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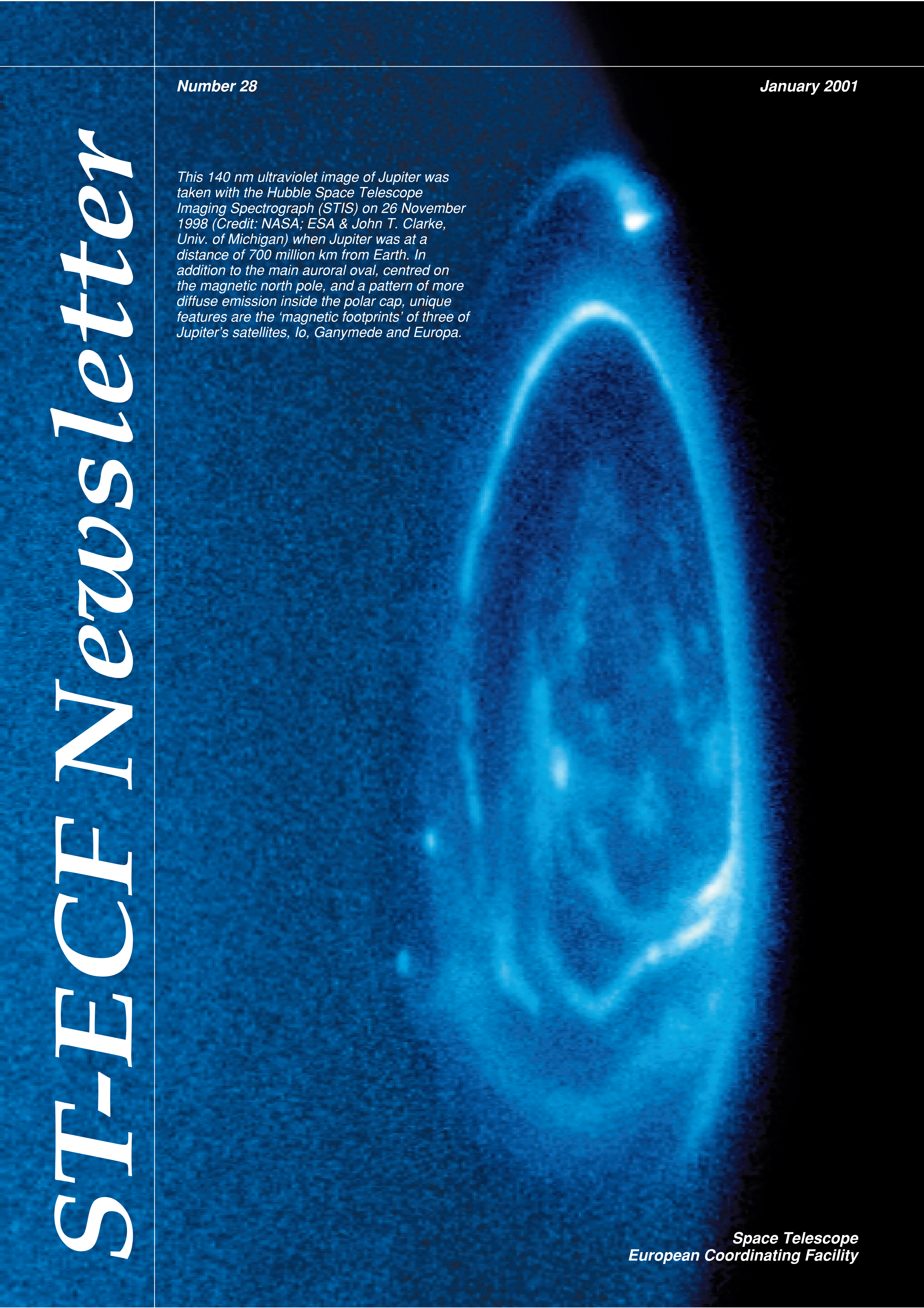

This 140 nm ultraviolet image of Jupiter was taken with the Hubble Space Telescope Imaging Spectrograph (STIS) on 26 November 1998 (Credit: NASA; ESA & John T. Clarke, Univ. of Michigan) when Jupiter was at a distance of 700 million km from Earth. In addition to the main auroral oval, centred on the magnetic north pole, and a pattern of more diffuse emission inside the polar cap, unique features are the 'magnetic footprints' of three of Jupiter's satellites, Io, Ganymede and Europa.

Space Telescope
European Coordinating Facility

European news

As the ESA contribution to HST moves away from hardware provision, support for another project has been agreed for the ST-ECF. Following the successful provision of a software package for extraction of NICMOS grism spectra (NICMOSLook, see ST-ECF Newsletter 24, p. 7, 1997), support for the spectroscopic modes of the ACS will also be provided. ACS has both grisms and prisms: the Wide Field Camera, with a coverage of 3.4' × 3.4', is fitted with a grism offering 40Å/pixel resolution (5500–11000Å) over the full WFC field; the High resolution Camera (26'' × 29'') provides 30Å/pix grism spectra and prism spectra with a maximum resolution of 2.6Å/pixel at 1600Å; the Solar Blind Channel (31'' × 35'') has two prisms with 1.4 and 1.7Å/pixel maximum resolution, with one prism excluding the geocoronal Lyman-α line. The ST-ECF/ACS project is larger in scope than the NICMOS one covering all aspects of the ACS grism and prism modes for the lifetime of the instrument, including ground and in-flight calibration, user support and documentation, provision of calibration files, and of course pipeline software to extract the spectra. The first output of this project is an imaging and spectrum simulator, called SLIM, which is described in this Newsletter. Ground calibration of the spectrometric modes of ACS is just beginning and the data will be analysed to determine how important is the fringing of the detectors to the accurate extraction of spectra. Following analysis of these data, the extraction software will be implemented (in Python) to be run in pipeline mode but also tunable for more interactive use.

The Cycle 10 Call for Proposals in September 2000 showed slightly lower European input, with 19.9% by number of proposals and 17.7% by number of GO orbits, compared with higher figures in previous cycles. Overall, however, the number of submitted proposals was almost identical to Cycle 9. The allocation was announced in December and the success rate for European GO orbits was also slightly lower than previous cycles at about 16%, but still above the 15% ESA contribution level. There were two proposals in the 50–99 orbit category and a large snapshot proposal to build an archive of images of sites of core-collapse supernovæ in nearby galaxies. However in contrast to Cycle 9, of the 14% of Large (> 100 orbit) proposals with a European PI, none were granted time. These are trends which could cause some concern but may perhaps be attributable to the absence of the Advanced Camera for Surveys (ACS) and the cryo-cooled NICMOS, which were expected for Cycle 10 but are now scheduled for installation during Servicing Mission 3B, expected for November 2001.

The pace of cross-telescope collaboration has been accelerated by the Great Observatories Origins Deep Survey (GOODS) proposal which was accepted as a SIRTF Legacy programme. HST is involved in this program inasmuch as the HDF's will be observed by other instruments. See
`http://www.stsci.edu/science/goods/`
for more detail. There is substantial European involvement in GOODS in the form of ground-based observations with Gemini and ESO telescopes and which are integral to this study of the high redshift universe.

Since its opening in April last year the Hubble European Information Centre has produced a steady stream of press releases of HST science: see the note at the end of this Newsletter.

Jeremy Walsh

NGST

Several events during 2000 have advanced ESA's significant rôle in the NGST project. In July, the ESA NGST Study Science Team (SST) submitted a proposal to ESA for European participation in NGST — this Study Report is available at:
`http://astro.estec.esa.nl/NGST`
It was strongly recommended by the Astronomy Working Group and, in September, by the Space Science Advisory Committee that NGST be selected as the next 'Flexi-mission' in ESA's future plan for implementation between 2008 and 2013. This selection was endorsed by the Science Programme Committee at its meeting in October.

This approval has allowed ESA to follow up the industry studies it funded during 1999 with new investigations focussed on the specific European contributions to the mission. In November, a study of the 1–5μm near-IR multi-object spectrograph to be provided by ESA was awarded to a consortium headed by Astrium (Munich) and Laboratoire d'Astronomie Spatiale (Marseille). This study is to concentrate on the spectrograph concept recommended by the *ad hoc* Science Working Group (ASWG) on the basis of the science programme described in the Design Reference Mission. The concept assumes a microelectronic mechanical system (MEMS) shutter or mirror array as its slit selector mechanism. With the possibility that MEMS technology may not mature in time for NGST, ESA is also in the process of soliciting a study of alternatives to MEMS for generating reconfigurable front end slit masks. This second industrial study is scheduled to start in March.

The mid-infrared capability of NGST will be provided as a 50/50 collaboration between NASA and the ESA member states, with some contribution from the Canadian Space Agency (CSA). A mid-infrared partnership planning group met during 2000 and recommended that an international steering committee be formed to coordinate the instrument design. Membership of the Mid-Infrared Steering Committee (MISC) is currently being competitively solicited by the agencies (see the ESA URL given above). The partnership concept envisages the European team, funded from national contributions, developing the instrument optical and mechanical structure with the US team developing the detectors and associated electronics and the cryocooling system.

The ASWG, which started in September 1997 and held its last meeting in mid-summer 2000, is being replaced by an Interim Science Working Group (ISWG) —see
`http://ngst.gsfc.nasa.gov/project/Groups/SciWG/`
— whose task will be to continue providing scientific guidance to the project until the US instrument AO is released in 2002. The membership was selected last September from over 100 applicants. The group is chaired by Marcia Rieke from the University of Arizona and includes Mark McCaughrean (AIP) and Ewine van Dishoeck (Leiden) as European members.

As the technological requirements for NGST are clarified and as the costing estimates become more firmly based, the NGST project has recently undertaken a detailed reassessment of the spacecraft design parameters in preparation for the issue of the 'Requests for Proposals' for the NGST prime contract in the spring of 2001. This exercise involved examining the size and temperature of the telescope, some design choices for the instruments and the division of responsibilities among the three agencies and the prime contractors. The main result of this process has been the relaxation of the requirements on the diameter, the areal density and the temperature of the primary mirror. A reduction in aperture from 8m to somewhere between 6 and 7m allows a stiffer mirror which can be more satisfactorily tested on the ground under gravity. Allowing the mirror to operate at a slightly higher temperature than would be achieved by pure passive cooling permits active thermal control using heaters. Together, these options render unnecessary the planned flight validation experiment Nexus (a 2–3 m test telescope proposed to operate at L2) which has consequently been cancelled.

The latest NASA mission update document can be obtained at:
`http://www.ngst.nasa.gov/cgi-bin/doc?Id=793`

Peter Jakobsen (ESTEC) & Robert Fosbury

SLIM — grism simulator for the ACS

Norbert Pirzkal & Anna Pasquali

SLIM is a program developed at the ST-ECF to simulate direct and slitless spectroscopic images. It was created to generate both geometrically and photometrically realistic data appropriate to the slitless spectroscopic modes of the Advanced Camera for Surveys (ACS). It is based on our current knowledge of the instrument parameters, the simulated data being needed to test future slitless spectroscopy extraction software. ACS is scheduled for launch during SM3B late in 2001.

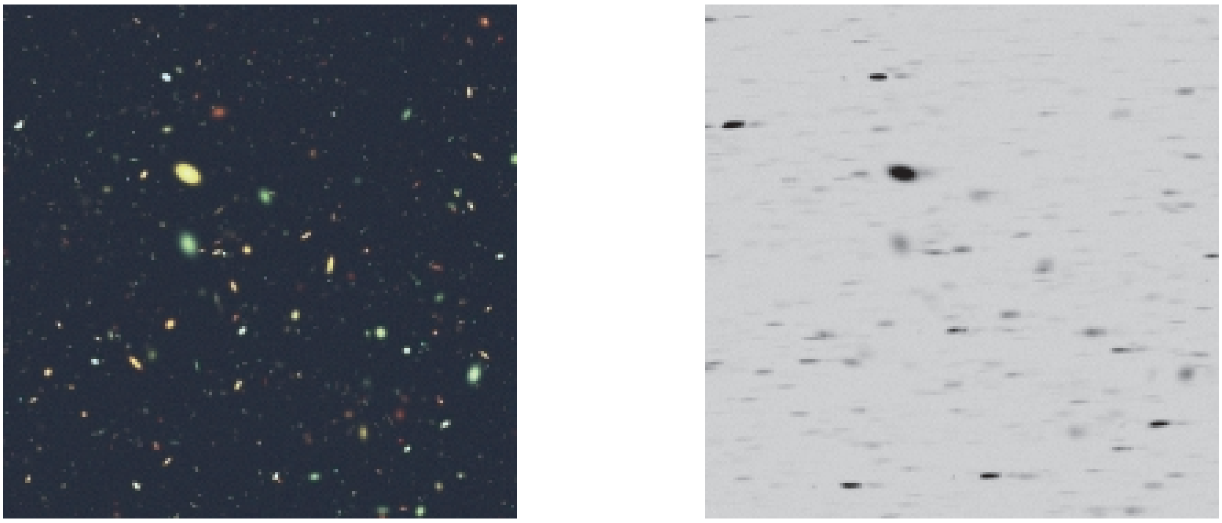

Figure 1 (a - left) direct WFC image (b) grism WFC image. Color composite direct image (F435W, F606W, F814W) and corresponding grism (G800L) image of a simulated ACS/WFC image of an HDF-N like field. Integration times are 1000s per filter.

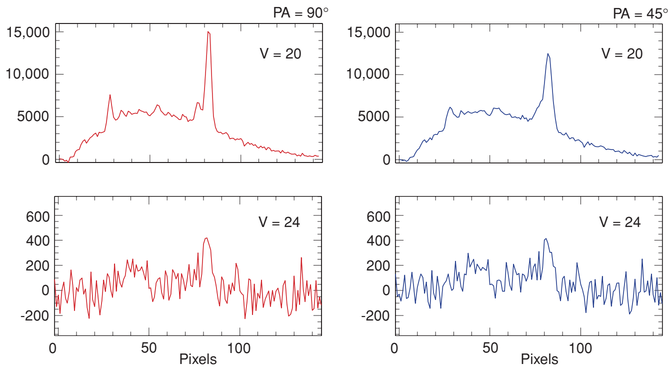

Figure 2: Simulated and extracted starburst spectra at z = 0.7 (1000s). The object is an ellipse of size 0.1" × 0.25" (2 × 5 pixels), with major axis PA of 90°(left) and 45°(right) with respect to the dispersion direction.

SLIM was written in Python to keep development time short. It features all of the spectral elements available in the ACS, and currently produces simulations which include the effects of geometric distortions, of fringing, and the field-dependence of the spectral dispersion. While SLIM will generally be used to generate ACS images, an effort has been made to keep the simulator general enough to be used for other instruments.

The main features of SLIM are:

- ❑ Configured using simple text files.
- ❑ Creates slitless simulations by dispersing a 1D input spectrum and, at each wavelength, convolving it with a PSF of the appropriate shape and size.
- ❑ An arbitrary number of throughput files can be used to simulate any combination of mirrors, windows, filters, dispersive elements, and detectors.
- ❑ Photometric zero points are computed on-the-fly using the input list of filters and throughputs and a spectrum of Vega.
- ❑ Arbitrary, n^{th} order polynomial descriptions of the dispersion relations can be used, allowing both near-linear (grism) and highly non-linear (prism) simulations to be generated. Field dependence can be included.
- ❑ Does not require any *a priori* sampling of the input spectrum or throughput files.
- ❑ Produces Wide Field Camera (WFC) simulations that agree photometrically within 1% with the ACS exposure time calculator.

Simulation examples

SLIM can be used to generate entire fields such as the one shown in Figures 1a and 1b where 1000s simulations of an HDF-N like field are shown. SLIM has also been successfully used to study the ACS spectral modes as shown in Figure 2 where we present extracted spectra from SLIM simulations of $z \sim 0.7$ starburst galaxies that have a size of 0.1″ × 0.25″, with brightness ranging from $V = 18 - 24$, and with position angles (angle of the object's major axis with respect to the dispersion axis) of 90° (left column) and 45° (right column). The input spectrum is a starburst spectrum (SB2) taken from Kinney et al., 1996 where the emission lines [O II] λ3727Å, Hδ, Hγ, Hβ and [O III] λ4959 and λ5007Å are present. From Figure 2, one can see that at a PA of 90° , the more prominent features due to [O II], Hγ, Hβ and [O III] can be identified, although the emission lines of [O III] doublet is blended. It also becomes clear that a lower spectral resolution is attained at a PA of 45°. This is caused by the additional smoothing of the object's spectrum by the extent of the object in the dispersion direction, which causes the Hβ and [O III] lines to be further blended and the [O II] λ3727Å feature to be diluted. The [O II] lines can however be detected down to $V = 22$, while the Hβ and the [O III] lines can be detected down to $V = 24$.

Availability

A version of SLIM running under Solaris is being made available and can be downloaded from the ST-ECF web site at `http://www.stecf.org/software/`

For information about other platforms, please contact npirzkal@eso.org.

Drizzle — status and planned enhancements

Richard Hook & Andrew Fruchter (STScI)

The Drizzle method of coadding images was developed back in 1995 in response to the image combination requirements of the Hubble Deep Field North WFPC 2 data (Williams et al. 1996; Fruchter & Hook 2001). After further enhancements in 1996 an IRAF-based implementation of Drizzle was released to the user community in September of that year. After minor changes it became part of the 'dither' package in STSDAS in February 1998 as V1.2. This release was widely used for combining dithered WFPC 2 images as well as data from other HST cameras.

In parallel to the HST applications of Drizzle it was also used in modified form as an image combination engine for some of the data from the ESO Imaging Survey (Nonino et al. 1999) where the data volume was much higher than HST/WFPC2. The 'EIS Drizzle' had several additional features both to improve speed and also produce additional output products which were useful for characterising the properties of mosaics built from overlapping ground-based images with differing properties.

Some of these additions, particularly those related to efficiently managing large images without making excessive demands on computer memory resources, were incorporated into the current version of Drizzle (V1.41) in the STSDAS 2.2 dither package. This version was first used extensively on the data from the Hubble Deep Field South (HDF-S). It is fully compatible with V1.2 and has the same parameter interface.

Over the last few years it has become clear that there are many other possible improvements which can be made to Drizzle to make it more general, flexible and efficient. Many of these have recently been implemented and are being tested. This article explains the motivation behind these changes and sketches the scope of the future Drizzle V2 which will be released in the next few months.

New geometric options

The current Drizzle relies on geometric information in two forms: coefficients describing the geometric distortion of the detector and a linear transformation describing the mapping from input to output in the form of shifts, rotations and scale changes. The latter values have to be determined by the user, usually with the assistance of additional tasks in the STSDAS 'dither' package. Although this is satisfactory for a small set of dithered frames, there are many cases where something more sophisticated is desirable. As an example, it is often the case that one measures small dither shifts in the frame of the original images and then wants to combine them and also apply a subsequent transformation — for example to put North at the top or to position the combined image in a mosaic. To do this kind of combination of linear transformations is tricky by hand and, as experience shows, creates much scope for making mistakes and wasting time. To make such cases much more tractable a new set of 'secondary geometric parameters' is included in the new Drizzle as a 'pset' (a separate set of parameters within IRAF). In normal use these parameters take default values and have no effect, but they may easily be set when necessary.

Another approach to specifying the geometric relationships between images to be combined is to use the 'world coordinate system' (WCS) in the image headers. This normally gives the linear mapping between the pixel grid and a projection on the sky. If it is accurate enough —which is often not the case — this information can be used to Drizzle an image either onto a new grid with specified scale, pointing and orientation on the sky or onto another reference image without any further information about shifts or rotations needing to be supplied. Such a WCS-driven Drizzle has been tested and was used to prepare the large mosaic images of the HDF-S flanking fields.

New kernels

The classical Drizzle method uses a small square kernel to distribute weight between pixels in the output image. This is equivalent to a form of linear interpolation of input data values and as such can be criticised as creating subtle artifacts which become more noticable in Fourier space. Such a kernel is only one possibility out of many, and the new version of Drizzle implements several new ones and provides a framework within the code for further extensions if desirable. The kernel within Drizzle is analogous to an interpolation kernel except that it controls how the weighting of a single input data value is distributed on the output rather than the weighting of input data values which are combined during interpolation.

The new kernels include a 'gaussian', which makes Drizzle closely resemble the independent image coaddition codes developed by Ron Gilliland and collaborators (Gilliland et al. 1999). There is also 'point' option in which each input pixel can only affect a single output one (equivalant to *pixfrac = 0*) which is very efficient for combining very large numbers of randomly dithered frames, such as the STIS HDF-S image. Finally a 'turbo' method, designed for speed, corresponds to the kernel used in the ESO Imaging Survey Drizzle version and approximates the square kernel by a rectangle on the output grid with constant size and shape and with edges aligned with the output pixel grid. This version is 2–3 times faster than the original and gives closely similar results in most cases.

Context images

A common problem when combining images, particularly in the case of mosaicing, is knowing how to characterise the properties of an output pixel. A rather general question is: "Which input images contributed to this output pixel?". If this can be answered then the inputs can be consulted to answer many other questions such as: "What is the total effective exposure time of this output pixel?". A context image is a way of encoding such information about the output images. The current implementation uses an integer index image which in turn refers to a list which relates context values to input images. As an example, a context value of 6 might mean: "Pixels which resulted from combining images 1 and 3". Other ways of approaching this problem are being tested including a simple bit mask encoding but this is limited to 16 or 32 images if normal integer arrays are used.

ACS requirements

A major priority for current Drizzle development is to include features which will be required for combining images from the Advanced Camera for Surveys (ACS), due to be installed in HST during the next servicing mission. The pipeline processing of ACS images will also include a drizzling step and discussions with the ACS team at STScI to decide details of this interface are in progress. The ACS is particularly demanding because of the larger size of the arrays and the very large geometric distortion which is present.

The future

All the features discussed above are currently implemented in test versions of Drizzle. Although details remain to be discussed —and possibly changed, a new version of Drizzle, incorporating most of these features, will be made public early in 2001 after extensive testing.

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Long-slit spectral extraction using restoration

Jeremy Walsh

In the domain of astronomical image analysis it has become commonplace to employ restoration techniques to help extract the photometric signal of closely separated targets, when there is blending either by crowding or proximity of point sources to extended sources. In the first three years of HST, restoration served the basic purpose of realising the achievable spatial resolution of the central spike of the PSF in the presence of the spherical aberration halo. An analogous procedure to image restoration can be performed for spectroscopic data by restoring the spatial profile of long-slit data. By applying spatial restoration to such spectra, the problem of how to subtract the background underneath the point sources can be solved. For simple background distributions this can easily be achieved by fitting (eg, by least squares) a linear or low order polynomial to the background, excluding the point sources. For more complex backgrounds, arbitrary higher order fits must be utilised; in the case of many point sources there may not be enough background points to constrain the fit. The result of a spatial restoration to the spatial component of a long-slit spectral image is both the signal of the point source(s) and the spatial profile of the background. Depending on the application, both point sources and background may be scientifically valuable. By treating every spectral element separately, as many spatial restorations as spectral elements are required. Some simplification is achieved if the spatial profile of the background spectrum is slowly changing, or constant, with wavelength.

The applications of restoration techniques to extract point source spectra, or more accurately to decompose point source and extended object spectra, are many. The simplest is the case of two spatially blended point source spectra, such as a visual binary. Long slit spectra of globular clusters and crowded stellar fields can yield spectra of many stars in a single slit position; here the point source spectra are extracted from the background which may consist of the combined spectra of unresolved sources, or a diffuse component (eg, from light scattered into the slit from the surroundings). In the deblending of point source and extended object spectra there are many applications ranging from spectral extraction of the cusp of early type galaxies for Black Hole studies, spectra of QSO host galaxies, separation of the spectra of gravitational lenses from one another and from the host galaxy, to the determination of the spectrum of an extended emission line region in the presence many (unwanted) point sources.

Restoration techniques

Applying restoration to the spatial component of a spectrum, clearly lends itself to two channel techniques, whereby the background is considered as one channel and the point source, or sources, characterized by a Point Spread Function (PSF), constitute the second channel. For a slit spectrometer, the imaging PSF is integrated over the slit in the dispersion direction and sampled in the spatial direction by the detector; this function is subsequently termed the Slit Spread Function (SSF). Of course the SSF may vary as a function of wavelength on account of instrumental effects or atmospheric seeing. A restoration technique for long-slit spectra relies on having, *a priori*, an SSF in contrast to more *ad hoc* methods of separating point source(s) from background spectra which require the user to differentiate regions occupied by point source(s) from the background.

The Lucy-Hook two channel restoration method (Lucy 1994; Hook & Lucy 1994; Hook et al. 1994), implemented as 'cplucy' in the 'iraf.stecf.imres' package:
`http://www.stecf.org/software/stecf-iraf/`
and based on the well-known Richardson-Lucy iterative restoration technique (Richardson, 1972; Lucy, 1974), provides the method of choice as the basis for spectral extraction. Two input images are required: one with the long-slit (or 2D) spectrum of the point source(s) and background/extended source; another of the SSF. The SSF image can either be created from a model of the PSF dispersed over the same range as the input image; or by extracting the spectrum of a point source from an observed 2D spectrum. The SSF could even come from the same image to be restored, such as from an offset star along the slit. The advantage here is that the seeing will be identical to that on the target of interest.

One problem with the R-L technique, and others based on non-linear techniques, is the ringing ('Gibbs phenomenon') which occurs in the neighbourhood of the restored point sources. The Lucy-Hook two channel technique overcomes this limitation by imposing a regularization term for the background channel, which excludes single pixel oscillations in the background, and specifying the point sources as δ-functions at designated positions. The imposed resistance to ringing can be varied depending on the strength of the regularization term. The entropic form is a good choice for the regularization term (Lucy, 1993), and this can be calculated relative to a flat background or a 'floating default', typically a smoothed version of the estimate of the background. The method has been shown to be successful when applied to real astronomical scenes (Hook et al. 1994) and elevates the R-L technique from a means for contrast enhancement to a true photometric restoration technique. The extension of this technique to spectra is then relatively straightforward; the position(s) of the point source(s) are specified, the value of the entropy constraint (a larger value forces the background to be smoother, a zero value results in a normal R-L restoration) is chosen, and the σ of the smoothing kernel for the floating default specified. The smoothing kernel is conventionally a Gaussian which is convolved with the current (iterated) estimate of the background.

The spatial restoration of a long-slit spectrum proceeds sequentially. Each spectral element of the input and SSF images are extracted, the 1D section is restored a given number of iterations or until some objective function changes by less than a specified amount (convergence criterion), the signal in the point source(s) is stored and the restored background section is written to an output image. The output results are thus the spectrum of the point source(s) and the 2D spectrum of the restored background (with or without the restored point sources included). By subtracting the restored background from the input spectrum image, the background subtracted point source spectrum is obtained. Further point sources can be discerned at this stage since they will be left above the smoother restored background. The input spectrum image can be background-subtracted using the restored background image so that the point source spectra could be re-extracted using a weighted extraction technique (Horne, 1986; Robertson 1986).

The entropy constraint is a free parameter and has to be chosen by the user. There is an inverse relationship between the smoothing width of the floating default for the regularization term and the entropy term multiplier, in that a very similar converged restoration (point source(s) and background) is achieved with a lower value of the entropy multiplier and broader floating default, or a higher entropy multiplier and a narrower default. The nature of the background can determine the width (σ) of the smoothing kernel: a lower value for an extended source with considerable structure, a higher value for weakly spatially varying background (or where the presence of further point sources is known or suspected). An alternative approach to this free parameter is to impose limitations on the sort of 2D spectra to restore. A distinct and well-behaved case is that where the spectrum of the background does not vary with position. Thus the background summed in wavelength can be applied at each wavelength increment with a multiplier to account for changes in the magnitude of the background. This code works in a similar manner to the previous one only the summed background is separately restored and the restored background is then used in a Lucy-Hook (ie, one input channel to be restored with two output channels) scheme. This avoids the use of the entropy multiplier. The point source signal in each wavelength section converges to the maximum likelihood values. Examples where this code finds application are in sky subtraction, extraction of spectra of very crowded star clusters where no unambiguous background can be defined, extraction of point source spectra in large H II regions and galactic nucleus decomposition for well extended (nearby) galaxies where the large scale continuum does not change with position.

Codes

The two methods — Lucy-Hook two channel restoration with floating prior entropic regularization 'specplucy' and two channel restoration with wavelength invariant background prior 'specpoint' — are to be included in the ST-ECF IRAF layered package 'iraf.stecf.specres' to extract spectra from long-slit or 2D spectra with an *a priori* SSF. The input data are the 2D spectrum and the SSF and a table listing the position(s) of the point source(s). The SSF image is required to be of the same dimensions as the input image. The output products are the extracted spectrum(a) of the point sources and the restored background image. A task 'psfimage' is also provided in the package to produce an SSF image from sets of (2D spatial) PSF's at different wavelengths, simulating the spatial profile produced by placing a long slit over a point source. Further information and help pages for the routines are available at:

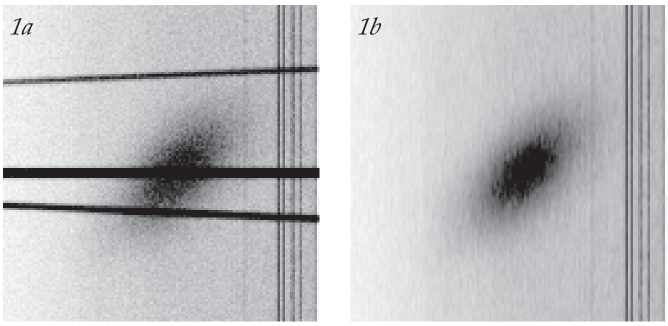
`http://www.stecf.org/~jwalsh/specres/`

The algorithms have been made flexible, can deal with slightly tilted spectra, spatially subsampled SSF's, and allow the position of point sources to be refined by cross-correlation. A separate table file is output for each extracted point source. Data quality of the input 2D spectrum is considered in order to neglect bad pixels and, if statistical errors are available, then multiple trials can be performed to determine the errors on the restored spectra.

The specplucy algorithm can be compared to a similar approach taken by Courbin et al. (2000) who use a deconvolution algorithm and minimize a set of constraints with user-chosen Lagrange multipliers, whilst allowing restoration to any spatial resolution. Another of the differences with their approach is that they constrain the spectral variation of the SSF through a separate constraint. In the 'specplucy' approach there is no such constraint; in 'specpoint' the constraint applies to the whole spectrum.

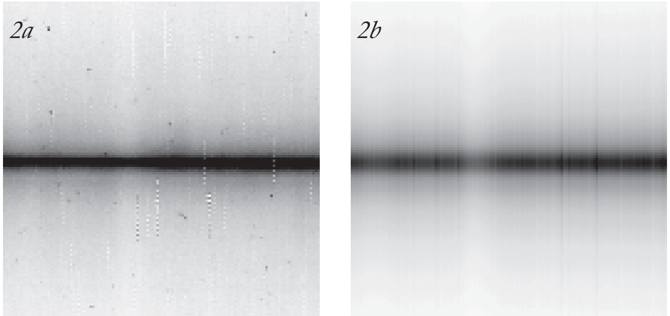
Examples

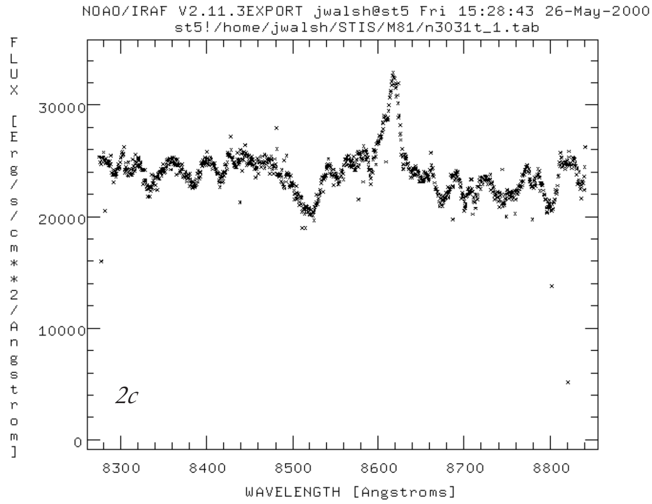
Figure 1a shows a deliberately exaggerated simulation of three point sources on an extended background which has



narrow emission components not varying with position along the slit and a broad background emission feature; Gaussian noise has been added. Figure 1b shows the restored background using the 'specplucy' code. The smoothing kernel had a FWHM of 12 pixels. The point source spectra were extracted with the expected fluxes.

This code has been successfully applied to a variety of ground-based and HST spectra. An extended Lyman-α emission was decomposed from the damped Lyman-α QSO in NTT spectra (data from B. Leibundgut) using as PSF another star on the slit length. VLT spectra of planetary nebulæ in the nearby elliptical galaxy NGC 5128 were extracted from the strong stellar continuum, revealing weak emission lines. HST STIS long-slit data of the nucleus of M 81 have been decomposed using the 'specpoint' code and figure 2a shows the





pipeline reduced data, the restored background spectrum (figure 2b) and the extracted point source nuclear point source spectrum in figure 2c. The Tiny Tim HST PSF modelling code of J. Krist

`http://www.stsci.edu/software/tinytim/tinytim.html`

was employed to form STIS PSF's at several wavelengths, which were then combined to produce the SSF.

The codes are available on request and will be available in the next 'iraf.stecf' package release early in 2001. The Web pages include simulation demos.

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Archive news

Alberto Micol, Markus Dolensky, Francesco Pierfederici & Benoît Pirenne

ASTROVIRTEL

The first ASTROVIRTEL cycle is well on its way. Of the eleven proposals received by mid June, five were accepted by a scientific panel composed of eight astronomers. The abstracts and relative information can be found on-line: see `http://www.stecf.org/astrovirtel`

All five investigator teams have been hosted at ESO for the so-called first visit. The aim of the first visit is for the ASTROVIRTEL team to understand the scientific goal of the project, to discuss its technical aspects in terms of where and how to find the necessary scientific data, how to reduce them, etc.

The result of the first visit is a document which states the user requirements and defines a project plan, including a time-line of the various activities to be performed by both parties (PI and the ST-ECF-based ASTROVIRTEL team), and the schedule for further visits.

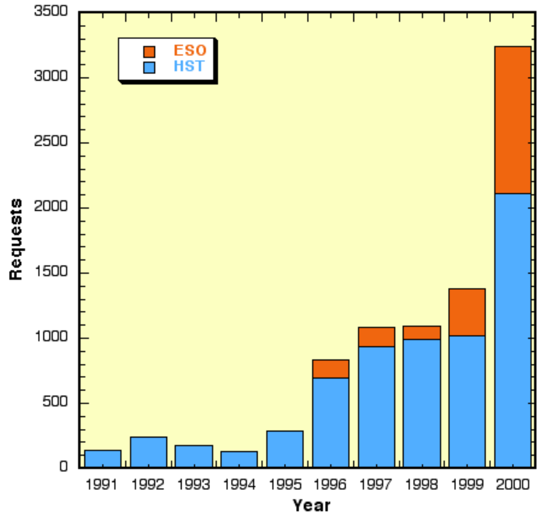
We expect that during the first six months of 2001 most of the programs will be well advanced, allowing us to release the resources for the next cycle of proposals, due in the early summer.

Archive Brochure

The first ESO/ST-ECF Archive Brochure has been published. The intent is to advertise our facility, our various services, and give an overview of technological challenges we are facing with a fast-growing data rate. A copy is being mailed with this Newsletter and the brochure is downloadable from `http://archive.eso.org/archive2000.pdf`

10,000th archive request

Year 2000 was a time of celebrations for us. Not only has HST completed its first ten years in orbit, but our archive is also about to celebrate its own tenth birthday, as we opened up to



the public in January 1991. Coincidentally, we have also recently received our 10,000th request and are about to register our 2000th user. Due to the ESO VLT archive, but also because we have kept offering numerous value-added products for the HST data (on-the-fly re-calibration, associations, previews, etc.), the rate of reception of requests has been increasing rapidly as can be seen in the graph. At the beginning we had only a couple of dozen registered users and for a long time we would have counted the requests at the level of a dozen a month. By now, requests come up at the level of 2 to 3 hundred per month. To keep up with the volume we are continuously improving our systems, automating as much as we can. We currently have an archive containing about 5 TB of active data and redistribute 3 GB/year in 3000 requests with basically the same manpower level that we had 10 years ago.

These numbers are a consequence, we believe, of the amount of data we have and the quality of service we provide. The speed of response to requests, the value-added to data products and the intrinsically high data quality make the archive an attractive resource.

HUBBLE European Space Agency Information Centre

Piero Benvenuti & Lars Lindberg Christensen

The first 16 months of activity of the Hubble ESA Information Centre, the most recently constituted group at the ST-ECF, have been very positive. More than 100 web pages were produced, describing the HST project in an appealing but technically and scientifically correct way. Among the available services there is a searcheable archive of published HST images that can be retrieved, together with the relevant captions, in three different resolutions.

Since August 1999, 26 original science- and photo-releases heve been issued, many of them stimulated by a careful browsing of the HST Science Archive and by fine tuning the quality of the colour representations of the images. In addition to the Brochure celebrating the 10th HST anniversary and distributed last April, a new one, 'The Infrared Revolution' has been issued recently: it was an interesting exercise because it was produced with the collaboration of different ESA projects and demonstrated how efficient this new type of synergy can be. Several posters and leaflets (like the Archive Brochure described here) were also produced on the occasion of major meetings (SPIE, IAU, etc.), enhancing the visibility of our services and activities among the potential users.

Finally, an educational project, the 'HST Xercise Series', was initiated. It is aimed at high school students and guides them through a number of interesting astrophysical problems, based on HST data. The first 3 exercises of the series have been produced and are being distributed to a selected list of European science teachers, seeking their comments. We will present and discuss this initiative in one of the subsequent issues of this Newsletter.

Below, we give an example of one of the photo-releases, constructed from archive data, made late in 2000.

Contents

This image of part of the Stephan's Quintet field comes from the large archive of scientific observations performed with the Hubble Space Telescope. It is a mosaic of two pointings with the WFPC 2 instrument made in December 1998 and June 1999. The natural-colour composite has been constructed by the Hubble European Space Agency Information Centre from individual exposures in red light (814W filter, 2000 seconds), in green light (569W filter, 3200 seconds) and in blue light (450W filter, 6800 seconds). The image measures 3.7 × 2.5 arc-minutes. A public photo-release was made by HEIC on 25 October 2000.

We should like this Newsletter to reach as wide an audience of interested astronomers as possible. If you are not on the mailing list but would like to receive future issues, please write to the editor stating your affiliation.

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