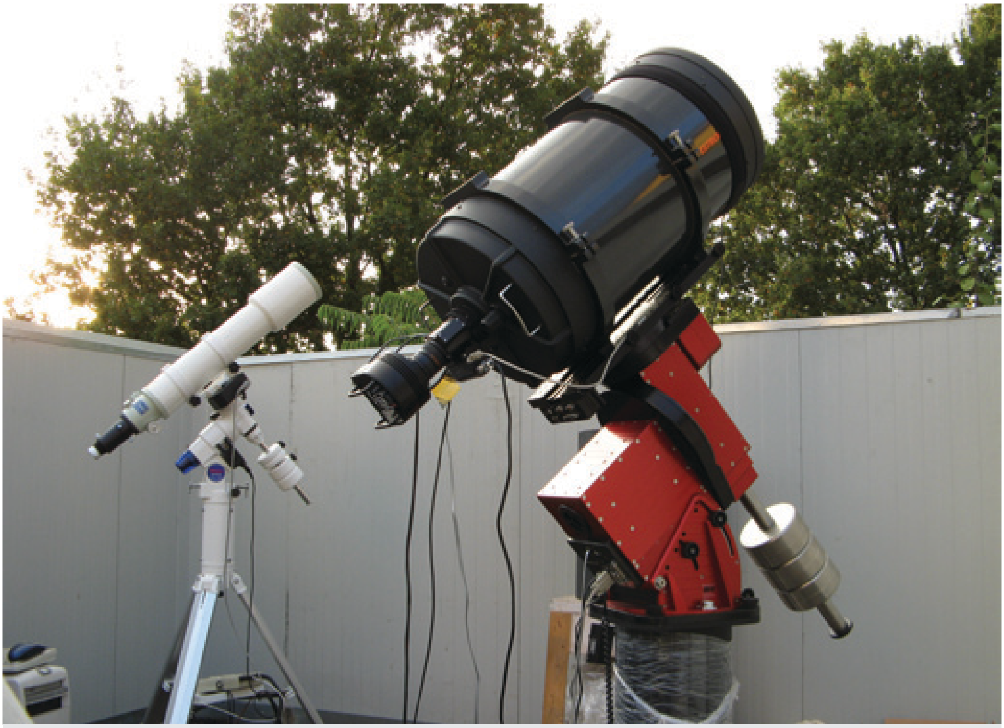


Figure 1 -Two of the telescopes available as part of the Virtual Telescope: the main telescope is a Celestron C14 installed on a Paramount ME robotic mount, from Software Bisque (more details in the paper). The smaller telescope is a Takahashi FS102, 102mm-f/8 fluorite refractor, well suited for planetary and solar observing.

Hardware and technology

The Virtual Telescope Project consists of several telescopes installed in Ceccano, central Italy, about 100 km south of Rome. They are hosted under a roll-off roof observatory and are fully remotely controlled[1].

The main telescope is a Celestron C14 optical tube assembly (355.6 mm in diameter and 3910 mm focal length, but generally used at f/6) installed on a Paramount ME robotic mount, from Software Bisque. At the primary focus a SBIG ST8-XME, high efficiency CCD camera is available, as well as a motorised filter wheel. Filters for standard photometry and colour imaging are available.

The other telescope is a Celestron C11 optical tube (279.4 mm in diameter and 2800 m focal length, but typically used at f/5) and is installed on a robotic New Atlux mount, from Vixen. The imaging instrumentation consists is a SBIG ST8-XME, high efficiency CCD camera equipped with a motorised filter wheel, sporting filters for colour and narrow-band imaging. In the near future this telescope will be upgraded and will become an exact twin of the previous one. A Takahashi

[1] http://www.virtualtelescope.eu

FS102, 102 mm–f/8 Fluorite refractor is also available, together with a Coronado PST H-α solar telescope.

These robotic instruments are accessed via the internet using VNC-like software. While a web interface is under development, the VNC access is the only one offering full control to all the parameters involved in telescope operation. This way, the remote user accesses the servers at the Virtual Telescope and starts running the session. Images can be automatically forwarded to any FTP site or retrieved as soon as they are grabbed. Each unit of the Virtual Telescope is controlled by a software suite available from Software Bisque and consisting of a number of integrated packages handling the telescope, the detectors and the other instruments.

Modus operandi and assistance

The Virtual Telescope offers several single-user options to those willing to access it: real-time observing (with different degrees of assistance), but also a service mode, where observations are handled by the staff on request. Also, monthly live shows are offered, in this case hosting many users at the same time, who assist in a journey driven by the staff and inspired by a specific astrophysical topic. Special shows are offered when unusual astronomical events happen, like comets or near-Earth objects.

The staff provide complete assistance, no matter if the user is a skilled researcher or a group of children discovering the Universe for the first time. The author was told by the users that they really like this, finding the professional assistance a key, winning factor of the project. The goal is to make it possible for users to succeed with their tasks. The assistance can include full support in scheduling, observing, data reduction and interpretation, all this being especially helpful to unskilled people and students.

Discussion and conclusions

Once introduced to the community (September 2006), the Virtual Telescope experienced a great success. It served more than 35,000 images to more than 400 users, mainly unskilled observers: they used the facility only because full support was available within the framework of the project. More than 160,000 unique visitors entered its website. It has contributed to many scientific projects, including the co-discovery of exoplanets and binary asteroids; it has played a central role to identify the nature of a few cataclysmic variable stars. It "broadcast" special events, like the close passage of asteroid 2006 RZ (Oct. 2006) and comet C/2006 M4 (SWAN), shown in Figure 2, and has contributed to many events in science communication (see Masi 2007b).

The Virtual Telescope is popular with the public because it offers advanced instrumentation as well as complete professional, scientific support, making it a unique facility. In the future it will continue to offer its services, while increasing and improving its instrumentation.

Acknowledgements
The Virtual Telescope technology is powered by Software Bisque and Santa Barbara Instrument Group (SBIG).

References

- Masi G. (2007a), The Virtual Telescope Project: Frequently Asked Questions, http:// virtualtelescope.bellatrixobservatory.org/vt_faq.pdf
- Masi G. (2007b), Astronomers for one night: When a telescope enters a planetarium dome, In Christensen L.L., Zoulias M. & Robson I. (eds.) Proceedings from Communicating Astronomy with the Public 2007

Gianluca Masia

Figure 2 – This image shows Comet C/2006 M4 SWAN, grabbed on 26 October 2006 with the C11-based unit of the Virtual Telescope (more in the article). A satellite trail crossed the field during the exposures.

The role of a communication department in an astronomical institution

Javier Méndez
Isaac Newton Group of Telescopes, La Palma (jma@ing.iac.es)

Abstract

The purpose of a communication department (CD) in an astronomical institution is essential to communicate research results efficiently to the public. The composition and the organisation of the CD are the two aspects that most contribute to global communication success.

A simple communication model is proposed to study how much information is lost from the original message from the astronomer. The amount of the received message can be described as:

$$M_R = f\,(N, \triangle C, A) \cdot M_E$$

M is the amount of message received or emitted; N is the amount of noise (on the code, the channel, the emitter, the receptor or the environment); $\triangle C = C_E - C_R$ is the cultural difference between the emitter and the receptor, including the understanding of concepts, use of scientific jargon, etc; and $A = A_E \cdot A_R$ is the multiplication of the emitter's attitude by the receptor's. A simple model for the f function and a description of how the message travels from the astronomer to the public, based on the above model, follows:

$$M_R \propto \frac{A_E \bullet A_R}{N \bullet (C_E - C_R)} M_E$$

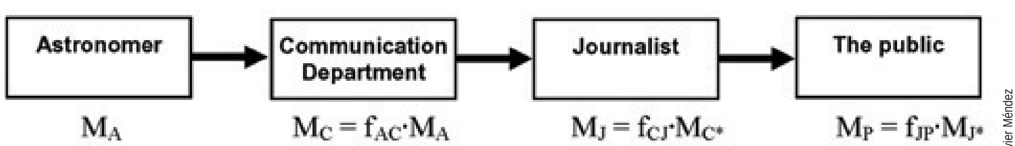


Figure 1 – Message flow with origin at the astronomer and end at the public when a communication department and a journalist are present. M_{C*} is equal to $F_{CC*} \cdot M_C$ while M_{J*} is equal to $F_{JJ*} \cdot M_J$

The F factors account for the efficiency in the elaboration of the message. The following contribute to F: codification (there must be a balance between concepts left with no explanation — or "black boxes" — and the number of described concepts); the selection of contents; the style; the format; how the information is put in perspective; the additional materials; the motivation, the level of knowledge and experience, and the skills of the staff involved in the elaboration of the message; the communication plan and the procedures. From now on, we will suppose that the members of the staff working in the CD have a background in both astronomy and public science communication. So finally we can write:

$M_P = f_{JP} \cdot F_{JJ*} \cdot f_{CJ} \cdot F_{CC*} \cdot f_{AC} \cdot M_A$

If the institution doesn't have a CD then the above equation can be rewritten as the following:

$M'_P = f_{JP} \cdot F_{JJ*} \cdot f_{AJ} \cdot M_A$

And the relation between the messages received by the public in both cases:

$$M_P = \frac{f_{CJ} \cdot F_{CC*} \cdot f_{AC}}{f_{AJ}} M'_P$$

Trained and motivated staff will make sure that $f_{AJ} << f_{CJ} \cdot F_{CC}* \cdot f_{AC}$, and therefore:
$M_P >> M'_P$

So when a CD exists in an astronomical institution the amount of message received by the public is bigger than when it doesn't exist. Or, in other words, the rate of success in reaching the communication objectives is higher.

Also, the message is perceived by the public as of higher quality, as the message emitted by the astronomer is elaborated by motivated staff with a background in astronomy and public science communication. Giving priority to other organisational aspects of the CD can increase the number of activities but not the quality of the output measured as the amount of message correctly received by the public.

Radio broadcasting – an attractive way of broadcasting astronomy

Cătălin Mosoia
Radio Europa FM, Romania (catalin.mosoia@europafm.ro)

Abstract

Astronomy is full of beautiful skyscapes, shining stars and huge planets. The vast majority of them can be transformed into tactile images and complemented by audio descriptions. These translations of visual information into raised lines, shapes and textures can be felt with the fingertips instead of viewed with the eyes. In this way, the beauties of the Universe enter the universe of blind and visually impaired people. Happily, we all have radio broadcasting as an important source of information and entertainment. Science radio programmes can bring the real music of the spheres (as Pythagoras once suggested) to the audience.

Astronomy on radio

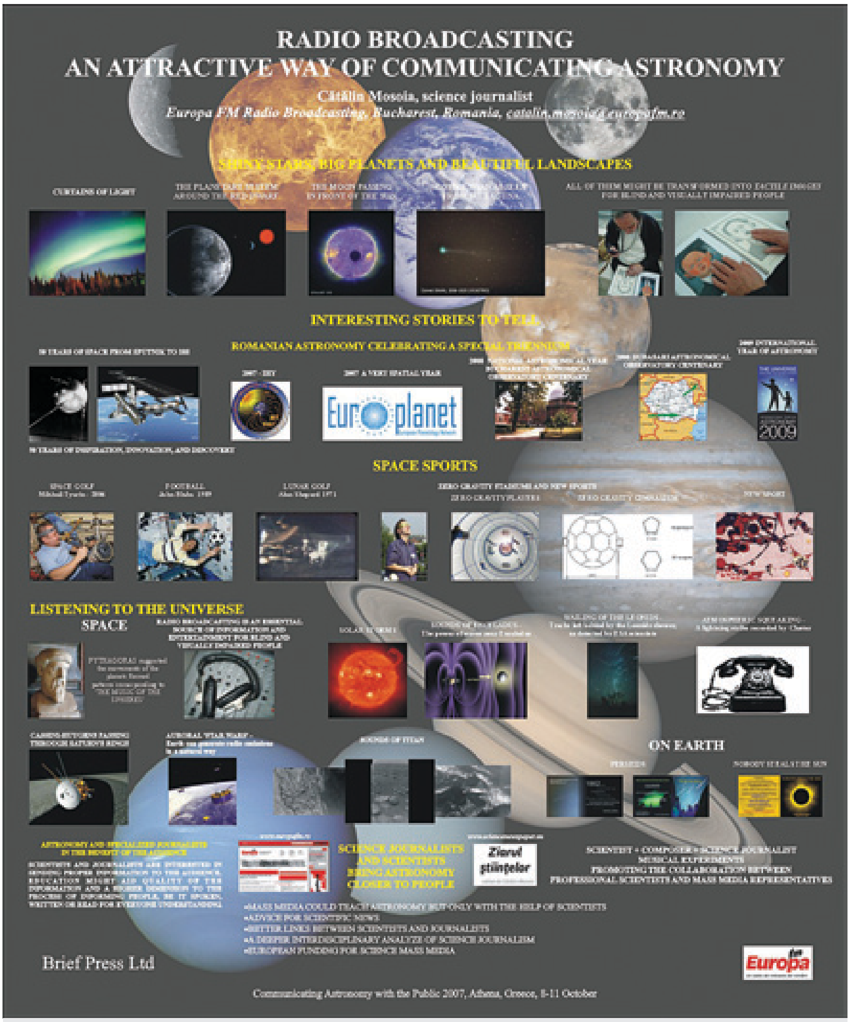
We might listen to the voices coming from space such as the sound of solar storms, the song of the Sun or low-frequency vibrations from the Sun, the power of waves near Enceladus, tracks left behind by meteor showers as detected by ESA scientists, the atmosphere squeaking in the form of a lightning strike recorded by Cluster, Cassini-Huygens passing through Saturn's rings, auroral "star wars" because Earth can generate natural radio emissions, the sounds of Titan, or the natural vibrations of the stars.

Apart from listening to the distant sounds of the Universe we also have the music of The Beatles, stars such as Brian May, and in addition, music dedicated to astronomical phenomena. This is the case for *Nobody Steals the Sun* – a musical experiment dedicated to the total solar eclipse on 29 March, 2006 – and Perseids – music dedicated to the 2007 Perseids meteor shower – made in the last couple of years by the same Romanian team of three: a professional astronomer (Dr Magda Stavinschi), a very talented composer (Cristian Matei) and a science journalist: a strong example of promoting collaboration between scientists, artists and mass media representatives.

Each of these items has its own history. There are interesting stories to tell even in a space–sport context: space golf (Alan Shepard, 1971, and Mikhail Tyurin, 2006), football inside the Discovery shuttle (John Blaha, 1989), or zero gravity stadiums full of zero gravity players and totally new sports in space.

All of these can be used in science programmes as an example of good practice collaboration between astronomers and science journalists. Both are interested in sending proper information to the public. It is education that can add quality to the information and a higher dimension to the process of informing people, be it spoken, written or read for everyone's understanding. Science journalists and scientists can bring astronomy closer to the people. Generally speaking, the mass media can teach astronomy, but only with the help of scientists. They can give advice for scientific news, but there is a need for better links between scientists and journalists interested in science. Maybe, there is a need also for a deeper interdisciplinary analysis of science journalism. The last, but by no means least, important thing is specific funding for mass media interested in science.

Special thanks to Europa FM[1], the first private Romanian radio station with national coverage, where I am working as a science journalist and to Brief Press Ltd, the owner of *Ziarul Ştiinţelor*[2] (Science newspaper), for supporting my participation at CAP2007 in Athens, Greece.



Catalin Mosoia

Figure 1 – Image of the poster *Radio broadcasting — an attractive way of communicating astronomy*

1 http://www.europafm.ro
2 http://www.sciencenewspaper.eu

Museum of Astronomy: From dissemination to the preservation of scientific heritage

Ronaldo Rogério de Freitas Mourão
Museum de Astronomy (MAST); Brazilian Historical & Geographical Institute (IHGB) (mourao@ronaldomourao.com)

Abstract

The Museum of Astronomy and Related Sciences (MAST) is a Research Unit supported by the Ministry of Science and Technology in Brazil. It researches science and technology history, preserves collections that represent a national scientific and technological legacy and organises educational activities that aim at stimulating interest in science and making people more aware of it.

The world's first Museum of Astronomy, located at Greenwich in the former Royal Greenwich Observatory, was created in 1957 and became the first example of a new trend: the idea of putting old astronomical observatories situated near big cities to good use and saving the old and obsolete instruments that remained, as the observatories themselves moved out to locations with better skies and less light pollution.

During my period of professional training in Europe, when I had the opportunity of visiting the Royal Observatory at Greenwich, by this time already transformed into a museum, after having been, for three centuries, one of the most important centres for astronomical research in the world, I perceived that the buildings and instruments at the National Observatory in the São Cristóvão district of Rio de Janeiro, ought to experience the same fate if we wanted to preserve their scientific heritage.

In 1978, as a consequence of my weekly column, *Astronomia e Aeronáutica*, in the Jornal do Brasil, concerning the oldest astronomical instrument in existence in Brazil, I was approached by Dr. Anita McConnell of the Science Museum, whom I invited to visit the National Observatory, where she gave a lecture on the historical importance of its scientific instruments. Her enthusiasm about our collection was an incentive for me to transform my idea of the Museum of Astronomy into reality one day.

With the completion of the Brazilian Observatory of Astrophysics in Brasópolis, in the south of Minas Gerais state, and the transfer of the astronomers to a new building on the São Cristóvão campus, the old National Observatory building lost its purpose. An important political decision when setting up the museum was to emphasise other related fields, such as geodesy, meteorology, chronometry, topography and other fields that are associated with astronomy, and were always linked to social, scientific and technological development, especially in Brazil, where the Observatory played an important socio-historical role. As a consequence of this decision, the most significant exhibitions held at the Museum were always the object of research that supplied

elements for historical studies and analyses of little-known aspects, not to say almost totally unknown aspects, of Brazil's social and scientific history, from the existence of a mechanically precise industry in the XIX^{th} Century, to studies of the relationship between science and parliament, to cite only two cases intimately connected to our first exhibitions. In addition, the creation of the Museum generated a new perspective on science history. Its exhibitions have emphasised the contrast between old and new in a social context and are proving to be an educational and cultural resource of the greatest importance.

History and aims

The originator of MAST — Museum of Astronomy and Related Sciences — takes pride in having conceived, from 1982 onwards, the Astronomy and Related Sciences Heritage Project in Brazil. This project is aimed at preserving scientific heritage, the development of research on the history of sciences and the dissemination of its methods and scientific knowledge. As a result of the Project's activities, the IPHAN (or National Secretariat for Historic and Artistic Patrimony, roughly equivalent to the UK's National Trust, or the conferral of landmark status in the US) awarded landmark status to the buildings and scientific archives of the National Observatory and suggested the creation of a Museum in 1984.

Installed on the campus of the former National Observatory, MAST brings together a permanent collection, which includes instruments and equipment used in astronomy, physics, astrophysics, geophysics, metrology and meteorology. It also possesses iconographic and documentary mate-

Figure 1 – Logo of the Museum

Figure 2 – The Museum of Astronomy (MAST).

rial. MAST's activity includes researching scientific history, exhibitions, the guided orientation of researchers and students, and also setting up courses, lectures and seminars, library and archive supervision and promoting educational and cultural events, fully consistent with its objectives: to recover, preserve and disseminate the existence of collections that make up Brazil's scientific heritage, bringing together and preserving documents and public collections, especially the personal archives of Brazilian scientists; promoting and developing research and activities directed towards producing knowledge in the field of science history, and museological and pedagogical studies in order to support the recovery and dissemination of collections regarding national scientific culture; disseminating science and making it popular, acting as the national centre for disseminating scientific knowledge, with the aim of awakening people's vocation for research, stimulating critical thought and favouring understanding about the role of science and technology in Brazil's social and cultural life.

Permanent collection

The museum's permanent collection, gathered together from 1982 onwards, through the Astronomy and Related Sciences Heritage Project in Brazil, is on view in a building which was the headquarters of the National Observatory from 1915 to 1980. The three-storey building is in the so-called eclectic style, with neoclassical components, and is situated in 40,000 square metres (10 acres) of woodland in the São Cristóvão district of Rio de Janeiro.

In the museum the visitor can see equipment and instruments that remind us of how far man has evolved by way of scientific and technological knowledge. There is the tide forecaster, a sort of analogue computer invented by Sir William Thomson, Lord Kelvin (1824-1907), in 1876, and used to calculate the times of low and high tides, as well as their depth. And what about the refractor telescope conceived by the astronomer Emmanuel Liais, around 1850, for the Observatory and then installed on the Castelo hill in Rio de Janeiro's city centre? Nine metres long, with a tubular wooden structure, the refractor telescope was said to be the biggest in Latin America. Brazil's Emperor Dom Pedro II, who saw it, was visibly impressed by the device.

The museum exhibits what remained of the instruments created by the Henry Brothers, donated by Dom Pedro II to enable Brazil's participation in the first major scientific project with international collaboration, Carte du Ciel (the Sky Chart), begun in 1888. This project planned to ally photography to astronomical observation in mapping the entire sky for the first time. Brazil did not carry out its part in the agreement, and the instruments were forgotten, but later recovered by the museum. There are also theodolites for taking measurements, and the Gambey compass, designed and made in Brazil around 1870. Many of these instruments, including the portable meridian circle, theodolites, sextants, chronometers etc. were used on undertakings that determined the solar parallax in 1882, during the transit of Venus, and, later, in 1893, the quadrilateral where, almost seventy years later, the new federal capital, Brasília, would be built. Especially worthy of note is the oldest astronomical instrument used in Brazil, in 1781, by the Portuguese astronomers, Sanches Dorta and Oliveira Barbosa — the quarter-circle — built two years previously in England. It was the first instrument used at the Astronomical Observatory in Rio de Janeiro, founded in 1780.

Outside the building, in woods where mangoes can still be picked and birdsong heard, are the domes and instruments which, for over 60 years, were used by the researchers at the National Observatory.

But in the woods, there is still more. There — in their pavilions, completely restored by the museum — are the Gauthier Meridian circle, the Bamberg and Ascania meridian refractor telescopes, two pieces used to determine the longitude of Rio de Janeiro, and therefore, the official time. This was when the rotation of the Earth was the astronomic standard of time, later substituted by the physical standard, the caesium clock. Beside them, is a zenith Heyde refractor telescope used for studying the variation in latitude of Rio de Janeiro and, consequently, the movement of the pole.

Added to this permanent collection, the Museum of Astronomy and Related Sciences brings together other collections in temporary exhibitions: the *Panorama of Astronomy*, in cooperation with the Palais de la Découverte; the *Pacific Use of Space*, in collaboration with UNO; *Comet Halley*, when popular tunes on the theme were recovered; *Cartas Celestes* (or Celestial Chart) by Almeida Prado, a presentation of contemporary music in the museum's gardens at night, to cite only a few of the themes that have had special exhibitions dedicated to them. Apart from these activities at headquarters, several other activities have proved successful, such as the Museum goes to the Beach, when, apart from exhibits concerning phenomena such as the tides, solar activity, etc., a stage play was performed about the history of astronomy, based on the book *The Sleepwalkers*, by Arthur Koestler.

Figure 3 – Theodolite Brunner, transit of Venus, 1882

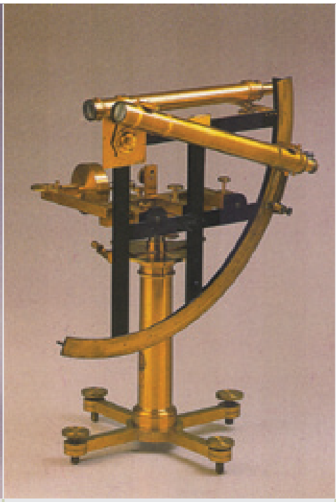


Figure 4 – Quarter-circle Sisson, 1780

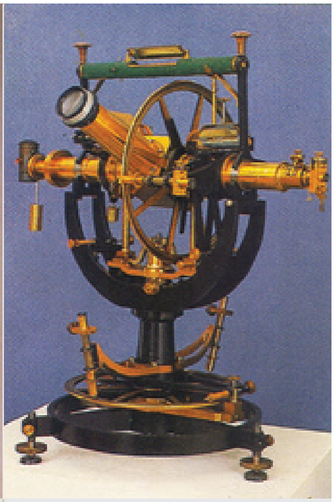


Figure 5 – Theodolite Borda, 1893

The ESA/ESO/NASA Photoshop FITS Liberator 3: Have your say on new features

Lars Holm Nielsen[1], Lars Lindberg Christensen[1], Robert Hurt[2], Kaspar K. Nielsen[1] & Teis Johansen[1]

[1] ESA/Hubble (lnielsen@eso.org, lars@eso.org, kaspar@barmave.dk, teis@siet.dk)

[2] Spitzer Science Center/Caltech (hurt@ipac.caltech.edu)

Abstract

The popular, free ESA/ESO/NASA Photoshop FITS Liberator image processing software (a plug-in for Adobe® Photoshop®) is about to get simpler, faster and more user-friendly! Here we would like to solicit inputs from the community of users.

Introduction

For many years astronomical images from the world's telescopes were reserved for an elite of astronomers and technically minded people. With the two releases of the ESA/ESO/NASA Photoshop FITS Liberator anyone with a desktop computer running Adobe® Photoshop® software can try their hand at crafting astronomical images as beautiful as those from the Hubble Space Telescope. This free software plug-in makes a treasure trove of archival astronomical images from the NASA/ESA Hubble Space Telescope, the European Southern Observatory's Very Large Telescope, the European Space Agency's XMM-Newton X-ray observatory, NASA's Spitzer Space Telescope, NASA's Chandra X-ray Observatory and many other famous telescopes accessible to home astronomy enthusiasts.

Current features

The first version of the FITS Liberator gave non-professional astronomers the opportunity to produce stunning astronomical images that, for years, had only been the privilege of the scientific community. With the advent of the FITS Liberator v2, it became possible for people at home to create even more spectacular pictures like the iconic Hubble image *Pillars of Creation* in a matter of minutes. The main features of the FITS Liberator 2 release[1] are:

- Direct access to FITS images in Photoshop/Photoshop Elements.
- Powerful tools for high dynamic range compression.
- Support for Astronomy Visualization Metadata v1.0 (see Hurt et al. (2006 & 2007).
- Choice of 8-bit, 16-bit, or 32-bit (Photoshop CS2/3 only) imports.

Issues to be addressed

Though we have come a long way since the first two versions of FITS Liberator, there is still room for improvement. One of the main issues in the current version is that the advanced powerful

[1] Version 2.1 of FITS Liberator can be downloaded free of charge from: http://www.spacetelescope.org/projects/fits_liberator/

tools offered can be relatively hard to use for novice users. On the technical side, the current version does not utilise the full power of today's modern multi-core CPUs.

The main focus of the version three release will therefore be to offer a split workflow in a "simplified" and "advanced" user experience, speed enhancements to utilise the full power of today's modern multi-core CPUs and finally conformance to the next upcoming version 1.1 of the Astronomy Visualization Metadata (AVM) standard[2].

The simplified interface will have a standardised three-step workflow:

1. Set black level.
2. Set white level.
3. Adjust dynamic range to recover detail.

The advanced interface will have the previous features from v.2.1 and some improvements such as displaying standard (Right Ascension, Declination) coordinates in the preview window (from the WCS coordinates), more powerful histogram display and more flexible black/background and white/peak levels.

The speed enhancements will include parallelisation and multi-threading, better panning on large images and better updating of background/peak/scaled settings.

The metadata improvements will be to support the AVM 1.1 standard, offer improved AVM "File Info…" panels for Photoshop and Bridge, utilise more of the information from the FITS header such as exposure times, distortion corrections and observation dates.

Possible additional features

Besides the main features for FITS Liberator 3 some additional features have also been considered for inclusion. These features are by no means guaranteed to be included, so if one the features has top priority for you, be sure let us know.

Additional features that are being considered for inclusion:

- Support for Planetary Data System (PDS) files.
- Scripting support.
- Photoshop batch import/processing.
- Open source the codebase (recent changes in Adobe licensing terms makes this possible now).
- Import several images into layers in one go (Photoshop CS3 only).
- Support for reading various RGB FITS formats.

---

[2] Read more at http://www.virtualastronomy.org
[3] Mail to lars@eso.org

Have your say!

Are we missing your killer feature, or would you just like a new keyboard short cut? Please do not hesitate to contact us[3]. Feature requests will be considered for inclusion until January 2008 as the FITS Liberator v.3 release is planned for the second quarter of 2008.

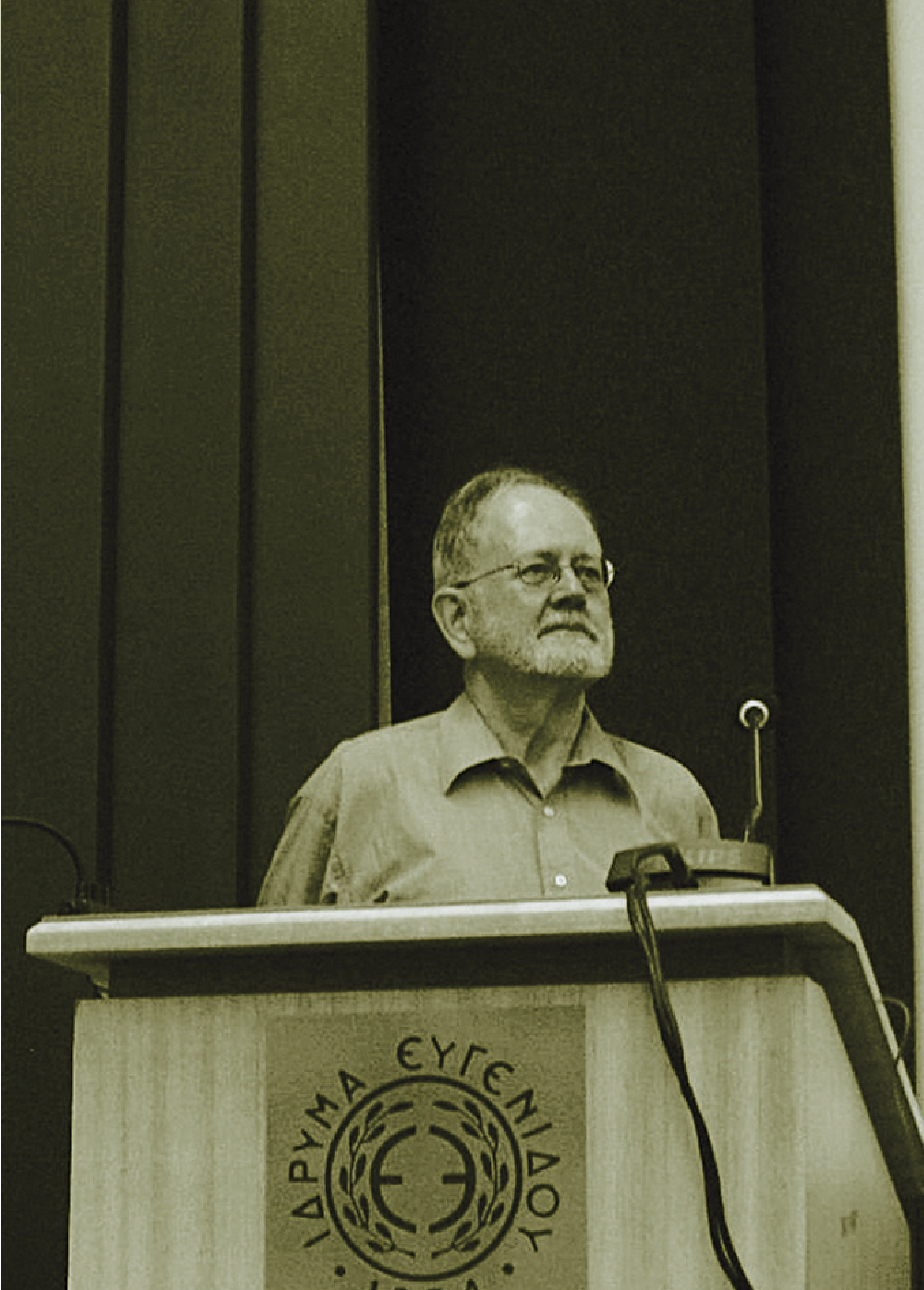
Acknowledgements

The project is a collaboration between ESA (the European Space Agency), ESO (European Southern Observatory) and NASA. ESA has financed the development and NASA has delivered manpower to support with scientific and technical issues. The team that produced the ESA/ESO/NASA Photoshop FITS Liberator consists of:

Project Lead:	Lars Lindberg Christensen
Development Lead:	Lars Holm Nielsen
Core Functionality:	Kaspar K. Nielsen
Engine & GUI:	Teis Johansen
Scientific Support:	Robert Hurt

References

- Hurt R.L., Christensen L.L., Gauthier A.J., Astronomical Outreach Imagery Metadata Tags for the Virtual Observatory Version 1.00, http://www.ivoa.net/Documents/latest/AOIMetadata.html (Sept 2006).
- Hurt R.L., Gauthier A.J., Christensen L.L., Wyatt R. Sharing Images Intelligently: The Astronomy Visualization Metadata Standard, In Christensen L.L., Zoulias M. & Robson I. (eds.) Proceedings from Communicating Astronomy with the Public 2007.



Credit: Dennis Crabtree

The Griffith Observatory exhibit programme: Turning visitors into observers

Carolyn Collins Petersen[1] **& Mark A. Pine**[2]
[1] Vice-president, Loch Ness Productions (Carolyn@lochnessproductions.com)
[2] Deputy Director, Griffith Observatory (mark.pine@lacity.org)

Abstract

For most Southern Californians and the many visitors who come to Los Angeles, the venerable Griffith Observatory is the shining white building in the Hollywood Hills, once referred to by director E. C. Krupp as "the hood ornament of Los Angeles". It is also familiar to moviegoers in numerous films, most notably the famous James Dean flick, Rebel Without a Cause. Griffith Jenkins Griffith gave funding for construction of the Observatory to the city, as he wanted to create a "people's observatory". Since opening in 1935, the institution has been sharing the skies for free with anyone who wants to see them.

The world-famous Griffith Observatory re-opened in November 2006, after a nearly five-year renovation and expansion project that restored the building, remade the planetarium, doubled the public space, and created a new, permanent exhibit programme. The theme of the exhibits is "turning visitors into observers". The premise was to develop exhibits to engage visitors in ob-

Image courtesy Friends of the Observatory (FOTO)

Figure 1 – Griffith Observatory, Los Angeles, California

servation, either directly or by experiencing the results of astronomical study. The exhibits were designed to be large, unique, and very visual, so as to provoke engagement, wonder, and inspiration. Writing the 165 panels that accompanied the dozens of exhibits focused on an inviting and conversational tone, as if the exhibits themselves could answer the questions visitors might have about what they were seeing. The panels make adroit use of imagery and very focused and meaningful written captions intended to connect with the Observatory's very broad, very diverse audience. This poster presents images of a selection of the exhibits, discusses the approach we took in writing the exhibits, and presents some lessons learned that other institutions may find helpful.

Creating the Exhibits

As the Observatory's non-profit partner in the project, Friends Of The Observatory (FOTO) hired C&G Partners, LLC to design the exhibits and Maltbie, Inc. to fabricate them. The Observatory's curatorial team, including Dr. Krupp, Dr. Bruce Bohannan (Exhibit Content Specialist), area astronomers, and Observatory staff devised content outlines to guide the design and writing.

Because the words on most of the exhibits are likely to stand in place for more than a decade and appeal to an astonishingly multi-generational and ethnically diverse audience, the exhibit captions required extreme clarity and approachability. The challenges were many:

- Text had to fulfil the core precept of the observatory's mission: turning visitors into observers;
- The material had to fit very precisely designed and limited spaces on each panel;
- The words had to be the equivalent of a popular-level astronomy book, yet written at about a 7th grade reading level and be friendly and approachable.

To achieve these goals, the senior exhibit writer (Petersen) developed the "voice of the Observatory", a writing role that moulded the exhibit tone, as if to suggest a personal discussion between the Observatory visitor and the exhibits. It was very important that no one participant's voice (writing style) be allowed to dominate the panels. Thus, the exhibit writer worked to keep the language level and tone as even as possible through several rounds of curatorial review and the rigours of design and layout.

The writing and layout processes proceeded in parallel. The writer worked in residence with the exhibit design team in New York City for eight and a half months, also advising on science issues and image selection and helping to resolve design issues. She met frequently with the curatorial team in Los Angeles. After approval, completed layouts were sent for fabrication.

Lessons Learned

As with any large exhibit project, there are a number of lessons that may be useful to other organisations:

Define a clear mission for the exhibit programme, one specific to your audience. This is absolutely critical, and the step most often overlooked in the rush to design. Being clear-eyed about purpose and audience from the very beginning — resisting the temptation to "design to the space and time" — will yield benefits throughout the process. In the Observatory's case, defining a clear mission enabled us to sort through the myriad suggestions and content by constantly returning to fundamental questions. We also developed a clear sense of our very broad audience in terms of their education, background, learning styles, and native language. For that reason, we chose a very visual approach by which meaning was imparted by observation rather than solely through reading.

Benchmark against other institutions. Although travel dollars are always in short supply, you will never regret seeing what other programmes have done. The Observatory benefited enormously from conversations with other leading institutions to understand their approach, successes, challenges, and choices. Those who do not learn from history are doomed to repeat it.

Hire talented design experts and have a conversation. Neither FOTO nor the Observatory had in-house staff with the design experience needed for such a large undertaking. This opened the door to consider outside design support. The Observatory purposely chose a firm — C&G Partners — with a demonstrated history of creative and responsive design, but also with people with whom we could imagine ourselves engaging in a five-year "conversation" about our exhibits. Beware of those professing expertise with your content, having "exactly the right solution for you", or people you wouldn't want to sit in a room with for six or seven hours.

Choose your words carefully, and pay close attention to voice. In speaking with other institutions about their exhibit development, we encountered the same story: tension between "designers" and "scientists" regarding how much text was needed and how it should sound. Especially for large exhibitions, consider hiring an outside writer to serve as the singular "voice" for the programme. In the Observatory's case, the professional writer helped integrate many inputs and writing styles while providing vital consistency of tone for the visitor. And the exhibit designers developed a template for all panels that placed a hard limit on the number of words, forcing a difficult but ultimately very rewarding effort to pare down concepts to only the most important elements.

A brief introduction to the Griffith Observatory exhibits

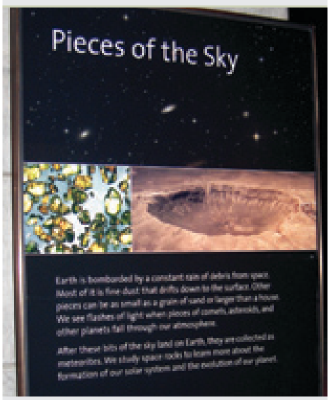
Each visitor to Griffith Observatory is cast in the role of observer, with an opportunity to do real observing in authentic environments. The exhibits explore fundamental questions of astronomy — what do we observe, how do we observe it, and why is it important — while prompting visitors to ponder their own relationships with the Universe. Each major exhibit area focuses on unique aspects of observation and the science of astronomy. The exhibits consist of sets of panels, illustrations, models, and carefully selected interactive pieces. Here is a representative sample of the more than 165 panels in the exhibition[1].

The Ahmanson Hall of the Sky establishes a personal connection to the sky for the visitor, answering six of the most-asked questions at the Observatory and anchored around the Observa-

[1] The complete poster presented at CAP is available at: http://www.thespacewriter.com/misc/griffith_poster.pdf

Image courtesy Friends of the Observatory (FOTO)

Figure 2 – Moon Phases: one of six alcoves that demonstrate answers to the most-asked questions by visitors to Griffith Observatory.



Carolyn Collins Petersen.

Figure 3 – A panel in the Edge of Space section of the Griffith Observatory exhibits, introducing visitors to meteors and meteorites.

Image courtesy Friends of the Observatory (FOTO)

Figure 4 – The scene from the Depths of Space, where visitors can explore planets, stars, galaxies, and the Big Picture.

tory's public solar telescope. Six alcoves demonstrate Day and Night, Sun and Stars' Paths (right), Seasons, Moon Phases (left), Tides, and Eclipses.

The Edge of Space provides visitors with an experience that bridges the familiar Earth-bound view of the sky with the larger universe. It contains Pieces of the Sky, with the Observatory's extensive meteorite collection and teaches about the role of impacts in shaping planetary surfaces. It also features the Cloud and Spark Chambers, which demonstrate the constant bombardment of cosmic rays that link us to the high-energy universe. Our Moon allows visitors to explore Earth's closest neighbour in space and includes an Apollo 14 lunar sample.

The Richard and Lois Gunther Depths of Space allows visitors to explore the planets, stars, nebulae and galaxies as seen by our ground-based and orbiting observatories in space. Visitors can use specially mounted telescopes to view details in the 152-foot long Big Picture, showing a small portion of the constellation Virgo as seen by the Samuel Oschin Telescope. It is accompanied by the Depth of Space, a series of animations that show the 3D character of our universe. Seated across from the image, against the outer wall of the Leonard Nimoy Event Horizon Theater, is a statue of Albert Einstein (left), and his extended finger represents the amount of sky covered by the Big Picture.

Vodcasting space weather: The Space Weather FX vodcast series

Carolyn Collins Petersen[1] **& Philip J. Erickson**[2]
[1] Loch Ness Productions (Carolyn@lochnessproductions.com)
[2] MIT Haystack Observatory (pje@haystack.mit.edu)

Abstract

The topic of space weather is the subject of a series of nine vodcasts (video podcasts) being created by MIT Haystack Observatory (Westford, Massachusetts, USA) and Loch Ness Productions (Groton, Massachusetts USA). This paper describes the project, its science and outreach goals, and introduces the principal participants[1].

The science research programme

The vodcast series is linked to the NASA *Living With a Star* Targeted Research and Technology project award *Multi-Instrument Investigation of Inner Magnetospheric/Ionosphere Disturbances*. It is being carried out by Principal Investigator Dr. John Foster, under the auspices of NASA Grant # NNX06AB86G.

The research involves using ionospheric total electron content (TEC) observations to study the location, extent, and duration of perturbations within stormtime ionospheric electric fields at mid to low latitudes. It combines ground-based global positioning system (GPS) TEC data, incoherent scatter radar measurements of the mid-latitude ionospheric state, and DMSP satellite observations to characterise conditions which lead to severe low-latitude ionospheric perturbations. The research period extends through 2008.

MIT Haystack Observatory

Carolyn Collins Petersen

Figure 1 (a-b) – MIT Haystack Observatory in Westford, Massachusetts, USA (left), with the Millstone Hill 46-meter radar and 67-meter incoherent scatter radar antennas (right).

[1] This poster paper can be downloaded in its entirety at: http://www.thespacewriter.com/misc/SWFX.pdf

Figure 2 – The series logo.

The vodcast project

As the terms “space weather” and “solar storm” become more ubiquitous in the common language, the need for explanations of these terms and the science behind them will help the general public understand the phenomena involved. The Vodcasting Space Weather series lets viewers explore Earth’s coupled ionosphere and inner magnetosphere with MIT Haystack scientists as guides. The series began production in early 2007. Episode 1 has been written, evaluated, and produced. It is complete and is available on the web, along with supplementary materials for educators and users in informal outreach settings[2]. Subsequent episodes will appear roughly every 2-3 months from late 2007 through early 2009. The production team comprises the following personnel:

Loch Ness Productions	**MIT Haystack Observatory**
Carolyn Collins Petersen, writer and co-producer	Anthea Coster, project ionospheric scientist
	Philip Erickson, project ionospheric scientist
Mark C. Petersen, videographer, composer, co-producer	John Foster, project principal investigator
	Madeleine Needles, observatory public outreach and education coordinator

The vodcasts are keyed toward educational and general public users. Scripts are reviewed for both scientific accuracy and outreach potential. To leverage the budgeted funds, the programmes use existing video material from the NASA GSFC Science Visualization Lab, still photos from such sources as NOAA, animations from the large NASA Sun-Earth Connection resource, and on-camera interviews with scientists and site scenes created specifically as part of the analysis

2 http://www.haystack.mit.edu/edu/poa/swfx/

of data from the associated research project. Each programme is Section 508 accessibility-compliant and accompanied by additional background materials In addition; several area teachers and museum personnel are acting as formal and informal education/outreach consultants for the vodcast content.

The vodcasts are available in several formats and at two resolutions, one at 640 x 480 for computer viewers, and the other at 340 × 240 for download onto personal digital entertainment players such as the iPod, Creative Zen, Zune, and others. The vodcast format is particularly appealing for this project due to flexibility of dissemination. Vodcasts can be used in educational and informal settings. Episodes can be used in classrooms, downloaded for projection in a variety of venues such as planetariums, museum displays and on information kiosks. The project will also make the series available through widely used distribution services such as iTunes, GoogleVideo, and YouTube.

Evaluation

These vodcasts are aimed at audiences across both educational and general public venues and thus have two modes of evaluation. The first is a review of the scripts by the project scientist(s), a teacher, and a museum specialist. The second is an online questionnaire for users to indicate how the vodcast is being used (i.e., school, museum, personal use, etc.), with some additional questions aimed at their understanding of the material presented. The feedback will be made available as part of our yearly report to NASA.

Equipment, filming and production

The size of the grant allowed a limited amount of money (~$3500) to be spent for video production equipment. The team eventually purchased the following: Sony Handycam HDR HC7 1080i camera, with tripod, lenses, etc.; Audio-Technica wireless lavalier mic system; Audio-Technica shotgun mic, with stands and cables; Lowell portable lighting kit for 3-point lighting; Photoflex backdrops for lumakey and chromakey scenes.

To best illustrate real-life examples of space weather in action and the effects it has, the production team shoots actual location footage to complement the various NASA animations used in the episodes. Principal photography began in July 2007 at sites around New England. Scenes included power grid stations, airport activity, automated teller machines at the MIT Federal credit union, ocean-going craft, and a series of scenes at MIT Haystack Observatory showing the radars and GPS systems in use by MIT Haystack scientists. As the series progresses, we expect to do more on-location shooting as events require. Episode post-production, voice-over and soundtrack production is being handled by Loch Ness Productions.

Space Weather FX episode list and descriptions

- **Space Weather FX: Introduction to Space Weather**
  This overview episode covers the basics of space weather and the Sun-Earth connection.

Carolyn Collins Petersen & Mark C. Petersen

Figure 3 (a-g) – Some scenes from shooting episode 1 of SpaceWeatherFX.

- **Space Weather FX: The Mysterious Magnetic Fields of Earthspace**
  This episode explores the electrical connections between Earth's atmosphere and magnetosphere.
- **Space Weather FX: Connecting the Sun and Earth**
  The episode describes the general connections between Sun and Earth in detail.
- **Space Weather FX: When Space Weather Attacks**
  What happens to Earth's magnetosphere and ionosphere during a space weather event.
- **Space Weather FX: Sensing Space Weather**
  How scientists sense and track the phenomena caused by space weather.
- **Space Weather FX: GPS: A Space Weather Twist on Navigational Technology**
  How GPS systems work and how they reflect the spaceweather-induced changes in our ionosphere.
- **Space Weather FX: GPS Tracks a Geomagnetic Storm**
  How Haystack used GPS data and ground-based radar to track two space weather events in 2003 and 2007 with severe disruptions in the ionosphere.
- **Space Weather FX:** The Big **Picture TBD**
- **Space Weather FX: It Came From the Sun — Big News on the Space Weather Front**
  A summary of the most recent findings from the NASA research connected to this series.

The role of the planetarium during IYA2009, the Portuguese context

F.A.L. Pires
Centro de Astrofísica da Universidade do Porto (pires@astro.up.pt)

Abstract

When people seek to learn more about astronomy or are interested in observing some astronomical event, planetariums are the natural places to turn to.

In Portugal there are three planetariums with capacity for more than 80 people: Planetário Calouste Gulbenkian (320 seats), Planetário do Porto (100 seats) and Planetário de Espinho (80 seats).

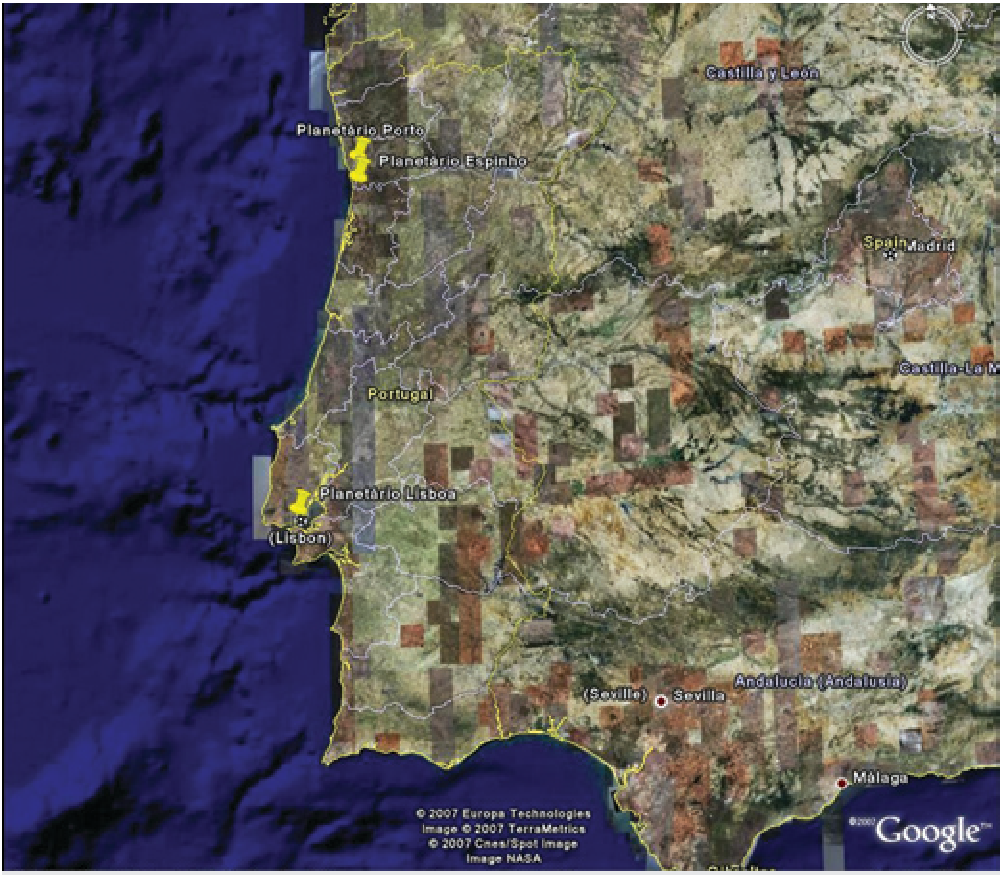
There are also some smaller planetariums, like the planetarium from Museu de Ciência da Universidade de Lisboa, and several portable planetariums. The annual total of visitors to the three main planetariums exceeds 150,000, 80% of whom are students.

The active involvement of planetariums in IYA2009 has the double advantage of assuring the participation of an interested crowd, and the use of equipment and human resources already available. A strong contribution to planetariums will ensure that the investments in IYA2009 will not end on 31 December 2009, but will continue for many years to come. Among the objectives of the IYA2009, planetariums are especially well suited to take astronomy to a school audience, to promote formal and informal education, to establish connections between the scientific community and the general public, and to promote scientific culture by showing a modern image of science.

From 1998 to 2007, Portuguese planetariums hosted more than 1 million visitors, equivalent to more than 10% of the Portuguese population.

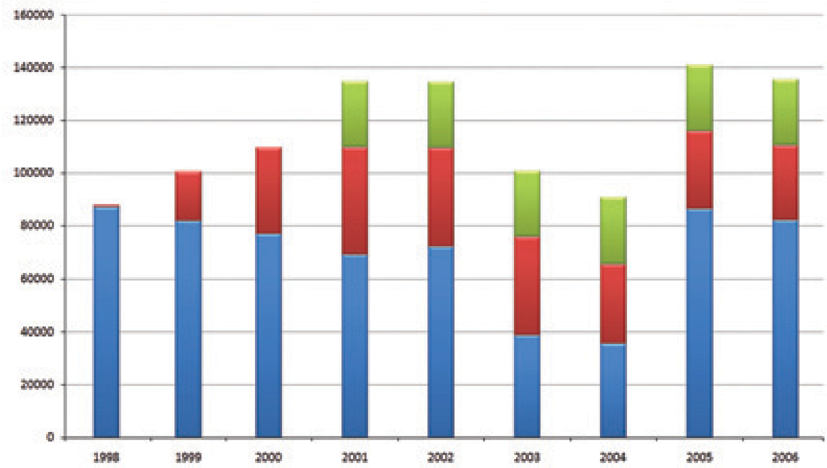
Year	Lisboa	Porto	Espinho	Total/Year	Total
1998	87152	690		87842	87842
1999	82033	18560		100593	188435
2000	77044	32611		109655	298090
2001	69461	40420	25000	134881	432971
2002	72492	37152	25000	134644	567615
2003	38915	36889	25000	100804	668419
2004	35617	30228	25000	90845	759264
2005	86438	29420	25000	140858	900122
2006	82258	28258	25000	135516	1035638

Table 1 – Annual visitor numbers for the biggest Portuguese Planetariums.



Google Earth

Figure 1 – Location of the largest planetarium theatres in Portugal (Lisboa 320 seats, Porto 100 seats and Espinho 80 seats).



Courtesy of the author

Figure 2 – Histogram of the annual visitors to the biggest Portuguese Planetariums. In the last 9 years, the national visitor average was 115,000 per year.

The Texas Connection: Transferring professional development workshops for astronomy teachers and student field experiences to distance learning technologies

Sandra Preston[1], Mary Kay Hemenway[1], Marc Wetzel[1], Kevin Mace[1] & Becky Yarbrough[2]
[1] The University of Texas at Austin (sandi@stardate.org, Hemenway@astro.as.utexas.edu, wetzel@astro.as.utexas.edu, mace@astro.as.utexas.edu)
[2] Region XI Education Service Center, Fort Worth, Texas (byarbrough@esc11.net)

Abstract

Texas is a big state! It measures 1244 km from east to west and 1289 km from north to south. It is as large as all of New England, New York, Pennsylvania, Ohio and Indiana combined and slightly larger than France. As the state's only professional observatory, our goal is to reach as many K-12 teachers and students as possible in Texas with astronomy activities that align with the state's teaching standards, Texas Essential Knowledge and Skills (TEKS).

The Frank N. Bash Visitors Center at McDonald Observatory near Fort Davis is the hub for our teacher workshops and student field experiences. It is also located on a remote mountaintop, which makes arranging student field trips difficult, so we have chosen to use videoconferencing technology, which the Texas Education Telecommunications Network (TETN) supports for most K-12 teachers and students around the state, to reach our target audience.

A science consultant and four teachers met with us at the Observatory to determine how best to transfer components of our student field experiences to this technology. We have pilot-tested our first professional development workshop for teachers via videoconference with Region XI teachers. As our distance learning programmes gain momentum, we are branching out to work with the other Education Service Centers around the state.

Four teachers and a science consultant (Becky Yarbrough) came to McDonald Observatory over a weekend in January 2005 to help design the videoconference version of the student field experience. While at the observatory, the teachers participated in on-site student field experiences and then recommended components and content to adapt to videoconferences. NASA IDEAS funding allowed us to create a solar viewing programme that aligned with Texas Essential Knowledge and Skills and Texas Assessment of Knowledge and Skills. Components of the solar viewing programme make up an important part of the videoconference. The programmes were then tested in the classrooms of the Fort Worth teachers that helped design the videoconference. Each teacher was responsible for recruiting two other classrooms to test the videoconference. Following the evaluation of the test programmes, the videoconference material was modified.

The content for the student field experience videoconference includes an interactive connection with Marc Wetzel, the Observatory's presenter. Marc takes students on a virtual tour of the 82-inch telescope, they participate in solar viewing and he answers questions during a 15-minute Q&A period. Teachers are asked to submit students' questions in advance of the programme. In September 2007 we launched the “Live from McDonald Observatory” videoconference programme officially. A school can sign up on the Connect2Texas website[1]. The programme is available for $100 for a two-way connection with a lower fee is charged for view-only access. Teachers can access introductory information, a pre-assessment test, pre-conference activities, post-conference suggestions and activities and a list of related resources online[2].

In February 2007 we pilot-tested a professional development workshop. Dr. Mary Kay Hemenway and Marc Wetzel developed a menu of activities from those activities normally offered in on-site teacher workshops and these were presented during three two-hour periods by videoconference. Becky Yarbrough was available to help co-facilitate the activities with the teachers. Evaluation was conducted using pre- and post-tests and focus groups. Post-test scores were almost 20% higher than the pre-test scores.

In 2007-08 funding from American Electric Power will support videoconferences in each of the areas where they supply power. We will also offer an on-site teacher workshop for teachers in Fort Davis, Marfa, and Alpine. Facilitators from four of the six regions have been trained and will be co-facilitating where the teachers are located.

Unexpected outcomes and lessons learned

One of the unexpected outcomes of videoconferencing is the opportunity to offer many schools a view-only experience, thereby making it possible to reach hundreds of schools and thousands of students. In 2006, we presented an Astronomy Day programme to 7500 students in 160 schools and again in 2007 to 5840 5th-8th grade students in 121 schools. During the Astronomy Day, Marc Wetzel led students through a scale model activity on the Solar System, conducted live observations of the Sun and used computer software to demonstrate the positions and orbital planes of objects in the Solar System. At the end of the programme a McDonald Observatory astronomer joined Marc in the studio to answer students’ questions. 94% of the teachers who completed the evaluation agreed that the videoconference session illustrated astronomy in ways not possible in their classroom. Two-way interactive videoconferences do offer a better experience, but multipoint view-only videoconferences reach many more students.

To overcome the logistical difficulty of connecting to many sites simultaneously, connection tests are usually done before the programme takes place. Connect2Texas is responsible for the advertising, registration, testing and hook-ups for all of our videoconferences.

External technical problems included blurring digital images probably caused by overloaded bandwidth. In the classroom the camera malfunctions when teachers forget to mute their microphones, which causes the camera to switch to the classroom rather than staying focused on the presenter. Teachers often omit the recommended preliminary work before the conference. We try to keep the preliminary work to a minimum, but some work is required for the interaction to be effective.

---

[1] www.connect2texas.net
[2] www.mcdonaldobservatory.org/lfmo

In a teacher professional development workshop videoconference, the presenter cannot walk around the room to make sure participating teachers understand the activity. An on-the-spot facilitator who has been trained in the activity before the videoconference is necessary. Now that our student field experience videoconferences have been officially launched, we plan to create a menu of different programmes for different age levels and topics. We expect that classrooms that purchaser videoconference programmes will be repeat customers during the year and we want to be able to offer them varied content.

Susan Williamson

Figure 1 – Students participating in an Astronomy Day videoconference in September 2007.

Figure 2 – Marc Wetzel (L) conducts a videoconference with students and Kevin Mace (R) is behind the camera. The classroom and view of the Sun can be seen on the monitors.

Mary Kay Hemenway

Figure 3 – Fort Worth teachers (L-R) Wendy Martindale, Jennifer Rosenburg, Billy Ingram,and Region XI science consultant Becky Yarbrough meet astronomer Bill Cochran and learn about his research while they are at McDonald Observatory helping to design the videoconference experience.

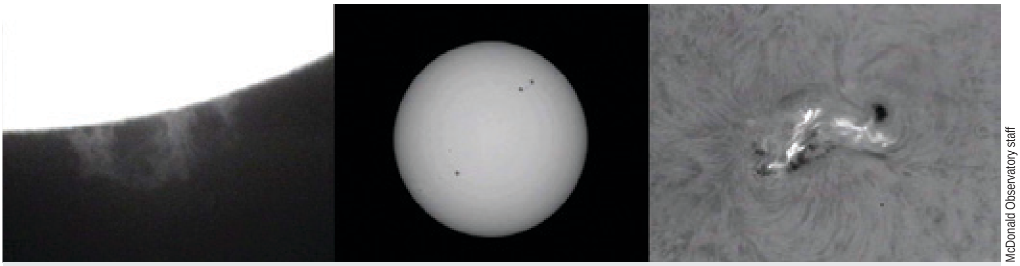


Figure 4 – The programme includes live views of the Sun from telescopes at McDonald's Visitors Center, weather permitting.

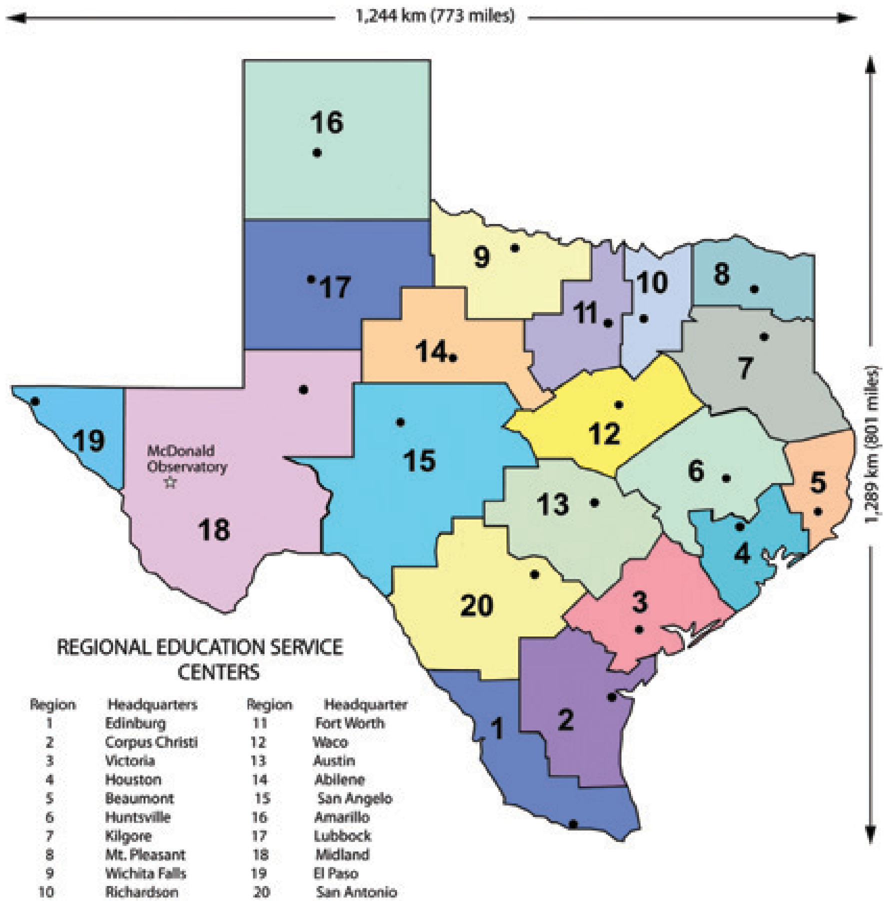


Figure 5 – The 20 Regional Education Service Centers in Texas.

Acknowledgements

We gratefully acknowledge American Electric and Power, Amon G. Carter, F. B. Doane, Lowe, and Bromberg Foundations, The Orion Circle, Richard King and Video Call, and NASA IDEAS HST-Ed90282.01-A for their support of this project.

Educational activities with the Faulkes Telescopes

Sarah Roberts[1], **Paul Roche**[1] **& Rachel Ross**[2]
[1] LCOGTN UK (sroberts@lcogt.net, proche@lcogt.net)
[2] LCOGTN US (rross@lcogt.net)

Abstract

Las Cumbres Observatory Global Telescope Network (LCOGTN) will eventually provide access to a global network of robotic telescopes for research-based science education. Here we present the educational projects that have been undertaken using the 2-m Faulkes Telescopes in Hawaii and Australia in both the UK and Europe. These include themed observing days in which schools collaborate in their telescope sessions, the development of science portals where schools can upload and share their telescope data, and other innovative projects. Public access to these facilities will increase as IYA2009 approaches.

UK

The LCOGTN project has been running in the UK for about three years, during which time a number of initiatives have been employed by both LCOGTN and the schools involved in the project.

Themed Observing Days

Themed Observing Days are collaborative projects for a number of schools, run throughout a school day. At present, three very successful observing days have been held, on the life cycle of stars, asteroid rotation and mosaicking of M101.

In the Lifecycle of Stars Themed Observing Day, 10 schools from the UK and Poland were given specific objects to observe that showed stars at different stages of their lives. A poster was produced with the final images taken on the day.

Online training

A new online training portal[1] has recently been launched by LCOGTN in the UK. Open to anyone, including teachers, students and members of the public, there are currently a range of courses on the online training portal, from introductory courses on how to plan a session with a telescope and look at data, to courses on image processing and asteroid observations.

[1] http://training.faulkes-telescope.com

Adult education

For the past two years the Faulkes Telescopes have been used as part of a series of astronomy workshops for adult education classes at Cardiff University. These workshops, open to anyone with an interest in astronomy, focus on areas such as asteroids, comets, galaxies and stars.

Science cafés

LCOGTN has run science cafés on a variety of topics in the UK, Israel, Poland and Warsaw (the international locations are supported by the British Council), involving several hundred members of the public in debates on issues such as the prospects for future colonisation of Mars and the threat of impacts from space.

Future plans

LCOGTN involvement in adult education is expected to expand dramatically over the next few years, particularly as access to FT South now provides early evening access. We intend to work with a variety of courses around the UK, in collaboration with bodies such as the Open University, and on pilot programmes targeting young offenders, with the University of Glamorgan.

Russia

Funded by the British Council in Russia, this joint project between LCOGTN and Russia involves 24 schools in the five regions of Moscow, Ekaterinburg, Samara, St. Petersburg and Nizhny Novgorod.

With an astronomer working with the schools in each region, a number of observing programmes have been carried out, including the study of interacting galaxies, observing planetary nebulae and searching for binary asteroids and trans-Neptunian objects.

Poland

A number of overseas schools who are registered users of the LCOGTN telescopes are part of joint projects between LCOGTN in the UK and the British Council. One of the first such projects to be funded by the British Council was LCOGTN in Poland. Originally there were six sites in Poland that had accounts on the telescopes — four schools and two observatories, but this has increased recently to 13. Here, astronomers are working with school students to use the telescopes to obtain data, then helping to analyse it. The main project which the Polish users have set up is the Supernova Portal[2].

This portal contains information such as lists of supernovae that need observing, instructions on how to use SalsaJ to carry out photometry on supernova data, and an area where users can upload their own data onto the portal so that supernova light curves can be plotted. Such a portal

[2] www.eu-hou.net/spbdadm/index.php

gives users of the LCO telescopes a chance to collaborate on projects together, wherever they are in the world.

LCOGTN has also been a key feature of British Council displays at a number of public events, such as the Warsaw and Krakow Science Festivals, with live observing sessions proving very popular, particularly with family groups. Displays of the images taken by schools, and presentations by the school students, also help promote the work of LCOGTN and the British Council.

Portugal

The LCOGTN project in Portugal was developed in a Portuguese high school together with NUCLIO (Nucleo Interactivo de Astronomia), a non-profit association of professional and amateur astronomers devoted to public outreach and education, and mentored by a professional astronomer. The ongoing observing project involves the students choosing class O stars from a star catalogue, and then observing fields around these stars to look for undiscovered open clusters of stars in those regions.

Credit: Dennis Crabtree

Meteorite, a rock from space: A planetarium adventure for children

Inés Rodríguez Hidalgo[1,2,3], Rubén Naveros y Naveiras[3] & Oswaldo González Sánchez[3]
[1] Instituto de Astrofísica de Canarias (irh@iac.es)
[2] Dpto. de Astrofísica, Universidad de La Laguna
[3] Museo de la Ciencia y el Cosmos

Abstract

At the Museum of the Science and the Cosmos (MCC, La Laguna, Tenerife) there is a small planetarium. All the different planetarium shows are carried out entirely by the Museum staff, from the original idea and the script to the final production. In February 2007, *Meteorite, a rock from space*, a new show, specifically for children, was released. The characters (astronomical bodies) are played by puppets, designed and manufactured for this occasion; the script has been carefully written, and introduces many astronomical concepts in the form of an entertaining tale, which encourages the children to participate by crying, counting, helping the characters… just like a traditional puppet show.

The aim of this contribution is to review the different resources (some of them really innovative) used to create this programme, which offers plenty of future possibilities.

Overview

- Title: ***Meteorite, a rock from space***
- Original idea and script: Oswaldo González Sánchez & Rubén Naveros Naveiras
- Scientific revision: Inés Rodríguez Hidalgo
- Country: Spain
- Language: Spanish
- Release date and place: February 9 2007, Planetarium, Museo de la Ciencia y el Cosmos (MCC), La Laguna, Tenerife (Spain)
- Genre: Adventure / Comedy / Family
- Plot synopsis: “Old” Meteorite remembers with nostalgia its childhood in the Oort Cloud and how its journey to the inner Solar System began after a collision with a friend-rock while playing. Along the way it meets planets, satellites, comets, and the Sun, it becomes more and more naughty, and wants to make an enormous crater on the Earth. It finally falls on the African desert, from where it is brought to the Museo de la Ciencia y el Cosmos. Meteorite does not fulfil its dream of producing a big cataclysm, but it is really dear and important to us, since we can admire and caress it at the MCC.
- Plot keywords: Meteorite / Solar System / crater
- Runtime: 25 min
- Soundtrack: selected fragments of Copland, Elgar, Bernstein, Gershwin, Enescu, Mozart, Bartok, Anderson, Katchaturian, Bach, Prokofiev, Rossini and Strauss, as well as solar “sounds”.

- Credits:
  - Production, post-production, editing, mixing, special effects, voice recording, and syncing: Planetarium Technicians of the MCC.
  - Dubbing: “Old” Meteorite’s voice belongs to Emilio Aragón, Miliki, a famous Spanish clown, actor, composer and musician. The rest of characters have been dubbed by some friends, including a popular Canary Island humorist.
  - Puppets: Miguel Montoya, *The Root Puppets*.
  - Manipulation of puppets: Oswaldo González, Rubén Naveros, Miguel Montoya.
  - Narration recording: CRAB Studio (Madrid).

- User comments:
  - *No, no, Meteorite, please! Don’t crash with the Earth!* (during the show).
  - *So, “Meteorite” is that rock out there in the Museum?*
  - *I finally learned what a cataclysm is.*

- Fun stuff:
  - Oswaldo got intense muscle ache after handling the puppets.
  - Children participate by crying, counting, helping the characters (just like a traditional puppet show)... and so do adults!
  - Travelling shots were recorded with funny tours around the Museum on a wheelchair.

- Additional details:
  - Planetarium dome diameter: 6.5 m;
  - Technical facilities of the Planetarium: opto-mechanical star projector GOTO GE2, three tri-tube video-projectors, 5.1 sound system;
  - Technical means employed: chroma-key recording of characters, integration with projected stars and astronomical images through post-production (Autodesk Combustion ® software);
  - Target audience / age group: general public / 3–10 years
  - Estimated audience numbers since the premiere: around 9000 visitors (by October 2007).

Astronomical content

- Meteoroid vs Meteorite;
- Oort Cloud;
- Outermost planet in the Solar System: Neptune;
- Pluto and other TNOs (Trans Neptunian Objects);
- Birth of the Sun and the Solar System from an interstellar cloud;
- Saturn and Mimas, Jupiter, Comet Halley, and their more conspicuous physical features;
- Comet Halley’s (average) period: 76 years;
- Collision of Comet Shoemaker-Levy 9 with Jupiter (16–22 July, 1994);
- The Sun, its enormous mass and gravitational attraction force, which keeps comets, aster-

oids, and planets turning around it;
- Meteoroids impact on planets and satellites, impact craters and cataclysms;
- Dinosaur extinction;
- Earth is, as far as we know, the only inhabited planet in the Solar System;
- Entry of a meteoroid in the Earth atmosphere…

The traditional distance sequence in the Solar System has been deliberately broken: the rock meets only some bodies, including Comet Halley, and the Earth is met after the Sun

10 keys to the making of the show

The making of the show is summarised in the figure by the 10 images to the right with the following captions:

1. 2D animation is really complex, and the level of well-known movie productions difficult to reach: 3D characters (puppets recorded with chroma-key) are an excellent alternative.
2. The "astronomical puppet team": Jupiter, Saturn, Meteorite, Halley, and Mimas.
3. Becoming intimate with Mimas…
4. Puppets were manipulated in front of a chroma-key screen.
5. Adequate illumination with no shadows is essential for chroma-key recording. Astronomical images were added later, and the result was projected on the planetarium dome.
6. News on Earth about the Shoemaker-Levy 9 — Jupiter encounter: they are introduced by an old-fashioned journalist who types the report on his typewriter for the newspaper "Ciencia & Cosmos Journal".
7. Recording of voices: narrative and dubbing of characters. In the image, Emilio Aragón "Miliki", a famous Spanish clown, actor, composer, and musician.
8. This is not an ordinary film, but a planetarium show: the amazing starry night is always present.
9. The hour of truth: the most demanding audience.
10. Local newspaper coverage of the premiere.

[1] http://es.youtube.com/watch?v=J1pKHeRtYOk
[2] http://es.youtube.com/watch?v=6yrouD4dXsQ
[3] http://es.youtube.com/watch?v=4__C1YWoTVY

Future perspectives

- We are currently working on a book for children, based on the script and images from the planetarium show.
- *Meteorite, a rock from space* is the first programme of a saga in which the characters will continue delighting the audience, while teaching astronomical concepts.

Broadcasting

The interested reader can see the trailer shown on the Museum's video-wall[1], the spot released on local TVs[2], and the TV report about the premiere on a local station[3].

Acknowledgements
We warmly thank all the MCC staff for their collaboration

Las Cumbres Observatory Global Telescope Network: Keeping education in the dark

Rachel Ross[1], **Paul Roche**[2], **Sarah Roberts**[2]
[1] LCOGTN US (rross@lcogt.net)
[2] LCOGTN UK (proche@lcogt.net, sroberts@lcogt.net)

Abstract

Las Cumbres Observatory Global Telescope Network (LCOGTN) is a privately-funded, non-profit organisation that is creating a cutting edge science programme paired with an innovative education programme. We are building two networks of telescopes in rings in both the Northern and Southern hemispheres for complete sky coverage, all of which will be equipped with high-quality, science-grade instrumentation. The telescopes will be completely robotic with the ability to be controlled by anyone, from anywhere with a broadband internet connection. Accompanying the observations will be a library of resources and activities including how to plan and carry out an observing session as well as several activities and project ideas to carry out in both formal and informal education settings. The goal is not to produce more astronomers, but to encourage a new understanding of science and technology that people will be able to apply to any field that is studied.

Telescope Network

Currently, LCOGTN operates two 2-m telescopes, the Faulkes Telescope North on Haleakala, Maui and the Faulkes Telescope South at Siding Spring Observatory, Australia. The prototypes for the 0.4–m telescopes are being designed and tested, with the first scheduled to be deployed in Coonabarbaran, Australia in mid-2008.

The final telescope network will consist of telescopes for both education and science. The education network will include 24 x 0.4-metre telescopes in clusters of four, creating rings in the northern and southern hemispheres. The science network will be made up of 18 x 1-m telescopes in clusters of three, also creating a northern and a southern hemisphere ring. The two Faulkes Telescopes will be used primarily as scientific follow-up.

The sites will include Hawaii (2.0-m + 0.4-m), Mexico (0.4-m + 1.0-m), Canary Islands (0.4-m + 1.0-m), Chile (0.4-m + 1.0-m), South Africa (0.4-m + 1.0-m) , and Australia (0.4-m + 1.0-m + 2.0-m).

LCOGTN education

LCOGTN will provide the tools and resources to inspire educators and learners to participate in real scientific research. This in turn will create an environment to motivate learners to pursue an interest in science, technology, engineering and maths. The skills acquired from participating in the research will be valuable in any subject area.

The tools will consist of a network of robotic telescopes completely controlled via the internet, including an archive of data that will be freely available and online data processing tools. The resources will include an interactive website where educators and learners will be able to find everything they need to use the telescope network and data.

The team includes core teams in Santa Barbara, CA and Cardiff, Wales. We are working with affiliated teams at the University of Hawaii and the Australian National University, as well as creating partnerships with several other international EPO groups. Through the partnership with EU-HOU and the British Council, several pilots have already been started in a few European countries and Russia.

The future education programme will include open and free access to the telescope network using a real-time or queued mode, collaborative projects done with schools around the world, and an interactive website while will include all the information needed on using the telescope network as well as some project ideas, observing programmes, and more.

LCOGTN will work cooperatively with groups already doing exciting things in education and outreach. These partnerships will allow the sharing of a vast amount of experience, knowledge, resources, and tools. LCOGTN's education telescope network will provide an avenue for educators and learners to use cutting edge technology do real science.

EuroPlaNet: Europe explores the Solar System

Pedro Russo[1], Jean-Pierre Lebreton[2], Mariana Barrosa[3] & the EuroPlaNet Outreach Steering Committee

[1] IAU & ESA/Hubble (prusso@eso.org)

[2] ESA (jean-pierre.lebreton@esa.in)

[3] Navegar Foundation (mariana.barrosa@multimeios.pt)

Figure 1 – Europlanet logo

Abstract

EuroPlaNet was created in 2005 to bring together the European researchers working in planetary science by setting up an interdisciplinary European Planetary Science Network and this way achieving a long-term integration of this discipline in Europe. Due to the diversity of the researchers' skills involved in the project, EuroPlaNet provides an important European added value to the science produced by the European and international planetary missions. An integral part of EuroPlaNet is the Outreach Work Package which is described here.

EuroPlaNet is a project supported by the European Union (EU) and funded through the Sixth Framework Programme (FP6) until the end of 2008.

Activities

There are seven so-called Work Packages:

- Activity N1: General management.
- Activity N2: Discipline working groups. The main objective of N2 is to find ways of maximising the science return from major European investments by developing synergies between the different types of activities within the fields of planetary sciences.
- Activity N3: Coordination of Earth-based and space observations — Consolidation of access by European planetary astronomers to telescope facilities in a variety of ways by the establishment of a global strategy for these observations, and, on this basis, of a "target" observation calendar, through a specific co-ordination working group.
- Activity N4: Developing an outreach strategy. Develop a pan-European outreach plan that will help European citizens associate with planetary exploration programme activities in Europe. N4 will develop and implement a plan for networking the outreach activities conducted by the different space agencies, research institutes, universities and science museums in Europe.

- Activity N5: Personnel exchange. Support of key exchanges of personnel between research groups developing co-operative programs in support of Cassini-Huygens (short-term visits), in order to establish a long-term working relation between groups, and produce a well-defined result for EuroPlaNet networking effort.
- Activity N6: Meetings, conferences. This Activity will organise one EuroPlaNet general meeting per year and one to two European Planetary Workshops during the project. It will monitor the overall consistency of all the more focused workshops organised by the other activities.
- Activity N7: Integrated and Distributed Information Service (IDIS). This activity will coordinate the studies for the implementation of an Integrated and Distributed Information Service (IDIS) and its further evolution into a European Virtual Planetary Observatory.

Outreach activities

The expected outcome of the Activity N4, as stated in its funding contract with the EU is:
It is expected that, as a result of this activity, European public awareness in Europe's involvement in the Planetary Space Exploration programme will be increased. This Activity will also help motivate all scientists participating in the consortium to invest a modest amount of their time in supporting a proper multi-lingual pan-European Outreach programme and to bring it to a level comparable to that existing in the USA.

The contract also declares that: *All participants in the Consortium will be invited to participate and to invest a small amount of their working time in this specific activity. Cultural exchanges may need to take place as active participation in outreach activities is not approached in similar ways in each EU country. Links with existing organisations that have established successful programmes will be encouraged*.

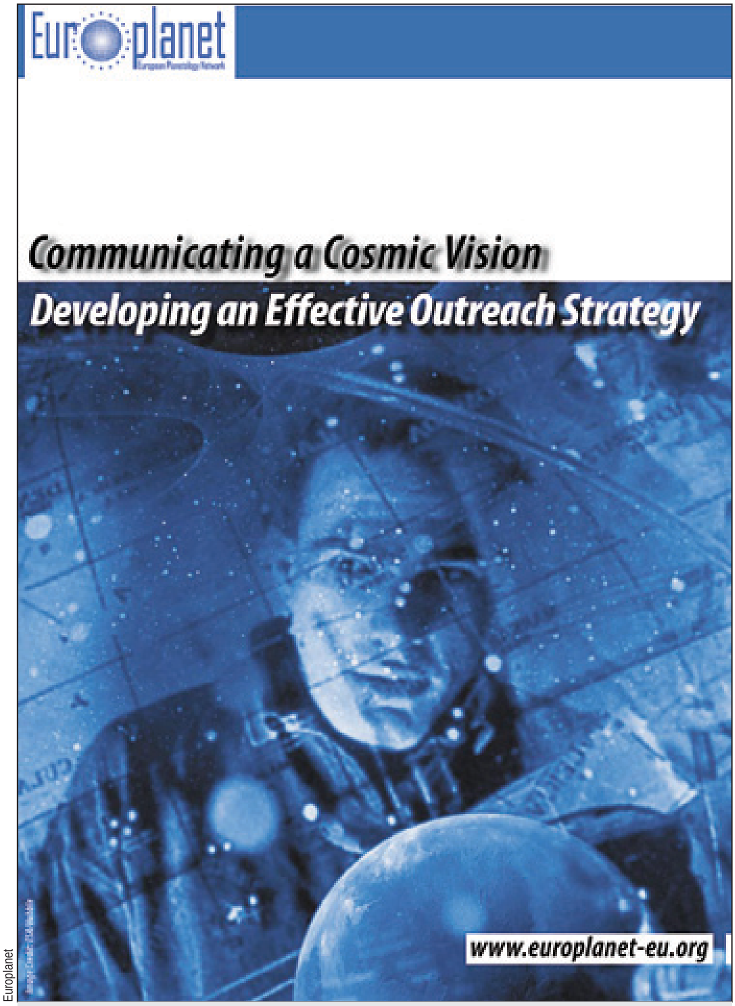
Outreach products and activities (2006-2007)

- EuroPlaNet Outreach website[1].
- Two institutional videos online[2].
- Best practice guide for science communication *Communicating a Cosmic Vision: Developing an effective outreach strategy*.
- Workshop in partnership with ESConet: *Communication Training for EuroPlaNet Researchers*.
- Events to celebrate the 50th Anniversary of the launching of Sputnik — *2007: A very spatial year*.

An Outreach Steering Committee was established this year and presently contacts are being made to establish a network of National Points of Contact who will be responsible for the coordination of local and national activities. EuroPlaNet is now in the process of implementing an Outreach and Communications Strategy.

---

1 www.europlanet-eu.org
2 http://www.youtube.com/watch?v=mcEtDuGOmAQ and http://www.youtube.com/watch?v=5Bn_IhDXWSA



Europlanet

Figure 2 – Communicating a Cosmic Vision: Developing an effective outreach strategy Guidelines Cover

European Union Seventh Framework Programme (FP7)

Outreach activities are currently funded at a level of 10% of the overall FP6 EuroPlaNet budget. We will aim to increase this ratio within the EuroPlaNet FP7 proposal in order to be prepared to respond to one of the priorities expected to be put forward in the call for FP7 proposals planned to be issued in mid–November 2007. Indeed, it is anticipated that outreach activities will be a key component of the EuroPlaNet proposal for FP7.

Credit: Lars Holm Nielsen

Communicating astronomy in a small island state: The unique role of the Mauritius Radio Telescope

SAROJINY SADDUL-HAUZAREE
Mauritius Astronomical Society (sarojiny@intnet.mu)

Abstract

The Mauritius Radio Telescope (MRT) is a 2 km x 1 km T-shaped aperture synthesis array that can generate radio images of the southern sky at 151.6 MHz. The sky surveyed can be in the declination range of -70° to -10°. It is located at Bras d'Eau, northeast of Mauritius at latitude 20oS and longitude 60oE. The MRT is a joint project of the University of Mauritius, the Indian Institute of Astrophysics and the Raman Research Institute. One of the main objectives of the MRT is to generate public interest in astronomy. Thus, it is involved in a wide range of onsite outreach activities for young school children. More mature students visiting the telescope learn about sky observation with a radio telescope, get to explore some sets of data, interact with the scientific personnel, get the opportunity to have hands-on experience with image manipulation and can ask a lot of questions on astronomy.

This poster gives an overview of the Mauritius Radio Telescope and the attempts of MRT ito communicate astronomy to students as a process and not just as a vast expanse of knowledge. The challenges and dilemmas faced by MRT in conveying astronomy to the general public in a small island state are investigated and presented.

Introduction

The Mauritius Radio Telescope (MRT) is found at Bras D'eau in northeast Mauritius and takes images of the sky at a frequency of 151.5 MHz. It is a collaborative scientific endeavour by the University of Mauritius and the Raman Research Institute and the Indian Institute of Physics that are both in India. The radio telescope at MRT consists of a 2-km EW arm and a NS 1-km arm in the shape of a T-array with one arm having 1024 fixed 2-m helical antennae and the other having 64 antennae on 16 moveable trolleys. The data collected by the telescope is sent to a PC which then transfers the data to a set of workstations for image processing.

Scientific activities at MRT

The MRT is primarily involved in the processing and astrophysical analysis of images of the southern sky. Its main objective is to generate and analyse original data on the southern sky that will be used in understanding the Solar System. The images at MRT originate from the collection of extremely weak radio signals by the T-shaped telescope. Scientists, research assistants, technicians and many MPhil/PhD students of the University of Mauritius and elsewhere then analyse the vast amount of data collected. For example, images of a supernova are often collected at MRT.

All the scientific data amassed are used to advance the study and understanding of galactic and extragalactic astronomy. In October 1997 MRT organised an international meeting on *Radio Astronomy at Low Frequencies*. Scientists from Italy, Mauritius, UK, USA, India, Chile and many others presented and shared the latest research in radio astronomy.

Astronomical outreach by MRT

Apart from its general objective of advancing the field of astronomy and astrophysics, the MRT aims at improving the understanding and appreciation of astronomy amongst the public and hence generating interest in this important subject. To achieve this, MRT is involved in many different kinds of activities. Workshops, open days for the public, night sky viewing using the optical telescope at MRT, briefing sessions for university students, international and local meetings are the means used by MRT for bringing astronomy to the public.

The Open Day in October 2002 attracted many visitors when the scientific staff of MRT and postgraduate research students at the University of Mauritius explained basic astronomy to students. The MRT also provides industrial training facilities for engineers in the domains of electronics, communication, image processing and IT. The 10th UN/ESA workshop on Basic Space Science for Africa was held in Mauritius in June 2001 and was hosted by the University of Mauritius with the collaboration of MRT. These international workshops are aimed at contributing to the worldwide development of astronomy, particularly in developing nations. Visits are often arranged by UOM/MRT students to go to secondary schools to bring astronomy to the student population.

Challenges and dilemmas faced by MRT in communicating astronomy.

For promoting astronomy education, MRT is involved directly in all the astronomical events that can be experienced in Mauritius and worldwide. The southern sky is very clear and not affected by dust and light pollution and frequent bad weather, thus making observations very easy and enjoyable. These events include eclipses, transits and passing comets. Pictures of astronomical phenomena observed at MRT are sent to the press. MRT is limited in its capacity to transform astronomy education due to scarcity of human resources and financial constraints. Talented PhDs who have studied astronomy at MRT leave the country. The absence of an optical telescope with a dome is seen as another major impediment in MRT's ability to attract the public to the centre.

In spite of its limited facilities MRT has gained worldwide recognition as a centre of excellence. It received an award from NASA in 2004 as recognition of its excellence on education and discovery.

Case Study: Solar science communication

Bruno Sánchez-Andrade Nuño
Max Planck Institute for Solar System Research & Institut für Astrophysik – Uni-Goettingen – Germany
(brunosan@gmail.com)

Abstract

The gap between scientific research and society is obvious. Unfortunately in most cases we are not able or don't pay enough attention to communicating the marvels of the Universe in which we all live to the public. In solar physics we are living in a privileged era, not only because we are pushing our observational limits further, but also because public attention is increasing (Sun-Earth connection, effects of global warming, dangers of UV radiation, disruption to satellites, etc.). Part of our work as scientists is to be able to communicate our progress in understanding the Universe to society. As part of my work, I use high quality image sequences of the Sun, which are highly suitable for public outreach. In the spirit of this I submitted some images to the *Astronomy Picture of the Day*[1] editors, a world reference in scientific outreach. The images and videos[2] were published on 22 May 2007. Using tracking software, it is possible to establish a profile for number of visits and visitors.

Data

The scientific data were recorded using the Göttingen Fabry-Perot Interferometer described by Puschmann et al. (2006a), mounted on the Vacuum Tower Telescope, in Tenerife, Spain. Observations were supported by the Kiepenheuer Adaptive Optics System. The observations consist of several frames from the Active Region AR10875 at heliocentric angle $\Theta=54°$ on 26 April 2006. We measured 2-D spectrograms (FWHM 45 mÅ, 5 ms integration time) scanning the $H\alpha$ line at 21 spectral positions every ~19 s for ~55 minutes. Simultaneous photospheric (6300 •, FWHM 50•) frames were recorded to support the post-facto image reconstruction. Both channels were reconstructed using the improved speckle interferometry method due to Puschmann et al. (2006b) to achieve close to diffraction-limited angular resolution of ~0.2 – 0.3''

Google Analytics	Accumulated	Publication day
Pageviews	56,742	2,015 (traffic overload)
Average time on page	~3 min	~5 min
Visits from APOD	5%	75%
Visits from referrals (mostly www.digg.com)	93%	25%

[1] http://antwrp.gsfc.nasa.gov/apod/
[2] http://www.astro.physik.uni-goettingen.de/~bruno/APOD/apod.html

Astronomy picture of the day (APOD)

Since the APOD began in 1995 it has been written, coordinated and edited by Robert Nemiroff and Jerry Bonnell, with the support of NASA, the NSF, and MTU. It serves ~600,000 pages every business day (not including mirror sites). On 15 May we submitted an overview of the data, and, after some comments from the editor, a 10-second flash movie from the broadband channel was published on 22 May. We inserted a Google Analytics tracker to retrieve information about every visit and visitor. The following chart and table above show some of the gathered information.

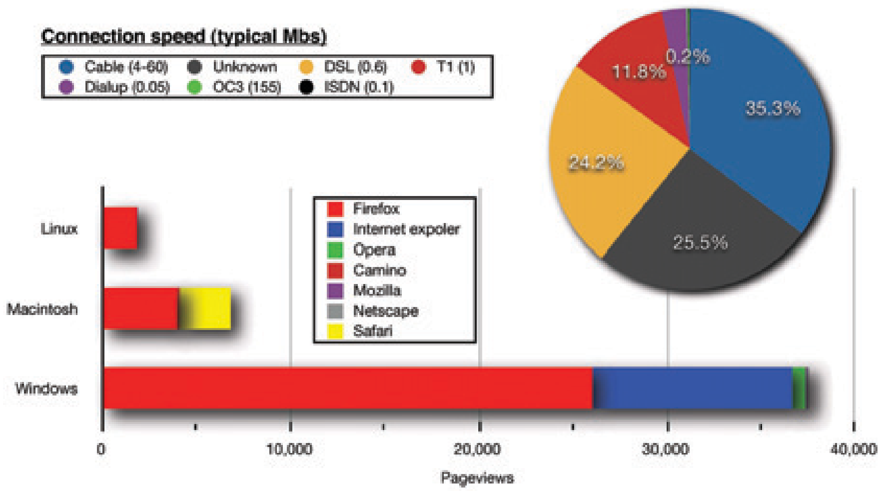


Figure courtesy of the author

Figure 1 – Overall Visitors statistics for the APOD 22 May 2007, up to 31 August.

Conclusions

- Server log provides total access numbers up to 31 August: 581,237 for any item on this APOD release (225,416 for main flash video).
- The latest multimedia web technologies (like embedded flash players) can improve the attractiveness and ease of use substantially.
- Unexpected increases of traffic can easily overload typical institute research facilities.
- Using free available services like Google Analytics it is easy to obtain a detailed profile of the visitors, including origin and length of visit, system used, referral sources and so on.
- Web searches can also help to trace the impact of the data in the public domain.
- >80% are able to load medium size contents.
- >90% can view complex multimedia pages with videos.
- ~93% of visits are from indirect sources (blogs and popularity websites)
- Average visitor profile does not match global general trends.
- The video is still being viewed, linked to or commented on by many web pages and blogs.

References

- Puschmann K. G., Kneer F., Seelemann T., & Wittmann A. D. (2006), A&A, 451, 1151P
- Puschmann, K. G. & Sailer, M. (2006), A&A, 454,1011

DomeView

Marco Silva, António Pedrosa
Navegar Foundation, Centro Multimeios de Espinho (marco@multimeios.pt, apedrosa@multimeios.pt)

Abstract

The planetarium world has experienced great changes in recent years, both in content display techniques as well as on the content creation side. We present a new tool to view and preview dome content, in order to help content developers to test their work easily without the need to use a dome, as well as to project content in domes using single projector systems.

Introduction

The content produced for fulldome projection is usually made in a frame (the Master) with a format corresponding to a projection of the dome on a plane. The standard is the fisheye projection, see Figure 1. Due to the distortions involved, looking at the Master does not give a clear idea of the final result once projected on a planetarium dome. The usual solution when creating content is to go through an interactive iterative process, making successive projections on a planetarium until the desired result is achieved. However, repeated access to a planetarium is difficult, costly and time consuming. So there is a need for a tool that can give the user a clear notion of the final result in the planetarium, direct to the desktop. In addition, if the tool could be used to show content in a small (single projector) planetarium, like a portable one, its versatility would increase substantially.

The software

DomeView is a real-time tool designed to view and preview dome content.

For previewing, DomeView displays the content projected in a spherical surface, like a planetarium dome, in 3D, see Figure 2. The viewing position can be changed, to mimic changing seats in the planetarium or even be viewed as if from outside the planetarium, see Figure 3. A model of a planetarium can be added for a more realistic view. To cope with many modern planetariums, the inclination can be set appropriately, see Figure 4. The entire dome can be displayed up to 360º, as in the all-sky view of the WMAP[1], see Figure 5.

The viewing feature shows the content in a 2D projection of the dome and can be projected in a dome using a single video projector, for example a fisheye, see Figure 6. The content can also be viewed in a spherical mirror projection. This means a fulldome projection can be made in a planetarium using a regular projector and a spherical mirror, see Figure 7.

[1] http://map.gsfc.nasa.gov

Domeview handles video and images of different types and content coming directly from third party programs such as Adobe After Effects[2], Adobe Photoshop[3], the free open source planetarium Stellarium[4] and webcams. The media content is displayed according to the selected location in the dome, size and projection. If the media source is the fulldome Plugin[5] under Adobe After Effects, see Figure 8, all options are disabled since the media are configured automatically.

Features

The software has a large set of features including:

- 3D previewing:
    - Spherical View;
    - Cylindrical View;
    - 3D model imports, e.g. planetarium models;
    - Selection of the viewing position.
- 2D viewing:
    - Fisheye projection;
    - Standard Projection;
    - Spherical Mirror Projection.
- Accepts different types of media content, videos (.mov, .wmv, .avi, mpg, mpeg, etc.) and images (.jpg, .gif, .bmp, .tga).
- Handles content arriving in real-time from other sources, Adobe After Effects, Adobe Photoshop, Webcam and Stellarium.
- Hyperdome ready (display from 0º to 360º).

Summary

A new tool was presented that:

- Offers extremely useful previewing capabilities.
- Is a powerful software tool for a digital planetarium, using both fisheye and spherical mirror projections.

Full details are available on the website[6].

---

[2] http://www.adobe.com/products/aftereffects
[3] http://www.adobe.com/products/photoshop
[4] http://www.stellarium.org
[5] http://fulldomeplugin.multimeios.pt
[6] http://domeview.multimeios.pt

The International Year of Astronomy: NASA contributions to the United States themes

Denise Smith[1], Mary Dussault[2], Leslie Lowes[3], Hashima Hasan[4], Doris Daou[4], and Marilyn Lindstrom[4]
[1] Space Telescope Science Institute (dsmith@stsci.edu)
[2] Harvard-Smithsonian Center for Astrophysics (mdussault@cfa.harvard.edu)
[3] Jet Propulsion Laboratory (leslie.lowes@jpl.nasa.gov)
[4] NASA Headquarters (hhasan@nasa.gov, Doris.Daou-1@nasa.gov, marilyn.lindstrom-1@nasa.gov)

Abstract

The International Year of Astronomy 2009 (IYA2009) is a global celebration of astronomy and its contributions to society and culture. Partners throughout the United States have been working together to plan an engaging experience available to anyone interested in participating. NASA, through its Science Mission Directorate (SMD), has developed a strategy for its involvement that uses its unique resources and facilities to complement and enhance the overall US effort. This rapidly maturing programme will leverage exciting space science missions and science research results, and build from education and public outreach (EPO) projects already in existence within NASA and its partners. Additional information can be accessed through the NASA IYA2009 website, coming soon.

Introduction

Coordination of US IYA activities is being handled by the American Astronomical Society (AAS) through a Program Committee and a Development Committee. The overall IYA effort within the US is based upon the goal: *To offer an engaging astronomy experience to every person in the country, and build new partnerships to sustain public interest*. To meet this goal, the Program Committee has developed major themes to guide involvement. These themes are: *Looking Through a Telescope; Dark Skies Are a Universal Resource; Astronomy in Arts, Entertainment, and Storytelling; Research Experiences for Students, Teachers, and Citizen-Scientists; Telescope Kits and Optics; Sharing the Universe through New Technology*; and *The Universe for Classrooms and Families*. The NASA effort is complementary to the overall US programme, while contributing its unique perspective and resources.

Education and Public Outreach at NASA's SMD

The unique aspect of the NASA SMD EPO programme is its direct tie to the NASA space science missions and research. By embedding EPO efforts within each mission, SMD ensures that students, educators, and the public have access to the most recent, timely and exciting science results and major mission milestones. The individual EPO efforts associated with each space science mission are affiliated through thematic Education Forums, either Heliophysics, Planetary Sciences, or Astrophysics. The Education Forums provide a key coordinating function, nurturing collaborations between space science mission EPO programmes and other interested partners.

NASA's strategy for EPO within IYA2009

The Education Forums have hosted a series of community discussions with NASA mission EPO Leads and other partners, internal and external to NASA, to help them all contribute to very large programmatic events within IYA2009. These community discussions brought together experts representing NASA Headquarters, space science missions, schools, museums, professional societies, and other related organisations. Each of these partners brings their own resources and key expertise to the NASA IYA2009 effort. The outcome of these meetings has been the development of an overarching SMD IYA2009 strategy, and identification of a number of targeted activities.

The cornerstone of the NASA SMD strategy for IYA2009 is to ensure alignment with the US themes and goals, while contributing a wealth of resources, projects, and infrastructure already in the NASA family of education and public outreach partners and programmes. NASA will capitalise on the public's interest and excitement about space science missions and discoveries through major mission milestones, like spacecraft launches, and through existing programmes, like professional development workshops for teachers. The NASA SMD IYA2009 effort will be accessible through the internet via a portal website, now in development.

Highlights from the NASA calendar

The NASA SMD EPO Community has compiled a calendar of major space science mission milestones that are naturally engaging for the public, and that provide great targets of opportunity for focusing IYA2009 programmatic interest. For example, in late 2008, *Servicing Mission 4* will greatly expand the capabilities of the *Hubble Space Telescope*. Early in 2009, the *Kepler* mission will launch, and begin its search for Earth-size planets. It will continue transmitting data throughout the IYA2009 year. In February of 2009, there will be a thrilling artificial impact on the Moon, as the companion payload to the *Lunar Reconnaissance Orbiter* strikes the surface. And July 2009 marks the 40^{th} anniversary of the *Apollo* Moon landing.

Specific activities supporting US IYA themes

The community is working together to identify a series of activities that can be leveraged to support one or more of the US IYA2009 themes. These cover a wide range of subject matter from spacecraft to the possibilities for life elsewhere in the Universe, and are presented through diverse channels including multimedia shows, podcasts, and live events. They target a number of different audiences including science centres, classroom teachers, planetariums, out-of-school time programmes, and more.

Current plans for featured activities include an unveiling of large-scale prints of celestial objects; multimedia broadcast programmes; and professional development workshops. NASA and the Space Telescope Science Institute will kick off the IYA2009 at various museums, science centres and schools with the public unveiling of large-scale images from the *Hubble Space Telescope, Spitzer Space Telescope and Chandra X-ray Observatory*. This event will also promote public observing opportunities including *Night Sky Network* star parties and use of *MicroObservatory* online telescopes. Within the US *Sharing the Universe Through New Technology* theme, NASA will host radio and podcast programmes around the topic *Are We Alone?* These programmes will be used to build awareness of IYA before and throughout 2009. They will be hosted by Dr. Seth Shostak of the SETI Institute, and will focus on recent research relevant to IYA and NASA's scientific explorations of the Universe. Targeting *The Universe for Classrooms and Families* theme, NASA will highlight its ongoing professional development opportunities for educators. This will include plenary speakers at major conferences, and coordinating workshops among mission EPO programmes for both classroom educators and out-of-school time programmes.

Where to learn more

The NASA SMD primary point of contact for the IYA is Dr. Hashima Hasan[1]. Her deputy for the effort is Doris Daou. Dr. Denise Smith, Mary Dussault and Leslie Lowes are the NASA Forum leads responsible for coordinating the planning and implementation of the programme. As the programme continues to take shape, a specific internet portal will be put in place to access the NASA SMD effort.

[1] hhasan@nasa.gov

Credit: Sze-leung Cheung

STARRY CITIES and ASTROLIES – Books to communicate with the public

Natasa Stanic
Public Observatory and Planetarium – Astronomical Society "Rudjer Boskovic"[1], Belgrade (stanic.natasa@gmail.com)

Abstract

Extragalactic worlds have been presented as star cities in a book of original design – *STARRY CITIES – galaxies and time travel*, the first book about galaxies written in Serbian for the general public. This book isn't written just for those interested in science, but for all kind of artists, philosophers and thinkers. A second book, *ASTROLIES* deals with common confusions concerning astronomy and astrology. These two books don't only offer interesting illustrations, data from the latest astronomical observations and currently accepted cosmological theories – they induce, by provoking curiosity in a specific and witty way, a sense of adventure and a challenge to explore.
The publisher of both books is the oldest and the biggest publisher of text-books in Serbia, *Zavod za udzbenike i nastavna sredstva*[2], currently celebrating 50 years in publishing (1957-2007). They already publish a dozen books in popular astronomy, but a special astronomical series for the general public was introduced in 2004. *STARRY CITIES* and *ASTROLIES* are part of the ongoing multidisciplinary project *Astronomy. Inspiration*. Art that started at the end of 2004 at the Public Observatory in Belgrade. This project intends to inspire (or perhaps even "infect") artists with cosmic themes and the fantastic scenery of the Universe.

STARRY CITIES – galaxies and time travel

This book is a story about galaxies by Stanic (2004), and includes not only the first ideas that appeared about "island universes", the evolution of some of the ideas, the story of the first galaxy to be discovered and the Hubble Deep Field galaxies, but, at the beginning of each chapter, also contains poems inspired by astronomical phenomena, as a wonderful bridge between the human mind and the vastness of space. On the first page there are verses by Edgar Alan Poe: *Here I opened wide the door – Darkness there and nothing more*.

The Universe as a whole and its evolution, as well as the possibility of Multiverses, has been described in Chapter Seven. Just: *Imagine you sink upwards, to the vast space abyss, among the crystals of light...* – Antic (1986).

The back cover states: *Starry Cities are the sparkling soul of the Universe and contain all the visible matter that has been ever created. Every single page takes you on a journey through the*

[1] http://www.adrb.org
[2] http://www.zavod.co.yu

mutually inspired worlds of art and science, imagination and reality. You shouldn't be just a reader, even a peaceful, intelligent and enthusiastic one, but a real "star detective" investigating a case of the known and the unknown and share the results with someone else. Does the sky ever end? Who knows? But don't miss a chance to travel with this book through the dark night to the beginning (and the end) of space-time.

In order to inspire the youngest generation of readers to get involved in science, Chapter Eight introduces 14 real, young and smiling "star detectives" who live and do their research in Serbia at the Astronomical Observatory, Faculty of Mathematics, Petnica Science Center and Public Observatory and Planetarium (Belgrade).

The book's illustrations and artwork are the work of Aleksandra Jovanic (master of art and mathematician, University of Art, Belgrade), Marica Radojcic (professor of Programming and Mathematics at Faculty of Mathematics and professor of Digital Art at University of Art, Belgrade), Petar Kubicela (academic painter, telescope maker and high school professor of Drawing and Mathematics, Novi Sad) and Jose Francisco Salgado (Astronomer, Adler Planetarium, Chicago).

The last chapter shows eight amazing artistic visions of "star detective: star cities" by three of the most important artists who have given, together with the book designer Deniza Letic (master of art), an incredible energy and unique design to this book: Aleksandra Jovanic, Marica Radojcic and Jose Francisco Salgado.

ASTROLIES

Unfortunately, even at the beginning of the 21st century the general public still confuses the terminology of astrology and astronomy, as well as methods of testing within these disciplines. Confusions between astronomy and astrology have never been studied in enough detail from the historical, scientific and psychological point of view at the same time, Stanic and Tadic (2005). In an era that has seen the very aggressive expansion of horoscopes and other kinds of superstition and quasi science in the media, the authors feel an obligation to explain the difference between a rational and irrational conception of the world.

In the first chapter there is a table that directly compares the astronomical and astrological interpretations of the five planets, the Sun and the Moon. An introduction to the celestial sphere, constellations and the Zodiac are given too. Astrology appeared in the mythological epoch of human history when no scientific proof was necessary. But with the beginning of the modern era in astronomy and from the work of such scientists as Copernicus, Brahe, Kepler and Galileo Galilei, science has given many essential explanations about the world we live in that are so convincing that nobody should believe in horoscopes today.

[3] http://www.zavod.co.yu

Important contributions to this book have been made by eminent professional astronomers who have given their own opinions about astrology: Milan M. Cirkovic (Cosmologist at the Astronomical Observatory Belgrade), Aleksandar Kubicela (Astrophysicist at the Astronomical Observatory Belgrade), Miodrag Dacic (Astronomer at the Astronomical Observatory Belgrade) and Jose Francicso Salgado (Astronomer at the Adler Planetarium, Chicago). The cover page artwork was created by Jose Francisco Salgado & Natasa Stanic.

Clear conclusions and suggestions are given at the end of the book: common people need much more news from the latest astronomical events and astonishing cosmic phenomena in the media instead of such "mental drugs" as astrology and numerology. Furthermore, the general public as a whole need to experience modern planetarium technology and see how it can present, in an extraordinary and unforgettable way, all the achievements of telescopes (on the Earth and in orbit), space probes and scientific theories in so called "3D cinema".

References

- Stanic N. (2004), Starry Cities – galaxies and time travel. Zavod za udzbenike i nastavna sredstva, Belgrade, Serbia
- Stanic N., Tadic M. (2005), Astrolies. Zavod za udzbenike i nastavna sredstva, Belgrade, Serbia

www.zavod.co.yu

Figure 1 – Cover page of book "Starry cities", (by Natasa Stanic) published by Zavod za udzbenike i nastavna sredstva, 2004, Belgrade.

Figure 2 – Cover page of book "Astrolies", (by Natasa Stanic & Milutin Tadic) published by Zavod za udzbenike i nastavna sredstva, 2005, Belgrade.

Credit: Sze-leung Cheung

The International Year of Astronomy in Serbia

Natasa Stanic
IYA2009 SPoC, Public Observatory and Planetarium – Astronomical Society "Rudjer Boskovic"[1], Belgrade
(stanic.natasa@gmail.com)

Abstract

The central institution in Serbia involved in the preparations for the International Year of Astronomy 2009 (IYA2009) is the Astronomical Society "Rudjer Boskovic" (ASRB) Belgrade, the oldest astronomical society in Serbia and one of the oldest in the Balkans (founded in 1934). ASRB has published the astronomical magazine *VASIONA* (Universe) since 1953. This is the oldest magazine in Serbia for the popularisation of astronomy and science in general. The most important activities in the ASRB public outreach programme are based on ongoing programmes and projects at the Public Observatory (founded in 1964) and the Planetarium (founded in 1969). The National Node has been working on a detailed plan to enrich ongoing projects and organise special IYA2009 events (public observations and lectures, 100 hours of astronomy, special TV shows and broadcasting programmes, concerts and exhibitions) all over the country, coordinating more than 20 amateur astronomical societies. It also should be noticed that in 2009, the year of celebrating astronomy, the Astronomical Society "Rudjer Boskovic" celebrates three important anniversaries – 75 years since its foundation, 45 years of the Public Observatory and 40 years of the Planetarium.

Ongoing projects and IYA2009 preparation at the Public Observatory and the Planetarium

The Public Observatory and the Planetarium are situated in the Kalemegdan Fortress[2] (built in the XIV-XVth century), surrounded by a beautiful park in Belgrade, on the top of the hill near the confluence of the Sava and the Danube. Over the past four decades these two institutions – unique for Serbia and in the region of the Former Yugoslavia – have been visited by more than 2 million people. Nowadays the ASRB still has about 30,000-40,000 visitors per year, although no longer so many as in the time of the former Yugoslavia with its six united republics.

Astronomical programmes and projects at the ASRB have been developed over the last 40 years and have significantly improved in last three years. The number of employees – four – has not changed since the beginning of the ASRB. In order to develop public outreach at the ASRB, a new organisational structure has been developed that includes at least 12 employees, including a technical staff, a marketing department, an educational department, an observational department and an administration.

[1] http://www.adrb.org
[2] http://www.beogradska tvrdjava.co.yu; http://razgledanje.tripod.com/tvrdjava

1. Public Astronomy Classes – Open Astronomy Course: 22 lectures free of charge and open to the public in semi-annual cycles, starting in March and September. Standard lectures: The sky above our head, Constellations, Time zones and the astronomical definition of the day and year, the Earth and Moon, Earthlike planets, Giant planets, Satellites of giant planets, Asteroids and comets, the Kuiper belt beyond Neptune and the Comet cloud (Oort Cloud), the evolution of the Solar System, Extrasolar planets, the Sun, Stars, Evolution of small stars, Evolution of massive stars – black holes and neutron stars, Milky way components, Dark matter in the Milky Way, Classification of galaxies and active galactic nuclei, Galaxy clusters and the large scale structure of the Universe, the Evolution of the Universe, Cosmological theories, Extraterrestrial life. The average number of visitors per lecture is 60-80. This programme will be a part of the IYA2009 Cornerstone Project, the *Portal to the Universe*.

2. Planetarium projections. Standard planetarium projections for schoolchildren, students and general public have been improved with additional PowerPoint presentations that tell short stories about the Universe and its evolution.

3. Belgrade Astronomical Weekend. This is a 25 year old event that attracts all amateur astronomers (and amateur astronomical societies) from Serbia. Usually, six to ten public lectures (by invited speakers, eminent astronomers) about the hottest astronomical topics (new discoveries and theories) are given every year at the Planetarium during the last weekend in June. In the evening after the lectures public observations are organised at the Public Observatory, or an observational expedition far from the city lights can be undertaken. This event will easily become a part of the IYA2009 Cornerstone Project, *100 hours of astronomy*.

4. Summer astronomical meeting. This event is more than ten years old. Each year some specific widely discussed astronomical topics are chosen and five special lectures are given about the topics. The lectures are usually held in the Planetarium on Friday evenings at the end of August. The summer meeting in 2007 discussed extraterrestrial life (communications, UFO problems and related philosophical and religious problems). This programme will be a part of the IYA2009 Cornerstone Project *Cosmic Diary*.

5. Summer School of Astronomy. The Summer School began in 2002 and is now one of the most popular ASRB programmes for the younger generation. The School lasts for 7-8 days at a selected Serbian mountain site and consists of a theoretical part (30-35 lectures given by young ASRB associates) during the day and practical astronomical observations at night. This event will also fit into the IYA2009 Cornerstone Project, *100 hours of astronomy*.

6. Public Observations – Every Friday and Saturday evening for 43 years of, since the first telescopes were installed at the top of the Dizdar's Tower (adapted and reconstructed for the Public Observatory), volunteers and associates of ASRB have demonstrated objects in the night sky introducing telescopes, interesting celestial bodies and astrophysical phenomena to the general public. The programme takes place every Friday and Saturday from sunset to 10 pm. This programme will be connected to the IYA2009 Cornerstone Project, *Portal to the Universe*.

7. Advanced Course for talented children – astronomical Olympiads. This programme started in 2005 and in just three years, the Serbian astronomical team has won 13 medals at the International Astronomical Olympiads. At the last Olympiad (Semeiz, Ukraine) Serbia won 2 gold, 2 silver and 3 bronze medals. This advanced course begins in January and lasts until October. Theoretical lectures and practical astronomical observations are given at the Public Observatory on Saturday afternoons. This programme could also be connected to IYA2009 Cornerstone Project, *Portal to the Universe*.

8. Teachers' Training Programme – New Project. The Serbian Ministry of Education has officially accepted this project and included it in the Catalogue of training courses for teachers in Serbia. The first course was held at the Public Observatory in May 2007 with 25 teachers from Belgrade and other Serbian towns. The course lasts 2-3 days and includes 20 theoretical lectures, 6 hours of practical observations and 4 hours of discussion. This programme could become a part of the IYA2009 Cornerstone Project, *Galileo Teacher Training Programme*.

9. Science Fiction Course – New Project. During the winter season 15 lectures will be given at the Public Observatory, once a week. This programme will be connected to IYA2009 Cornerstone Project *Universe Awareness*.

10. Multidisciplinary studies – Astronomy. Inspiration. Art. – New Project. The main goal of the project is to gather together artists and scientists to talk about the Universe and to inspire each other. This programme will be connected to the IYA2009 Cornerstone Projects: *Universe Awareness* and *The Universe from the Earth – An Exhibit of Astronomical Images*.

stanic.natasa@gmail.com

Figure 1 – Webb-SHARE.

Credit: Sze-leung Cheung

Looking Up – An overview of astronomy education in the UK and its impact on the wider communitiy.

Sotira Trifourki[1,2]
[1] SETPOINT Greater Manchester, University of Salford (sotira@stemsalford.org)
[2] Cosmos Media Educational Trust (sotira.cosmosmedia@yahoo.co.uk)

Abstract

In this poster the author gives an overview of the educational activities in the UK that can be used as case studies for planned activities for the International Year of Astronomy 2009. Activities and events in schools, teacher training centres, museums and science centres, have been provided and the knock-on effects of this level of engagement are described with encouraging results from the participation of hard to reach audiences in deprived communities.

Introduction

Each of the four UK nations has its own unique curriculum. All regions share similarities and exhibit differences in the way that science is taught in each area. The introduction of a newly revised science syllabus this year saw the addition of a large amount of astronomical based content into the national syllabus with the emphasis on using astrophysical topics in *How Science Works*, and *Astronomy and Industry* based themes. Secondary schools also have the opportunity to include GCSE Astronomy as an option for study for the first time.

Discussion

The large shift introduced by placing astronomy on the UK's regional national curricula in a relatively short space of time, has meant that teachers unfamiliar with astronomy are desperate to find materials and textbook sources to teach the subject. To support these changes and to guide teachers and pupils in the right direction for information on educational programmes and associated learning materials, the UK has sought to create its first set of space and astronomy education offices. In October 2006 the Northern Ireland Space Education office (NISO)[1], based at the Armagh Planetarium[2], opened as one of the first science centres to have actively influenced a curriculum directly, with astronomy and space science to be presented in schools as from September 2008. NISO aims to build on the interest and enthusiasm of teachers already involved in astronomy and space science projects by developing resources to support all teachers in aligning the potential offered by developing technologies to the requirements of the revised Northern Ireland Curriculum. The resulting resources, support materials and thematic units created by NISO for the new curriculum will use the context of astronomy and space science to relate science, technology, engineering and mathematics (STEM) to real life.

Events and activities for IYA2009

The activities target audiences that would not normally have had the opportunity to participate in astronomy education-related and communication outreach events. Attempts to provide activities

[1] http://spaceconnections.net
[2] http://armaghplanetarium.com

for all members of the community; from schools, science learning centres and science centres to community groups will have the knock-on effect of engaging the family members of the school pupils involved and getting them to join in the events through working with local community leaders.

Activities include:

- Children's Master classes and teacher training workshops to incorporate hands-on learning activities for pupils from the ages of 5 to 16.
- Class twinning and e-twinning through messaging software such as Skype, MSN and the Xplora portal community chatroom features.
- A planned stage show to be performed at concert arena venues for IYA2009. The Stage Show will be a two year event starting with workshop activities taken into schools where the stage show will be created by the pupils themselves. Pupils will then learn how to create a stage production from scratch accompanied by educational activities incorporating the science curriculum set in a cross-curricula interdisciplinary theme.
- Creation of cartoons, planetarium movies, and animations, all done by children and community members attending the workshops.
- Role Play, Theatre and Dance Workshops fusing creative media, music and street dance with traditional aspects of astronomy.
- A One-Stop Shop of Astronomy Education resources with a built-in virtual learning environment and repository for multimedia teaching materials and resources.

Astronomy related resources to support communication and outreach

- Creation of a CD-ROM and DVD of teaching materials and multimedia resources for Primary and Secondary Schools.
- Implementation of a new national programme to support both primary and secondary teachers in providing regional in-house training (INSET), workshops for specific subject areas and recognised accreditation to count towards their Career Professional Development.
- Provision of teaching materials and resources encouraging cross-curricula aspects embracing creative learning.
- Extension of the current Teacher/Scientist Network.

Looking towards IYA2009

Cosmos Media[3] is preparing a journal in collaboration with the Association for Astronomy Education to support astronomy education in the UK. The ASE is an education publisher, producing textbooks and resources on behalf of organisations and offering these for purchase through the ASE bookshop. The newly-launched Astronomy Education and Outreach Resource Centre operated from the SETPOINT[4] office in greater Manchester in partnership with the University of Salford and the University of Manchester will act as a drop-in centre for teachers, learners, science communicators and local businesses.

The programme has been successfully piloted to a number of schools across the North West region with a total of over 500 schools to date participating in the teacher training and pupil hands-on activities.

---

[3] http://www.cosmosmagazine.tv
[4] http://www.stemsalford.org

Astronomy and the developing world

Barbara Villone
Istituto di Fisica dello Spazio Interplanetario Torino, Istituto Nazionale di Astrofisica, Torino (villone@ph.unito.it)

Abstract

Today Astronomy is studied by a small number of researchers. Although there is general interest in astronomy, it is difficult for the general public to gain access to information and knowledge on the subject…The institution of the International Year of Astronomy could provide a solution to the problem by providing a scientific basis for the traditional and cultural perception of the sky. It could also encourage scientific research in the field.

These words are taken from the *Proclamation of the International Year of Astronomy* by UNESCO in 2005 and should encourage activity in astronomy in and for developing countries. There is no undisputed definition of a developing country, as it involves a complex evaluation of much data: in this work, I will use the International Statistical Institute evaluation[1].

The International Astronomical Union (IAU[2]) has promoted and safeguarded the science of astronomy in all its aspects through international cooperation since 1919. It has both Individual and National Members and is a professional institution. The IAU is also active in the promotion of astronomical education and research in developing countries. At the moment only 25% of the National Members of IAU are developing countries. Of course, developing countries are underrepresented: only 10% of all developing countries are present in the IAU. Nevertheless, for example, India, China and Iran etc., which count as developing countries, have a very ancient astronomical tradition and some are still very active. The fact that just under 5% of the participants officially listed in the CAP2007 web page come from developing countries is enlightening: one can hope that the IYA2009 will be a good opportunity to improve this situation.

What is the relation between astronomy research and people from developing countries, who live near a big international experiment? Is there some outreach to local communities? Three examples illustrate the typical situation.

The Astrophysical Radiation with Ground-based Observatory (ARGO) at Yang Ba Jing in the high mountains of Tibet is a China–Italy collaboration, which also involves the Tibetan University of Lhasa. ARGO is based at 4300m above sea level, in a small Tibetan village. It studies gamma-ray astronomy by performing a systematic search of steady sources. The high altitude allows the maximum size development of low energy showers and the site coordinates permit the Northern

[1] si.cbs.nl/tinbergen/developing.htm
[2] www.iau.org

Hemisphere to be monitored in the declination band between -10° and 70°. The village is very small and the Tibetan people marvellous. However it seems that only a few local people are involved in the experiment.

In Namibia, Africa, the High Energy Stereoscopic System (H.E.S.S) studies very high energy gamma rays. H.E.S.S is a very good experiment, whose results have been published in over 30 research articles in prestigious journals. H.E.S.S was awarded the 2006 Descartes Prize for research, together with two other European projects. Namibia was chosen as an ideal site for optical astronomy with many clear nights and a dark sky. The mild climate makes operations at the telescopes easy. The H.E.S.S. project involves about 100 scientists from Germany, France, the UK, Ireland, Poland, the Czech Republic, Armenia, South Africa and Namibia. *A key component in the decision to use the Gamsberg site was the participation of the University of Namibia. Construction and operation of H.E.S.S. is defined and supported by an Exchange of Notes by the Namibian and the German governments, and by cooperation and agreement between the University of Namibia and H.E.S.S institutes.* However, it seems that only some technicians from Namibia work there. But hopefully this excellent experiment could foster an interest in astronomy for Namibia University and other Namibian schools.

As a very good example of fruitful relations between an experiment and local activities I would cite the Auger Observatory, funded, among others, by UNESCO, which is based at Malargue in Mendoza, Argentina. Even if Argentina is not a developing country, this is a good example because Malargue is a rather isolated, not prosperous town. Auger searches for the unknown sources of the highest-energy cosmic rays and it is now very much appreciated by the locals, *who understand that the Auger Project will certainly not bring the kind of prosperity of the oil boom but see other, less tangible, but important benefits. They appreciate the close association with Auger scientists and engineers and the contacts with the outside world… Amid the discouragement and hardship of Argentina's economic crises, these connections keep spirits up and serve as a source of hope for the future*, as Mantsch (2002) writes. Outreach and education were seriously considered by the Auger Observatory: it was felt that a real effort to include the local population in the Observatory in every way possible should be made. As Swain (2000) records, plans included a lot of printed information with posters, art work by local artists, cartoons etc. at the site; while activity in the Malargue area was devoted to visiting the schools, press releases, public lectures, the inclusion of schoolteachers in the project, the organisation of possible internships, parties, Saturday programmes for interested students, writing popular articles, and even local football matches. The experiment is now very well integrated with the local population.

In conclusion, the International Year of Astronomy is a precious opportunity to involve local people in all developing regions and interest them in different aspects of astronomy. However outreach specialists should be aware that every culture has different sensitivities and history that should be respected.

References

- Mantsch P. (2002), Fermi News, Volume 25, 1 Feb., 2002, N. 2
- Swain J. (2000), Notes on Public Relations for the Pierre Auger Observatory, www.auger.org/admin/GAP_Notes/GAP2000/GAP_2000_013.pdf

The Society for Space and Astronomy at Volos, Greece

L. Zachilas[1], P.A. Patsis[2] & C. Mavrommatis[3]
[1] University of Thessaly, Volos, Greece
[2] Research Center for Astronomy, Academy of Athens, Greece (patsis@academyofathens.gr)
[3] Society for Space and Astronomy, Volos, Greece

The Society for Space and Astronomy was founded in Volos, Greece, in 1992 and now has more than 500 members, both in Greece and abroad. Approximately one third of its members are high school students.

Since it was founded, the Society has issued its own magazine, *Ouranos* (The Sky), with subscribers in Greece, Europe and the United States. The Society holds meetings and discussions on issues concerning astronomy every Sunday evening in the yard of the 1st Volos High School. Members can also borrow books, maps, slides, videotapes, CDs, DVDs and similar material from the Society's library.

Each month the Society holds *Astronomy Courses for All*, open not only to its members, but to anyone interested in astronomy. Every summer the Society organises a Summer School on *Popular Astronomy*. The school is attended by more than 60 participants and the subjects covered include: planetary systems, star morphology and evo-lution, galactic dynamics and morphology, cosmology and observational techniques. On the first night of the Summer School the students meet at Hania, on Mount Pelion, where they can observe or take photographs of planets, nebulae, galaxies etc. using telescopes belonging to the Society and its members.

Each year the Society organises the pan-Hellenic *School Competition in Astronomy* and hosts a special prize-giving evening for the winners. Each year since 2000, two winners, one boy, one girl, have visited the US Space and Rocket Center at Huntsville, Alabama. The top five students also participated in the International Olympiad on Astronomy and Astrophysics since 2007. The 1st IOAA took place in Thailand and Greece won a bronze metal.

The Society's activities include visits to sites with astronomical interest and scientific lectures. The Society also has its own sun clock in the yard of the 1st Volos High School.

The website keeps members and all friends of astronomy up to date with the activities of the Society.

Credit: Raquel Shida

Credit: Sze-leung Cheung

List of Participants

Abbott, Brian	American Museum of Natural History	USA	abbott@amnh.org
Acker, Agnes	Observatoire Astronomique, Universite Louis Pasteur de Strasbourg	France	acker@astro.u-strasbg.fr
Adams, Mark	NRAO	USA	mtadams@nrao.edu
Ahn, Young Sook	Korea Astronomy & Space Science Institute(KASI)	Republic of Korea	ysahnn@kasi.re.kr
Alarcon, Minella	UNESCO	France	m.alarcon@unesco.org
Albanese, Lara	Arcetri Astrophysical Observatory (INAF)	Italy	albanese@arcetri.astro.it
Altamore, Aldo	Physics Department "E. Amaldi", Università Roma Tre	Italy	altamore@fis.uniroma3.it
Alvarez, Rodrigo	Planetarium of the Royal Observatory of Belgium	Belgium	rodrigo.alvarez@oma.be
Alvarez–Pomares, Oscar	Direction of Sciences, Ministry of Science, Technology and Environment (CITMA)	Cuba	oscar@citma.cu
Annuk, Kalju	Tartu Observatory	Estonia	annuk@aai.ee
Arcand, Kimberly	Smithsonian Astrophysical Observatory	USA	kkowal@cfa.harvard.edu
Argandona, Gonzalo	ESO / Chile	Chile	gargando@eso.org
Arosio, Ilaria	INAF — Osservatorio Astronomico di Brera	Italy	ilaria.arosio@brera.inaf.it
Bajtlik, Stanislaw	Copernicus Astronomical Center, Warsaw, Poland	Poland	bajtlik@camk.edu.pl
Barrosa, Mariana	Europlanet | Nagar Foundation	Portugal	mariana.barrosa@multimeios.pt
Bartlett, Cheryl	Institute for Integrative Science and Health, Cape Breton University	Canada	cheryl_bartlett@cbu.ca
Bassett, Isobel	South African Astronomical Observatory	South Africa	isb@saao.ac.za
Benacchio, Leopoldo	INAF — Istituto Nazionale di Astrofisica	Italy	leopoldo.benacchio@oapd.inaf.it
Blasco, Carmen	Instituto Nacional de Tecnica Aeroespacial (INTA)	Spain	cblasco@laeff.inta.es
Boccato, Caterina	INAF — Astronomical Observatory of Padua	Italy	caterina.boccato@oapd.inaf.it
Boffin, Henri	ESO	Germany	hboffin@eso.org
Bokovos, George	Noesis — Thessaloniki Science Center	Greece	bokovos@noesis.edu.gr
Bosler, Tammy	National Science Foundation	USA	tbosler@nsf.gov
Botti, Thierry	Observatoire de Marseille	France	thierry.botti@oamp.fr
Boyle, Alison	The Science Museum, London	United Kingdom	alison.boyle@sciencemuseum.org.uk
Bravo–Alfaro, Hector	Departamento de Astronomia, Universidad de Guanajuato	Mexico	hector@astro.ugto.mx
Bretherton, Claire	Royal Observatory, Greenwich	United Kingdom	cbretherton@nmm.ac.uk
Cabezón, Sergio	AUI/NRAO	Chile	scabezon@nrao.cl
Cesarsky, Catherine	European Southern Observatory	Germany	ccesarsk@eso.org
Chen Chen, Lau	National Planetarium of Malaysia	Malaysia	lau@angkasa.gov.my
Cheung, Sze–leung	Ho Koon Nature Education cum Astronomical Centre	Hong Kong — China	csl@hokoon.edu.hk
Chochol, Drahomir	Astronomical Institute of the Slovak Academy of Sciences	Slovakia	chochol@ta3.sk
Christensen, Lars Lindberg	ESA/Hubble	Germany	lars@eso.org

Christian, Carol	Space Telescope Science Institute	USA	carolc@stsci.edu
Correa, Nathalia Silva Gomes	Observatorio do Valongo — UFRJ/ Brazil	Brazil	nathaliacor@hotmail.com
Crabtree, Dennis	Gemini Observatory	Chile	dcrabtree@gemini.edu
Crawford, Carolin	Institute of Astronomy, Cambridge University	United Kingdom	csc@ast.cam.ac.uk
Cruz, Maria	Liverpool JMU — Astrophysics Research Institute	United Kingdom	mxc@astro.livjm.ac.uk
Cuesta, Luis	Centro de Astrobiologia (Instituto Nacional de Tecnica Aeroespacial)	Spain	cuestacl@inta.es
Cuillandre, Jean–Charles	Canada — France — Hawaii Telescope Corp.	USA	jcc@cfht.hawaii.edu
Cutispoto, Giuseppe	INAF — Catania Astrophysical Observatory	Italy	gcutispoto@oact.inaf.it
Czart, Krzysztof	Astronomia.pl — Polish Astronomy Portal	Poland	k.czart@astronomia.pl
Damineli, Augusto	Inst. de Astron. Geof. e Ciencias Atmosfericas da USP	Brazil	damineli@astro.iag.usp.br
Daou, Doris	NASA	USA	Doris.Daou-1@nasa.gov
Del Puerto, Carmen	Instituto de Astrofisica de Canarias & Dept. Astrofisica Universidad de la Laguna	Spain	cpv@iac.es
Delivorias, Alex	Eugenides Foundation Planetarium	Greece	alexd@eugenfound.edu.gr
Deustua, Susana	American Astronomical Society	USA	deustua@stsci.edu
Diego, Francisco	University College London, Dept Physics and Astronomy	United Kingdom	fd@star.ucl.ac.uk
Doran, Rosa	GHOU / NUCLIO	Portugal	rosadoran@gmail.com
Dultzin, Deborah	Instituto de Astronomia Universidad Nacional Autonoma de Mexico	Mexico	deborah@astroscu.unam.mx
Dyer, Ian	Global immersion Ltd	UK	ian.dyer@globalimmersion.com
Edwards, Pete	Durham University, United Kingdom	United Kingdom	p.j.edwards@durham.ac.uk
Emmart, Carter	Rose Center / American Museum of Natural History	United States	carter@amnh.org
Evans, Gary	Science Photo Library	United Kingdom	gary.evans@sciencephoto.com
Ferlet, Roger	Institut d'Astrophysique de Paris	France	ferlet@iap.fr
Fienberg, Richard	Sky & Telescope	USA	rfienberg@SkyandTelescope.com
Fischer, Daniel	Interstellarum Magazine	Germany	dfischer@astro.uni-bonn.de
Freitas Mourao, Ronaldo Rogerio de	Museu de Astronomia e Ciencias Afins	Brazil	mourao@ronaldomourao.com
Fulco, Maria Teresa	INAF — Osservatorio Astronomico di Capodimonte — ITALY	Italy	mtfulco@na.astro.it
Gallego–Calvente, Aurelia Teresa	Astronomical Observatory, Univ. of Valencia	Spain	teresa.gallego@uv.es
Galli, Daniele	INAF Osservatorio Astrofisico di Arcetri	Italy	galli@arcetri.astro.it
Garcia, Antonieta	AURA — GEMINI OBSERVATORY	Chile	agarcia@gemini.edu
Garnier, William	ALMA	Chile	wgarnier@alma.cl
Gauthier, Adrienne	Steward Observatory, University of Arizona	USA	agauthier@as.arizona.edu
George , Martin	International Planetarium Society	Tasmania, Aus-tralia	martingeorge3@hotmail.com
Gilchrist, Eleanor	Royal Observatory, Edinburgh	United Kingdom	efg@roe.ac.uk
Godunova, Vira	International Center for Astronomical, Medical & Ecological Research	Ukraine	godunova@mao.kiev.ua
Gogus, Ersin	Sabanci University	Turkey	ersing@sabanciuniv.edu
Goudis, Christos	National Observatory of Athens	Greece	cgoudis@astro.noa.gr
Govender, Kevindran	South African Astronomical Observatory / Southern African Large Telescope	South Africa	kg@saao.ac.za
Greene, Michael	Jet Propulsion Laboratory	USA	michael_greene@mindspring.com

Grice, Noreen	You Can Do Astronomy LLC	USA	noreen@youcandoastronomy.com
Haley, Paul	The SHARE Initiative	United Kingdom	PAHAstro@aol.com
Hansen, Frode	Institute of Theoretical Astrophyics, University of Oslo	Norway	frodekh@astro.uio.no
Harvey, Janice	AURA — GEMINI Observatory	USA	jharvey@gemini.edu
Hasan, Hashima	NASA Headquarters	USA	hhasan@nasa.gov
Hawkins, Isabel	UC Berkeley Space Sciences Laboratory	USA	isabelh@ssl.berkeley.edu
Hesser, Jim	NRC — HIA	Canada	Jim.Hesser@nrc-cnrc.gc.ca
Heyer, Inge	Joint Astronomy Centre	USA	inge_heyer@yahoo.com
Hill, Robert	Northern Ireland Space Office	Northern Ireland	rabhill@hotmail.com
Hillier, Dan	Royal Observatory Edinburgh, Visitor Centre	United Kingdom	djh@roe.ac.uk
Huchim, Jose	Instituto Nacional de Antropologia e Historia	Mexico	xailh@hotmail.com
Huettemeister, Susanne	Planetarium Bochum / Ruhr — Universitaet Bochum	Germany	huettemeister@planetarium-bo-chum.de
Hurt, Robert	Spitzer Science Center	USA	hurt@ipac.caltech.edu
Isbell, Douglas	National Optical Astronomy Observatory	USA	disbell@noao.edu
Jacobsen, Aase R.	Steno Museum planetarium	Denmark	aase.jacobsen@si.au.dk
Jacoby, Suzanne	LSST Corporation	USA	sjacoby@lsst.org
Janssen, Chris	Europlanetarium	Belgium	chris@europlanetarium.com
Jonas, Lindqvist	SCISS AB	Sweden	staffan@sciss.se
Kaneko, Yuki	TEV Inanc Turkes Ozel Lisesi	Turkey	yuki.kaneko@nasa.gov
Kapadia, Amit	ESA/Hubble	Germany	akapadia@eso.org
Katalin, Olah	Konkoly Observatory of the Hungarian Academy of Sciences	Hungary	olah@konkoly.hu
Katsafylloudi, Eleni	Thessaloniki's Omilos Filon Astronomias	Greece	6977699792@mycosmos.gr
Kleidis, Stelios	EAE / Zagori Observatory	Greece	steliosklidis@gmail.com
Konstantinides, Stefanos	vDimension	Greece	stefanos.konstantinidis@gmail.com
Kouveliotou, Chryssa	NASA/MSFC	USA	chryssa.kouveliotou@nasa.gov
Kovalenko, Nataliya	Kiev Planetarium	Ukraine	kievplanet@ukr.net
Krishnamurthi, Anita	University of Maryland & NASA Goddard Space Flight Center	USA	Anita.Krishnamurthi@nasa.gov
Krone–Martins, Alberto	Inst. de Astronomia Geof. e Ciencias Atmosfericas da USP	Brazil	algol@astro.iag.usp.br
Laskarides, Paul	Greek National Committee for Astronomy	Greece	plaskar@phys.uoa.gr
Lawton, Christopher	Scientific Directorate of European Space Agency	Netherlands	Christopher.Lawton@esa.int
Laychak, Mary Beth	Canada-France-Hawaii Telescope	USA	laychak@cfht.hawaii.edu
Lazzaretto, Elena	INAF — Astronomical Observatory of Padua	Italy	elena.lazzaretto@oapd.inaf.it
Le Moli, Soccorsa	Istituto Nazionale di Astrofisica	Italy	lemoli@inaf.it
Lee, DongJoo	Korea Astronomy & Space Science Institute(KASI)	Republic of Korea	marin678@kasi.re.kr
Lee, Kyoung–Suk	Korea Astronomy & Space Science Institute(KASI)	Republic of Korea	cloth79@kasi.re.kr
Levin, Sarah	Universe Awareness, Leiden Observatory	Netherlands	levin@strw.leidenuniv.nl
Lockwood, Sarah	National Maritime Museum	United Kingdom	SLockwood@nmm.ac.uk
Lorenzen, Dirk H.	German Public Radio	Germany	DLorenzen@compuserve.com
Lory, Shana	Renegade Marketing Group	USA	slory@renegade.com
Mahoney, Terence J.	Instituto de Astrofísica de Canarias	Spain	tjm@iac.es
Malin, David	Anglo-Australian Observatory/RMIT University	Australia	david@davidmalin.com

Malkov, Oleg	Institute of Astronomy	Russia	malkov@inasan.ru
Manning, James	Astronomical Society of the Pacific	USA	jmanning@astrosociety.org
Manos, Kitsonas	Eugenides Foundation Planetarium	Greece	mak@eugenfound.edu.gr
Manxoyi, Sivuyile	South African Astronomical Observatory	South Africa	sivuyile@saao.ac.za
Markkanen, Tapio	University of Helsinki, Department of Astronomy	Finland	tapio.markkanen@helsinki.fi
Masiero, Sabrina	INAF — Astronomical Observatory of Padua (Italy)	Italy	sabrina.masiero@oapd.inaf.it
Massey, Robert	Royal Astronomical Society	United Kingdom	rm@ras.org.uk
Matsopoulos, Nikos	National Observatory of Athens	Greece	matsop@astro.noa.gr
McLennan, Ian	Telus World of Science Edmonton	Canada	ian.mclennan@gmail.com
Mendez, Javier	Isaac Newton Group of Telescopes, La Palma	Spain	jma@ing.iac.es
Metaxa, Margarita	Arsakeion	Greece	m-metaxa@otenet.gr
Miley, George	Leiden Observatory	Netherlands	miley@strw.leidenuniv.nl
Mora–Carrillo, Gara	Instituto de Astrofisica de Canarias	Spain	garamora@iac.es
Mosoia, Catalin	Radio Europa FM	Romania	catalin.mosoia@gmail.com
Moussas, Xenophon	University of Athens, Physics Dept., Astrophysics Lab.	Greece	xmoussas@phys.uoa.gr
Napoleao, Tasso	REA — Rede de Astronomia Observacional	Brasil	tassonapoleao@gmail.com
Naranjo, Orlando	Grupo de Astrofisica Teórica. Universidad de Los Andes. Facultad de Ciencias. Departamento de Fisica	Venezuela	naranjoula@yahoo.com
Nielsen, Lars Holm	ESA/Hubble	Germany	lars@holmnielsen-it.dk
Nxumalo, Mdumiseni	UniZul Science Centre	South Africa	zwide@webmail.co.za
Ödman, Carolina	Universe Awareness, Leiden Observatory	Netherlands	odman@strw.leidenuniv.nl
Olthof, Henk	KNVWS	Netherlands	h.olthof@wxs.nl
Ormrod, Gill	PPARC	United Kingdom	gill.ormrod@stfc.ac.uk
Ortiz–Gil, Amelia	Astronomical Observatory — University of Valencia	Spain	amelia.ortiz@uv.es
Pacini, Franco	Arcetri Observatory — University of Florence (Italy)	Italy	pacini@arcetri.astro.it
Parello, Stephanie	Sydney Observatory / Powerhouse Museum	Australia	StephanieP@phm.gov.au
Parker, Tracey	The University of Leicester	United Kingdom	tp57@le.ac.uk
Patkos, Enikö	ESO	Germany	epatkos@eso.org
Patsis, Panos A.	Academy of Athens / Research Center for Astronomy	Greece	patsis@academyofathens.gr
Pedrosa, Antonio	Navegar Foundation	Portugal	apedrosa@multimeios.pt
Pekkola, Marko	Tähdet ja avaruus magazine / Ursa Astronomical Association	Finland	marko.pekkola@ursa.fi
Petersen, Carolyn Collins	Loch Ness Productions	USA	carolyn@lochnessproductions.com
Pierce–Price, Douglas	ESO	Germany	dpiercep@eso.org
Pires, Filipe	Centro de Astrofisica da Universidade do Porto	Portugal	pires@astro.up.pt
Pomierny, Jan	Astronomia.pl — Polish Astronomy Portal	Poland	j.pomierny@astronomia.pl
Pompea, Stephen	National Optical Astronomy Observatory	USA	spompea@noao.edu
Posch, Thomas	Institut fuer Astronomie	Austria	posch@astro.univie.ac.at
Preston, Sandra	The University of Texas McDonald Observatory	USA	sandi@stardate.org
Pu'uohau–Pummill, Kirk	Gemini Observatory	USA	kpummill@gemini.edu
Ratcliffe, Martin	Sky-Skan, Inc	USA	ratcliffe@skyskan.com
Roberts, Sarah	Las Cumbres Observatory Global Telescope (LCOGT)	United Kingdom	sarah.roberts@faulkes-telescope.com
Robson, Ian	UK ATC/ROE	United Kingdom	i.robson@roe.ac.uk

Roche, Paul	Cardiff University	United Kingdom	proche@lcogt.net
Rodriguez Hidalgo, Ines	Instituto de Astrofisica de Canarias, Dept. Astrofisica Universidad La Laguna, Museo de la Ciencia y el Cosmos	Spain	irh@iac.es
Rojo, Patricio	Universidad de Chile	Chile	pato@das.uchile.cl
Ross, Rachel	Las Cumbres Observatory Global Telescope Network	USA	rross@lcogt.net
Russo, Pedro	IAU/IYA2009 / ESA/Hubble	Germany	prusso@eso.org
Saddul–Hauzaree, Sarojiny	Mauritius Astronomical Society	Mauritius	sarojiny@intnet.mu
Sakamoto, Seiichi	Institute of Space and Astronautical Science (ISAS), JAXA	Japan	sakamoto.seiichi@jaxa.jp
Salgado, Jose Francisco	Adler Planetarium	USA	salgado@adlerplanetarium.org
Sánchez-Andrade Nuño, Bruno	Max Planck For Solar System Research / Institut fuer Astrophysik Goettingen	Germany	bruno@astro.physik.uni-goettingen.de
Scorza, Cecilia	Landessternwarte, ZAH	Germany	cscorza@lsw.uni-heidelberg.de
Sekiguchi, Kazuhiro	National Astronomical Observatory of Japan	Japan	kaz.sekiguchi@nao.ac.jp
Seogu, Lee	Korea Astronomy and Space Science Institute	Republic of Korea	sglee@kasi.re.kr
Shida, Raquel	ESA/Hubble	Germany	rshida@eso.org
Sillanpää, Aimo	Tuorla Observatory/Turku University	Finland	aimosill@utu.fi
Sim, Helen	CSIRO and Anglo-Australian Observatory	Australia	Helen.Sim@csiro.au
Simopoulos, Dennis	Eugenides Foundation Planetarium	Greece	dps@eugenfound.edu.gr
Smith, Denise	Space Telescope Science Institute	USA	dsmith@stsci.edu
Smith, Glenn	SkySkan	Germany	smith@skyskan.com
Solomos, Nikolaos	Eudoxos National Observatory for Education	Greece	nsolom@hna.gr
Sosa Mendez, Anselmo	Instituto de Astrofisica de Canarias	Spain	asosa@iac.es
Stanic, Natasa	Belgrade Planetarium / Astronomical Society of Serbia / IYA SPoC Serbia	Serbia	stanic.natasa@gmail.com
Stavinschi, Magda	Astronomical Institute of the Romanian Academy, IAU Com.46	Romania	magda_stavinschi@yahoo.fr
Steel, Simon	Harvard-Smithsonian Center for Astrophysics	USA	sjsteel@cfa.harvard.edu
Stoke, John	Space Telescope Science Institute	USA	stoke@stsci.edu
Trifourki, Sotira	Association of Astronomy Education/ Cosmos Media	United Kingdom	sotira.cosmosmedia@yahoo.co.uk
Tryfona, Catherine	University of Glamorgan	United Kingdom	artrow@glam.ac.uk
Uson, Juan M	NRAO	USA	juson@nrao.edu
Varano, Stefania	Istituto di Radioastronomia	Italy	s.varano@ira.inaf.it
Venner, Laura	Jet Propulsion Laboratory	USA	lv2008@columbia.edu
Verdoes Kleijn, Gijs	Kapteyn Astronomical Institute	Netherlands	verdoes@astro.rug.nl
Vienne, Alain	Institut de Mécanique Céleste et de Calcul des Ephémérides	France	alain.vienne@imcce.fr
Villar–Martin, Montse	Instituto de Astrofisica de Andalucia	Spain	montse@iaa.es
Villone, Barbara Vanda	Istituto di Fisica dello Spazio Interplanetario — Torino	Italy	villone@to.infn.it
Voss, Björn	Planetarium of the Westphalian State Museum of Natural History	Germany	bjoern.voss@lwl.org
Wagner, Susan	Adler Planetarium & Astronomy Museum	USA	swagner@adlerplanetarium.org
Walker, Constance	National Optical Astronomy Observatory	USA	cwalker@noao.edu
Wankerl, Barbara	Cluster of Excellence "Origin and Structure of the Universe"	Germany	barbara.wankerl@universe-cluster.de
Warnstam, Jan	SCISS AB	Sweden	jan@sciss.se
Watzke, Megan	Chandra X–ray Center	USA	mwatzke@cfa.harvard.edu
Wong, Curtis	Microsoft Next Media Research	USA	curtis.wong@microsoft.com

Wyatt, Ryan	California Academy of Sciences	USA	rwyatt@calacademy.org
Yamani, Avivah	Rigel Kentaurus (langitselatan.com)	Indonesia	avivah@rigelkentaurus.org
Yoon, Han Bae	Korea Astronomy & Space Science Institute(KASI)	Republic of Korea	hbyoon@kasi.re.kr
Yu, Ka Chun	Denver Museum of Nature & Science	USA	kcyu@dmns.org
Zanazzi, Alessandra	Città della Scienza	Italy	zanazzi@cittadellascienza.it
Zhu, Jin	Beijing Planetarium	China	jinzhu@bjp.org.cn
Zoulias, Manolis	Academy of Athens/Research Center for Astronomy	Greece	mzoulias@academyofathens.gr