October 1996 • Volume 13, number 3

SPACE TELESCOPE SCIENCE INSTITUTE

Newsletter

Highlights of this issue:

Second Servicing Mission

SM2

JD 2450492.832

(1997 Feb 13 07:59 UT)

The next servicing mission to HST promises to be as significant as the first, with two brand-new instruments installed and several improvements to or replacements of other items. This Newsletter features several stories and updates on progress toward launch. As we get closer to February you can find up-to-date information on the web: See page 6 for URLs.

Servicing Mission Astronauts visit ST ScI

Taking a break from training in the Goddard Space Flight Center clean room, the STS-82 astronauts visited the Institute on September 19, 1996. The crew requested briefings on science operations and what the two new instruments they will install will do. They were interested to learn that the Solid State Recorder is of keen interest to astronomers because the two new instruments will dramatically increase requirements for data handling. Crew members asked presenters Peg Stanley, PRESTO, and Chris Blades, Servicing Mission Office, the questions they frequently get during public appearances: Will the new instruments provide as dramatic an improvement as the first servicing mission fix did? How efficient is the telescope? Can astronomers around the world use the telescope?

But the highlight of the visit was the astronauts' hour-long presentation to the Institute staff. Commander Ken Bowersox opened the session by reassuring the crowd, "We care about your telescope and we're going to take good care of it." Each crew member described his particular responsibilities. All emphasized the importance of the Hubble mission. Steve Smith said it best, "I hope that each day you don't forget the incredible science that your telescope is returning to the people of Earth. We've got eight children among us in this crew as well as a couple more on the way... and the information that your telescope is returning is going to make their lives better."

Bowersox, STS-82 mission commander, said the mission to service the Hubble Space Telescope was the top choice among astronauts. "We all wanted this one."

"This one" will take place in February 1997, when pilot Scott "Doc" Horowitz will maneuver the shuttle Discovery into position for robot-arm

operator Steve Hawley to grapple the telescope and EVA crew members Steve Smith, Mark Lee, Greg Harbaugh and Joe Tanner will spend four days spacewalking to complete servicing tasks.

Mary Brown, of the Director's office, closed the afternoon session. She wished the crew good luck on behalf of the entire staff and said, "The best way for us to be with you on your mission is to be on your back, looking

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Director's Perspective

Preparations for the launch of the second servicing mission and planning for the Cycle 7 TAC have been receiving a great deal of attention in recent weeks. Pre-launch activities have been proceeding nominally, although the schedules for integrating, testing, and calibrating the new instruments have required intensive efforts. Individuals from the Institute's Servicing Mission Office, headed by Chris Blades, and from the Project, the instruments' Investigation Definition Teams, and Ball Brothers have been working virtually around the clock to make sure that both STIS and NICMOS are ready to perform well when placed into *HST*. Some glitches have occurred and others will undoubtedly come up as launch approaches, but work arounds have been implemented successfully to this point, and we are still on schedule for a February 1997 launch.

The scientific program for Cycle 7 should be especially interesting, with two new instruments in use. Long-slit spectroscopy with STIS and IR imaging and grism spectroscopy with NICMOS should produce significant results in a number of different areas. The panels and full TAC may have given their recommendations by the time you read this, having reviewed an impressively large number (1,298!) of proposals. The strong recommendation of the Institute Advisory Committee that large observing programs be encouraged, countering the trend of previous TACs to have approved more programs with a smaller number of orbits per program, seems to have worked. The number of proposals requesting 30 or more orbits increased from 32 (Cycle 6) to 205 (Cycle 7).

Goddard and the *HST* Project recently requested an Independent Science Review for the two new scientific instruments that are scheduled to be placed on the telescope. They asked AURA to conduct the review via an international committee which AURA constituted, chaired by Malcolm Longair. The committee heard two days of presentations on the status of the instruments, including plans for their commanding and calibration, and contingencies should unexpected problems arise. The report which was submitted to Goddard and NASA was quite positive about the current status of the instruments.

As many PIs of Cycle 6 programs now know, we have had to devote most of the *HST* observations in recent months to FOS and GHRS spectroscopy, delaying implementation of most imaging programs in order to complete all of the TAC-approved spectroscopy programs before FOS and GHRS are removed from the telescope. This situation was exacerbated by a July safemode incident which caused one of the two remaining functional tape recorders to be removed from science use so that it could be dedicated to transfer and storage of engineering data, a situation which limited our ability to do imaging. The second tape recorder has now been returned to science use, so most of the Cycle 6 spectroscopy programs will be completed by February, however the delay of most Cycle 6 imaging programs until after launch and subsequent observatory check-out is still necessary.

Planning for the future of *HST* is proceeding well. NASA is scheduled to release an Announcement of Opportunity (AO) in November for the development of a new *HST* instrument for the 2002 servicing mission. And, the studies of the Next Generation Space Telescope follow-up mission to *HST* that was recommended by the *HST* and Beyond Committee have produced considerable activity, including the active participation of the European Space Agency in planning for the Next Generation Space Telescope (NGST). For the immediate future, the projected budgets for data reduction of GO programs is holding steady, in spite of the continuing budget pressure in all sectors of the government, and we can therefore strive to maintain the high scientific productivity of *HST*.

Bob Williams

Note: The full text of the Independent Science Review and responses from the HST Project can be found on the web. Go to our home page, then "STScI," then "STScI Policy...".

Status of the Fine Guidance Sensors: Which One to Replace in Servicing Mission 2

Rodger Doxsey, ST ScI

One of the major goals for the upcoming Servicing Mission 2 (SM2) is to replace one of the Fine Guidance Sensors (FGSs). In September, based on an assessment of current FGS performance data, the *HST* Project has decided to alter the plans for replacement; we now plan to replace FGS1 rather than FGS2.

Each FGS has two bearings, A and B, which hold optical elements within them. These are used to position the 5 arc-second instantaneous field of view within the FGS "pickle." These bearings are also used in executing the spiral and coarse track motions used to acquire guide stars. During the first three years of *HST* operations, coarse track was used extensively as the prime guiding mode, to offset the effects of spherical aberration on fine-lock sensitivity, and to avoid loss-of-lock due to solar array jitter. The extensive use of coarse track caused degradation, now seen at some level, in all bearings. In the spring of 1993 the problem became severe enough in FGS2 bearing A to cause failures of guide star acquisitions. For about 6 months, FGS2 was taken "off-line" while changes were instituted to the operations procedures for the FGSs. These changes, including the dropping of coarse track as a guiding mode and substantial reductions in bearing speeds, allowed re-activation of FGS2 late in 1993.

This problem with the bearings led to a decision to include an FGS replacement in the manifest for SM2. The FGS diagnostic program instituted in 1993 has kept detailed trending data on all 6 bearings, and has established some correlations with bearings tested on the ground to high wear states. The trending data continued to indicate that FGS2 bearing A was the worst of the 6 bearings through 1994 and 1995.

Toward the middle of 1995, the trending program began to reveal unexpected behavior in FGS1 bearing B. This bearing began to show high torques when its direction of motion was reversed. This behavior was not seen during the early life of the FGS, and it is not clear whether it is in any way associated with the coarse track wear, or is an independent phenomenon. By late fall of 1995, there were times when these reversals reached torques high enough to saturate and momentarily stick the bearing, causing loss of lock. These were particularly painful losses of lock, because they tended to occur during FOS or GHRS target acquisitions. These target acquisitions naturally move the bearings in a pattern to get rate reversals. The loss of lock would then cause the target acquisition and the entire observation to fail. A work-around was then developed which has allowed us to continue using FGS1 for FOS and GHRS observations. Even with the work-around, we have lost several moving target observations due to this phenomenon. The mechanism seems to be very sensitive to the speed of the bearing as it reverses, and moving target observations result in extremely low bearing rates which have a high tendency to stick. Consequently, we are currently avoiding the use of FGS1 for moving targets.

In August and September, ST ScI, MOSES (Mission Operations System and Engineering Software, the operational staff at Goddard Space Flight Center), and GSFC Project staff reviewed the trending data, the possible additional work-arounds available, and the potential effects on science operations, given the behavior of all FGSs to date. This review led to the decision to replace FGS1 rather than FGS2. This will have a relatively minor effect on SM-2 preparations. The EVA preparations and astronaut training had already prepared for FGS1 replacement as a contingency operation. They will now train for FGS1 replacement as prime and FGS2 replacement as a contingency.

The trend data for FGS2 indicate that it is possible, but not guaranteed, that it will last until SM3, in late 1999. ST ScI, MOSES, and GSFC staff are working on further changes to operational procedures which might delay the onset of further problems with FGS2. The group is also working on possible alternate guiding strategies using one FGS, rather than two, which would reduce overall wear on the FGSs. The project has already initiated activities to refurbish FGS1 so that it can be returned for flight on SM-3.

Astronauts visit *from page 1*

over your shoulder." She then presented the astronauts with T-shirts emblazoned with some of Hubble's greatest "hits" and signed on the back by Institute staff members.

Ken Bowersox was part of the crew of the previous servicing mission and Steve Hawley worked the arm on the shuttle during the deployment of HST.

Development of the MAMA detectors for STIS

David Leckrone and Carolyn Krebs, Goddard Space Flight Center

The Space Telescope Imaging Spectrograph (STIS) is one of the two advanced scientific instruments scheduled for launch and installation on *HST* during SM2. The numerous spectroscopic and imaging modes of STIS cover the wavelength range from 1150 to 11,000 Å, and the instrument employs two-dimensional detectors, with a 1k × 1k pixel CCD for the optical region, and two 1k × 1k multi-anode microchannel array (MAMA) detectors covering the ultraviolet. An extensive description of the instrument is given in the STIS Instrument Handbook, 1996, Version 1, S. Baum et al.

The MAMA detectors are new for *HST*. They have a number of features which should make their use in STIS very powerful for many ultraviolet programs: they are solar blind (visible-wavelength photons are rejected), they can be operated in time-tag mode, they have good global and local count rates for two-dimensional photon counting detectors, and they are expected to be stable over time. Since the selection of STIS in 1985, the MAMA detectors have undergone an extensive and sustained period of development, selection and characterization. This has now culminated in a successful thermal-vacuum test of the flight instrument, including the flight detectors, covering a test period of over 5 weeks (see the accompanying article). Therefore, we thought this would be an opportune moment to summarize how the MAMAs were selected and their development milestones.

Although other ultraviolet detectors were considered for STIS at the time of selection, MAMA technology was farther along and offered advantages when compared to other types. Once selected, the STIS program embarked on an effort to evolve the MAMA detectors to the point at which they could be space qualified for flight with STIS. The science-driven performance requirements for STIS dictated that the detector tube containing the microchannel plate/photocathode/anode array portion of the device be sealed in situ in high vacuum. The requirements also dictated that high quantum efficiency be obtained with stable performance over time. MAMA detectors are process-based and rework-limited. Each of the many steps in the process, including the final seal, have finite yields, making the production of a flight-qualified MAMA an exacting art.

In the early 1990's, a series of six demonstration (D-series) tubes were built to test evolving microchannel plate improvements, to develop improved and repeatable cesium iodide (for the far uv) and cesium telluride (near uv) photocathode and tube sealing processes, and to develop microchannel plate conditioning procedures (scrubbing) to stabilize performance. One of these tubes was put into service at Goddard Space Flight Center as the work-horse detector for evaluation of STIS UV gratings. By the end of the demonstration phase, a repeatable photocathode process — combined with improved, curved-channel microchannel plates — resulted in tubes consistently exceeding the quantum efficiency specification for Band 1 (1150 to 1700 Å) by 50%, and meeting the specification for Band 2 (1650 to 3100 Å). Of the six planned demonstration tubes, four successfully completed processing and entered extensive testing, a very respectable 67% yield. In 1992, an independent committee made up of astronomers and detector experts reviewed the STIS MAMA development program at Ball and concluded that the detectors were making satisfactory technical progress.

The D-series development phase was followed by six engineering model (E-series) tubes to ensure robustness of the tube design in the anticipated flight environment. While the demonstration tubes operated well in a laboratory environment, it was clear that improvements in the mechanical design were necessary in order to withstand the stringent vibration, thermal, and vacuum requirements of deployment on *HST*. A series of changes in the mechanical packaging of the tube, each verified in a step-wise series of tests, resulted in qualification of the design at vibration levels significantly higher than those expected with *HST* (for example, during shuttle launch). No movement of the microchannel plate was evident. A unit was tested in a thermal environment to evaluate operation within the temperature ranges required. One tube was again put into service at GSFC as a more mechanically robust work-horse detector for evaluation of STIS UV gratings, and accumulated many hours of operation. Another tube was upgraded to flight unit status (for the near uv channel). The remaining tubes, excepting one process drop-out, completed processing and have been used for STIS system integration tests and as checkout units for trouble-shooting and failure analysis.

Over the last year or so, the flight build (F series) provided five candidate tubes. In combination, these tubes (plus the engineering tube upgraded to flight) have successfully undergone over 3000 hours of testing, including thermal vacuum tests with non-flight electronics.

The complete MAMA detector subsystem consists not only of the sealed tube, but also its local electronics and power supplies. As mentioned above, all three tube series demonstrated successful performance with non-flight electronics. During 1995 and early 1996, the flight electronics and power supplies were completed and mated with the tubes with troublesome results. When mated under full vacuum, anomalies occurred

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STIS Prepares for Launch

Stefi Baum, ST ScI

STIS Thermal Vacuum Calibration ended in the early hours of the morning on September 20, roughly thirty days after it began, marking a major step in STIS's steady progression to launch readiness. Within a day, STIS departed from Ball Aerospace for the final time, heading first to Goddard Space Flight Center, in Greenbelt Maryland, for an extended period of ground testing, including astronaut checkout and acclimatization, the Servicing Mission Ground Test 24 in early November, and 3 to 4 weeks of science calibration in air and nitrogen purge. Final shipment to Kennedy Space Center is slated for early December, and launch remains on track for February 13, 1997. Mark your calendars.

The Thermal Vacuum Calibration period focused on the verification of the performance of the instrument as a whole, and also on the science calibration of STIS's UV channels. These use the MAMA (Multi Anode Microchannel Array) detectors. The CCD calibration was deferred until a later ground testing at GSFC.

The analysis of the vast quantity of data taking during Thermal Vacuum Calibration is just beginning, but it is clear that the scientific performance of STIS was exemplary, with specifications being met or exceeded virtually across the board, including sensitivity, spectrum and spatial resolution, detector characteristics, scattering, and repeatability. The MAMA detectors functioned without problem throughout the extended calibration period, and the success of the Bright Object Protection scheme (used to protect the MAMA from damage due to overexposure by bright light) was demonstrated. Another test established the robustness of the MAMA detectors to high voltage cycling. A number of hardware and flight software problems were identified during Thermal Vac which must be treated prior to flight. Final investigation of those problems is continuing at Ball, with the fixes to be installed at GSFC prior to shipment to Kennedy Space Center.

While GSFC, Ball, and ST ScI staff worked to calibrate and characterize the instrument in Boulder, those left behind at ST ScI were busy supporting the Phase I Cycle 7 Deadline. The STIS Group saw over 30,000 uses of the STIS Exposure Time Calculator on the ST ScI STIS World Wide Web Site, and responded to over 140 questions for users preparing their proposals. Meanwhile, work on the ground system to support STIS continued uninterrupted; the first test version of RPS2 to support Phase II proposal submissions was released for internal testing, verification of the commanding chain through the Certification Proposal is nearly complete and the first phase of the STIS Calibration Pipeline was tested end-to-end. The next few months look to be as busy as ever as the data from Thermal Vacuum Science Calibration must be analyzed and understood, science calibration of the CCD and long wavelength (near-ultraviolet) NUV-MAMA modes carried out at GSFC, hardware and Flight Software fixes installed in the instrument, the calibration pipeline and commanding chains updated to take account of changes and planned for capabilities developed. Lastly, we are in the thick of the detailed design of the SMOV (Servicing Mission Orbital Verification; see previous Newsletter) program which will characterize and calibrate STIS on orbit during March to June 1997, with the eager expectation that the instrument will be ready for GO and GTO (Guaranteed Time Observer) use at the start of the Cycle 7 STIS Observing era: July, 1997.

MAMA Detectors *from page 4*

in the power supply and its interface to the tube that compromised two flight tubes. These unforeseen anomalies dictated that the power supply design and tube potting configuration be thoroughly re-examined and carefully re-qualified before any further integration of the subsystem could proceed. The high voltage power supply has now been modified to preclude recurrence of the initiating events, and the tube potting configuration has been changed to a conformal coating to render it less susceptible to high-voltage breakdown. Careful, stepwise qualification of the two parts of the subsystem has been completed. Finally, the two MAMAs selected for flight were successfully integrated in STIS and have been operating nominally and without any anomalies over the summer.

Extensive thermal-vacuum testing at Ball Aerospace resulted in a large amount of spectroscopic and imaging data, which will be used by the science team in the calibration and characterization of the MAMAs. By launch, we are expecting to have achieved over 1000 hours of run time on all STIS flight components, including the detectors. This extensive ground-based testing will give us the information and the confidence to operate STIS successfully on orbit, starting in February 1997.

NICMOS Preparations

Chris Skinner, ST ScI

As part of their preparations for launch and insertion into *HST*, new Science Instruments undergo a regimen of tests. One of those is the System Level Thermal Vacuum testing (SLTV), which NICMOS (Near Infrared Camera and Multi-Object Spectrometer) underwent at Ball Aerospace during August. NICMOS SLTV included tests to characterize the performance of detectors and filters. The results from SLTV are currently being analyzed by the Investigation Definition Team (IDT) and ST ScI staff, but the initial indications are that the NICMOS performance on-orbit should be as good as advertised in the NICMOS Handbook. Instrumental characteristics such as the dark current, read noise and flat-field response should be well characterized by these data, and an initial suite of calibration reference files for NICMOS are being developed.

Some changes to NICMOS' hardware were clearly necessitated by SLTV because of the dewar problems that became apparent. As a result, a short second SLTV test is being carried out at the time of this writing. Some of the measurements made during the first SLTV will be repeated to check for any possible effects due to the new hardware, but those effects are expected to be small. Announcements will be made on the ST ScI Web page for NICMOS as calibration reference data become available from these SLTV tests. Those data will then be used in the NICMOS data reduction pipeline early in Cycle 7. The NICMOS Exposure Time Calculator will be updated as appropriate when the SLTV data have been analyzed. The August 15 supplement to the NICMOS Handbook noted that problems were experienced during the thermal cycling of the NICMOS dewar. The most important science consequence is that there are separate foci for NICMOS camera 3 compared to Cameras 1 and 2 (which still share a common focus). During routine operations on the ground, the dewar is periodically cooled to about 40 K, and then allowed to passively warm up to about 58 K. This warm-up takes about 2 months. However, while the dewar is being cooled the solid nitrogen is "cryo-pumped" to the cold end of the dewar. Because of the dewar's internal design, this cryo-pumping results in the dewar being stretched during the warm-up part of the thermal cycle. One result of this stretching, as noted, is that the three NICMOS cameras cannot all be in focus simultaneously while the instrument is at its expected operating temperature of 58 K. Instead, the Pupil Adjust Mechanism (one of the mirrors in the NICMOS fore-optics, external to the dewar) must be moved to bring either Camera 3 or Cameras 1 and 2 (simultaneously) into focus.

An Anomaly Review Board (with representation from GSFC, ST ScI, the NICMOS IDT, and various external agencies) has been asked by NASA to investigate the current health of the dewar, the ramifications for scientific operations, and ways of minimizing the problem. It is currently unknown whether simultaneous three-camera operation of NICMOS will be recovered either by the time of launch or later. Work is afoot at the Institute to plan for operation of the instrument with multiple foci, and to develop a focus monitoring campaign to be executed during SMOV (Servicing Mission Orbital Verification, which takes place for STIS and NICMOS during the two months following launch; see previous Newsletter) and the early part of the NICMOS GO era.

SM2

Where to find more:

Launch of mission STS-82 as the Second Servicing Mission to *HST* is scheduled to occur on February 13, 1997, at 07:59 UT. Many factors can alter those plans, of course, so to get up-to-date information near the time of launch we suggest looking on the Web. You should also be able to find some details of what activities are planned for what times as launch approaches. The following URLs are worth checking:

`http://www.osf.hq.nasa.gov/shuttle/sts82/`

`http://www.ball.com/aerospace/hst.html`

`http://www.jsc.nasa.gov`

`http://www.ksc.nasa.gov`

Astronomy with HST

WFPC2's Linear Ramp Filters

John Biretta, ST ScI

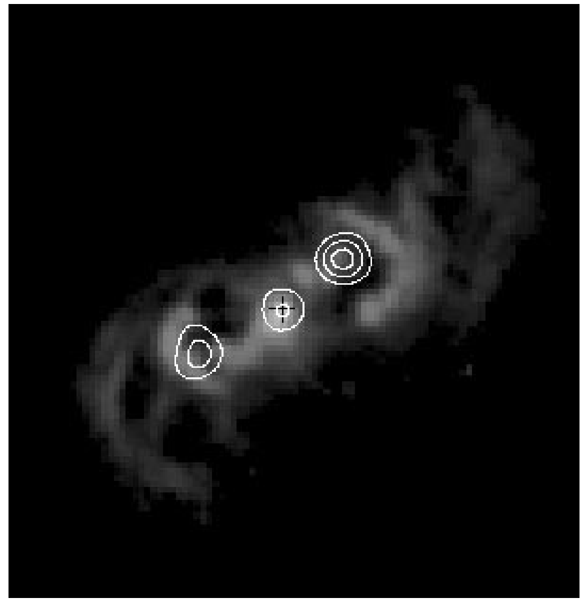
The WFPC2 Linear Ramp Filters (LRFs) provide a narrow band imaging capability which is continuously tunable from 3710 to 9762 Å. These are essentially a collection of narrow band interference filters whose central wavelength varies linearly with position on the filter glass. Over 370 science images have been taken with the LRFs to study problems including Martian soil composition, cloud layering on Neptune, searches for massive black holes in galaxy nuclei, photo ionization and shock models for active galaxies, and the cause of the radio - optical alignment effect in high-redshift galaxies.

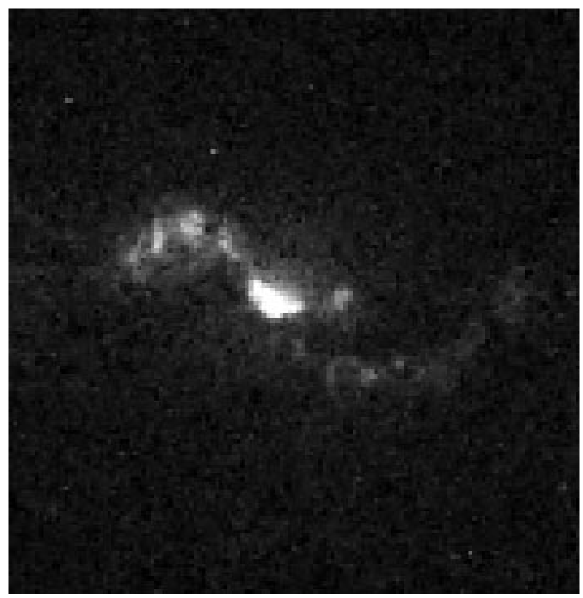
The LRFS are particularly useful for imaging emission lines in distant galaxies, where the redshift prohibits using other narrow band filters onboard *HST*.

In one project the LRF filters have been used to obtain H-alpha images of intermediate redshift Seyfert 2 galaxies. From ground-based observations, these are known to have significant line emission, but the exact structure was unknown. Figure 1 shows an LRF image of MK 573 (redshift *z*=0.017) in Hα light after continuum subtraction (Wilson, Falcke, and Simpson), with contours of the radio emission superposed. The visible line emission extends about 1.4 kpc from the galaxy nucleus (black cross).

This image clearly shows the H-α emission forms shell-like bow shocks centered on the radio emitting regions, this implying a close connection between the radio jet and the line emitting regions. In other Seyferts he LRFs reveal line emission from helical strands wrapping the radio jet.

The LRFs have also been used to survey radio galaxies of the 3CR catalog (Sparks, et al.). Figure 2 shows the typical case of 3C305 (z=0.041) where the LRFs reveal an S-shaped filament of [O III] emission which is nearly 8 kpc across and centered on the galaxy nucleus. These S-shaped filaments appear to be common among 3CR galaxies. They may be signatures of warped disks resulting when gas acquired in an interaction settles into preferred orbits in the host galaxy. In other cases the S shape traces the radio jets, suggesting again that the line emission may result from interaction of the jets and ambient gas.





Medium deep survey team announces first catalog on CD-ROM

Kavan U. Ratnatunga, Richard E. Griffiths, and Eric J. Ostrander, Carnegie Mellon University and the Medium Deep Survey Team

The Medium Deep Survey (MDS) has been a Key Project (presently in its sixth year) which has used parallel WFPC2 data to build up a database of random sky-field images. The best datasets have consisted of pointings with 2 to 3 orbits in the I-band (F814W) and 2 to 3 orbits in V (F606W), although the longer pointings now include the B-band (F450W) also. Each of these fields contains a few hundred galaxies, for which quantitative and structural parameters have been measured through the application of specialized software developed for this purpose. The uniform processing of the MDS data has also been extended to two other datasets: the GTO parallel survey data, generically very similar to that of the MDS, and the primary Cycle 4 survey (28 contiguous fields) performed by the GTOs, viz. the WF/PC team and Ed Groth (the "Groth-Westphal" strip). We are now making public, via CDROM, the images and catalogs of objects from each of these three surveys.

The measured galaxy parameters in these catalogs have relied on a modeling approach based on the maximum likelihood method. The measured global parameters for all but the very faintest galaxies include the centroid positions, magnitudes, disk or bulge-like morphology, effective half-light radius, position angle of the major axis, and axis ratio. The modeling approach has recently been extended to include a full 2-dimensional (Disk+Bulge) decomposition. When a galaxy image has sufficient signal-to-noise, we measure the luminosity ratio of Bulge/(Disk+Bulge), and the ratio of Bulge/Disk half-light radii in each of the observed filters. Measurements of the Bulge/(Disk+Bulge) ratio can be made for a decreasing fraction of images reaching down to $I = 23$ and $V = 24$ in one hour WFPC2 exposures. Individual FITS images are provided for each object, consisting of the observed, model, unconvolved and the residual images which remain after subtraction of the model from the observed image. The residual images, which may contain features such as spiral arms, are not treated further. The individual image stacks, rms sigma images and masks of detected objects are also provided. The ability of the procedure to measure the intrinsic properties of real galaxies has been tested by application of the fitting method to the galaxies in the individual sub-stacks of the Hubble Deep Field and by cross-comparison between the results from each substack.

Catalogs from the three datasets are currently available via CDROM on the Digital Sky Survey jukebox at ST ScI. A full description of the catalogs is available in the README files on each CDROM. A web interface is being developed at CMU to enable the selection and extraction of data from this database, and this is expected to be completed by Oct 10.

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HST Recent Release: NGC 604

This nebula lies in M33 and is a site of star formation in a spiral arm. NGC 604 is about 500 pc apart, and in the center are about 200 hot stars which irradiate it. This is a WFPC2 image from H. Yang (U. Illinois).

The *HST* Grant Funding Process

Ray Beaser and Elyse Wagner, ST ScI

Editor's note: How are decisions made about how to fund the research that is done with HST? Who does it? Why didn't I get what I requested? The TAC process — reviewing the scientific merit of a proposal and deciding how much time to award — is fairly well understood because many of us have participated in it. But the process used for approving budgets can be much less clear. This article is intended to reduce some of that confusion.

U.S. scientists and foreign nationals working in U.S. institutions may receive funding from the Space Telescope Science Institute (ST ScI) to conduct research with *HST* data. Budgets requesting support are submitted with the Phase I proposal in the case of Archival Researcher (AR) programs, but during Phase II for General Observer (GO) programs. This delayed budget submission for GOs has been done to make it easier to propose in the first place, and to ensure that budgets are appropriate for the amount of telescope time actually awarded.

The GO/AR proposals submitted in Phase I are, of course, reviewed by the Telescope Allocation Committee (TAC), which then provides recommendations to the Director of ST ScI. The Director has ultimate responsibility for deciding which AR programs will receive funding and how much time to allocate to each GO program.

After these decisions are made, the funding allocation process begins. The first review of budgets for a Cycle takes place in early February, when AR programs are examined. Those budgets are already in hand and there are relatively few of them, so they can be reviewed soon after those programs are approved. AR grants are usually awarded in March.

Budgets for GO programs are submitted in February, at about the same time as Phase II. There are many GO programs, and so an initial review and summary is performed by the ST ScI Grants Administration Branch, and all of the budget materials submitted for all programs are distributed to a Financial Review Committee (FRC) later in the spring. GO grants are awarded as observations are received.

The FRC consists of nine scientists, including ST ScI staff scientists and two members from the *HST* user community. The members are chosen for their expertise with *HST* instruments and data analysis hardware and software. The ST ScI Head of Administration is the Chair of the FRC, and the Grants Administration Branch provides administrative support to the Committee. All of the scientists on the FRC are users of *HST* and thus knowledgeable about the requirements of reducing and analyzing *HST* data. Conflict of interest procedures require that scientists are not present during Committee deliberations as budgets for their own programs (or those for which they are associated) are reviewed.

Each GO/AR budget is reviewed individually in a manner similar to that of the TAC. Each member of the FRC has primary responsibility for reviewing all of the budget materials for a specific number of programs, and presents to the Committee a summary and critique of the requirements of the program and the requested resources. The scientific abstracts, TAC Comments, and scientific standing are presented to the FRC for each program, along with the budgets and budget narratives. A list of the equipment that was approved in previous cycles for each investigator and a list of publications prepared by the ST ScI library are also provided.

The budget narrative is the single most important component of what the FRC reviews. It should provide a brief justification of the level of support requested, especially for personnel,

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A Brief Update on Cycle 6 Progress

P. Stanley and G. Miller, ST ScI

Good progress is being made on completing the FOS and GHRS programs prior to the Servicing Mission (SM2) in February 1997. While we plan to execute at least 75 to 80 orbits per week of FOS and GHRS observations, we also have about 220 orbits of WFPC2, FOC and FGS observations that remain in the long range plan for execution before the Servicing Mission. These observations have been selected for pre-SM execution because they are Early Acquisitions for FOS and GHRS programs, are observing events unique to this year, or are sequences from long-term monitoring programs.

We have also recently taken steps to identify single orbit, standalone WFPC2 observations that will be placed in a special pool for execution similar to the Snapshot program. These observations will take higher priority for filling "gaps" in the schedule than snapshot observations. The visits selected can not include any links (timing or orientation) to other visits in the program. The visits will appear on the *HST* Public Status Page with a status of "scheduling" but without the usual 6 to 8 week plan windows. Their original post-SM plan window assignments will be retained in our scheduling data base in case they are not executed prior to the Servicing Mission. In this manner, we will optimize our opportunities to execute as much as possible from the prime science program. Analysis of the FOC and FGS programs did not identify any good candidates for this scheduling pool.

Grants *from page 9*

travel, and equipment. Unusual items (for example, secretarial support) should also be specifically justified. If a program involves foreign investigators, a description of the role of each investigator should be described, including the percentage of data analysis that will be performed by each U.S. and non-U.S. investigator. Together with the knowledge of the Committee members, spreadsheets and graphs are prepared to assess whether funds are allocated equitably. The budget review process is extensive. For Cycle 6, the budgets submitted for the 393 funded GO programs, representing about 1200 grants, were reviewed over a 3.5 day period.

For Cycle 6, the 393 approved GO programs requested about $27 million, while only about 18 million was available from NASA. Of those 393 programs, 24% received 100% of their requested funding, 23% received 80% to 99% of their budgeted costs, while 26% received from 60% to 79% of the requested funding.

Budget guidelines were provided to Cycle 6 General Observers in Phase II and are included in the Cycle 7 Call for Proposals. The budget guidelines provide definitions of reasonable budget requests for Salaries and Wages, Travel, Supplies, Equipment, Ground-based Observations, Page Charges, and Collaboration. Please note that NASA prohibits any GO/AR funds being provided to non-U.S. scientists (i.e., individuals affiliated with foreign institutions), including travel and subsistence support. Since the available funding from NASA for the GO/AR programs was considerably less than the requested amount, ST ScI found it necessary to recommend that travel budgets be limited to only $2,000 to $3,000 in loaded costs. The Institute also encourages investigators to request only the publication support that is needed. ST ScI will generally support one year of funding at a time. If additional funding is required after the approved funds are exhausted, a request may be submitted for a small supplement to complete the analysis of data and publish the results.

Funding notification letters, signed by the Director of ST ScI, are sent to the PIs of each funded GO program. The PIs are requested to forward the letter to their Co-Investigators, if applicable. When allocated support is less than what was requested, PIs may contact the Grants Administration Branch to inquire about the specific reasons for the reduction. However, unless specific funding restrictions are listed in the Director's letter, the PI may allocate the approved funds as appropriate to achieve the scientific goals of the program. When revising a budget, the PI should keep in mind the budget guidelines and any specific recommendations in the Director's funding notification letter.

Budget forms in electronic format are available on the ST ScI web site (`http://www.stsci.edu/`). The forms are available in Lotus and Excel formats for a PC, and in LaTeX format. The instructions are available in downloadable ascii files. Upon request, a 3.5" disk with the Lotus and Excel files will be sent to you or your institutional administrative staff.

We hope the above information concerning the way GO/AR funding is allocated for *HST* programs is useful. Any questions concerning the GO/AR grant process may be directed to Ray Beaser or Elyse Wagner (410) 338-4200 or `beaser@stsci.edu` or `wagner@stsci.edu`.

HST Recent Release: Jupiter & Io

Here we see Io passing above the turbulent clouds of Jupiter in a PC image taken in the violet on July 24, 1996. The resolution is approximately 150 km at Jupiter. The bright spots on Io are sulfur dioxide frost. This image was taken in coordination with a Galileo program.

Instrument News

WFPC2

Brad Whitmore, ST ScI

The WFPC2 continues to work extremely well, and so most of our news is about improvements in calibration and data analysis.

First, an algorithm was installed in the calibration pipeline on August 9th to identify bias jumps in WFPC2 images. This is part of an effort to automate the Data Quality Assessment (DQA) of *HST* data. This software provides a more objective and sensitive method of finding bias jumps. A stand-alone version of the task will be available in the next STSDAS release so that observers can fine-tune the detection parameters themselves. At present the pipeline simply puts an informational message into the image header and into the PDQ file which is sent to observers as part of their “paper products”. The bias jumps can be corrected by the observer if so desired using separate bias levels for specific ranges of rows. This is described in WFPC2 Instrument Science Report 95-06, “A Field Guide to WFPC2 Image Anomalies,” which is available on the WFPC2 web page.

Second, unusually large discrepancies have arisen in comparing pre-launch throughput predictions and standard star observations for the CH4 and UV quad filters. For example, a 30% throughput difference was found for the 8929 Angstrom quad of the CH4 filter, while the other CH4 and UV quad filters showed differences in the range of 3 to 15%. These are larger than the typical 5 to 10% differences previously seen in pre-launch predictions of the throughputs for other filters. Updated throughput curves have been calculated for the CH4 and UV quad filters and have been installed in the SYNPHOT synthetic photometry package as of July 1996. Observers with affected data have been notified. Third, effective August 1st the weekly dark files delivered to the calibration pipeline have been constructed using a superdark, with hot pixels replaced from a weekly dark observation. This procedure improves the noise properties for the majority of pixels, as well as the timeliness of hot pixel information. Hot pixels are marked in the Data Quality file with different values, according to whether they have changed significantly since the previous week.

Finally, new software is now available to improve the spatial resolution of images taken with subpixel dithering. Most observers presently use simple linear “shift-and-add” techniques or non-linear Richardson-Lucy deconvolution techniques (developed at the European Coordinating Facility and incorporated into STSDAS through the task ACOADD). A new technique developed by Andy Fruchter and Richard Hook is now available in a Beta version. The new program, known formally as variable-pixel linear reconstruction and informally known as “drizzling,” can handle missing data, random dither patterns, and large offsets. An early version of the code was used for the Hubble Deep Field. The code will be incorporated into STSDAS in the near future. However, those who wish to use the code in its present form can download Drizzle V1.0 via the WWW at:

`http://www.stsci.edu/~fruchter/dither/dither.html`

In addition, substantial progress has been made on using the drizzle code to remove cosmic rays from dithered images, potentially removing the need to take multiple exposures at the same location when large numbers of dithered images are obtained. We will have more information on this capability in time for Phase II proposal submissions.

For up-to-date information on HST’s science instruments, check ST ScI’s web pages. You may also wish to subscribe to one or more STANs (Space Telescope Analysis Newsletters). Subscriptions are done through a listserver, the instructions for which may be found on each instrument’s web page.

GHRS

David Soderblom, ST ScI

The GHRS (Goddard High Resolution Spectrograph) is performing well under the heavy usage needed to complete Cycle 6 programs, and there have been no serious anomalies. Please consult our web pages to learn of minor issues that have arisen in data analysis.

FOS

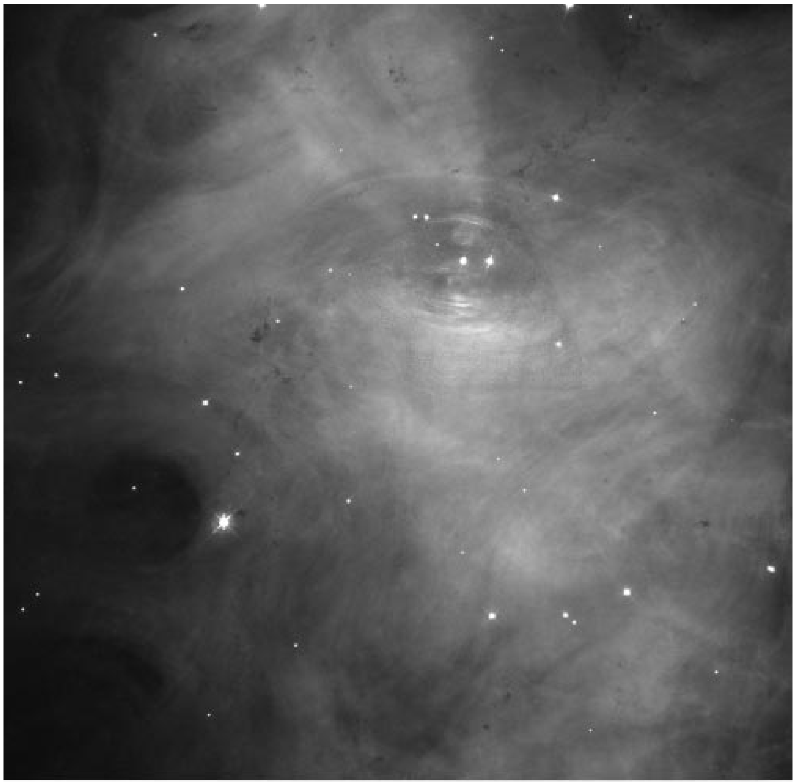
Tony Keyes, ST ScI

The Faint Object Spectrograph continues to operate nominally in all modes.

The comprehensive FOS/RD flat field calibration suite, which failed guide star acquisition in April, was successfully executed in August as were external source observations that can be used to unify the FOS and GHRS Side 1 external wavelength systems.

Recent analysis of FOS target acquisition slews has shown a dramatic improvement of *HST* blind pointing accuracy since the FGS alignment matrix update of 14 April 1996. For pointings with FGS2 dominant, 75% of all blind pointings are now within 1 arcsec of aperture center compared with only 30% prior to the update. For FGS3-dominant pointings, an improvement to 85% from 60% is seen. No information is currently available for FGS1-dominant pointings.

Effective 16 August the FOS Contact Scientists are responsible for routine post-observation data quality assessment and OPUS assessments have been discontinued. Re-designed and more quantitative FOS paper products, which facilitate this effort, have been routinely distributed to observers since that time.



HST Recent Release: Crab Nebula

This is the inner region of the Crab Nebula, taken with WFPC2 and the F550W filter. It is one of a sequence of images taken to study changes in the nebula. To see the results, check under "Crab Nebula: The Movie" on the Public ST ScI web page.

ST-ECF Newsletter

The Space Telescope —
European Coordinating Facility publishes a quarterly newsletter which, although aimed principally at European Space Telescope users, contains articles of general interest to the HST community. If you wish to be included in the mailing list, please contact the editor and state your affiliation and specific involvement in the Space Telescope Project.

Robert Fosbury *(Editor)*
Space Telescope — European Coordinating Facility

Karl Schwarzschild Str. 2
D-85748 Garching bei München
Federal Republic of Germany

E-Mail: rfosbury@eso.org

Archive Branch News

by Megan Donahue and Tim Kimball, ST ScI

An Archive Web Interface!

You may now search the catalog and retrieve public data from the Hubble Data Archive (HDA) via the World Wide Web. Check out the Archive page at `http://www.stsci.edu/archive.html` for the full range of Archive Web services (including the Digitized Sky Survey). The URL for the Web interface is `http://archive.stsci.edu/HDA/` (The preferred browser is Netscape.) Basic search and retrieval capabilities are supported in this first release. More features will be added as demand determines and time permits.

Three search forms are available: basic search, proposal information, and dataset list retrieval. The basic search allows you to search the Archive on object name or position, proposal, wavelength, or instrument. You may then mark and retrieve public data, display preview images or the corresponding Digitized Sky Survey image. The DSS image can be displayed with the *HST* apertures overlaid.

The proposal form allows you to display or search information for a specific proposal, such as titles, abstracts, and principal investigator, along with a list of datasets archived for that proposal.

The dataset list retrieval form can upload a file listing dataset names, or it accepts a list you type in directly. If you have generated a list of retrieval datasets by other means, you can use this form to retrieve those datasets from the archive.

Web-access to the HDA expands the number of potential platforms that can be used to use the archive. StarView is only supported on Unix and VMS operating systems, which leaves out PC and Mac users. The features available on the Web also allow investigators to bring up additional information easily, such as Digitized Sky Survey images with the overlaid *HST* apertures for any observation or with a click of the mouse, reveal proposal information such as the abstract or observation plans.

Because we cannot currently ensure the security of a user's login password on their system, only non-proprietary data can be retrieved to the Archive Host staging disk through this interface. Proprietary data retrievals by authorized users and direct retrievals to a user's home disk can only be accomplished via StarView (see previous Newsletter.)

Archive Future Shock

The new instruments on *HST* are projected to create data ingest rates of upwards of 10 GBytes a day. As a result, we are taking a look at new ways of storing and distributing data. New technologies, such as Digital Versatile Disks, offer the potential for cheaper and more compact storage. On-the- fly recalibration, still under consideration by the Institute, would obviate the need for archiving obsolete calibrated data, and lossless data compression would reduce the demand for disk space even further. Electronic access has offered PIs nearly instantaneous data gratification. Electronic distribution of General Observer data may replace the manual creation and collation of some of the data tapes sent to Principal Investigators, if PIs opt to forgo receipt of data tapes. We are planning this fall to offer a DAT tape option to PIs and those using the archive. Watch this space and the Archive web pages for announcements of the exciting new developments!

An Updated Archive Manual

The updated, long-awaited Archive Manual is now available, either by sending a request for a paper copy to `help@stsci.edu` *or by browsing the electronic version on the WWW:*

`http://archive.stsci.edu/manual/noteworthy.`

Planets Beyond the Solar System and the Next Generation of Space Missions

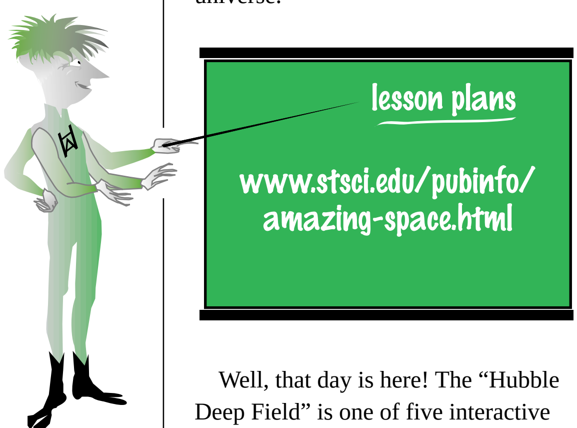
Proceedings from the workshop, which was held at ST ScI on October 16, 17, and 18, will be out next year in the ASP Conference Series. Meanwhile you can find abstracts for the invited presentations and posters on the web, under "STScI," then "Meetings...".

Public Outreach and Education

Amazing Space: Lessons from the Hubble Space Telescope

Flavio Mendez, ST ScI

Imagine the day a teacher says to the class: “Let’s start our class by surfing to the Space Telescope’s home page and click on the “Hubble Deep Field” lesson. Fasten your seat belts because today Professor WifPic will take us on a trip to the edge of the known universe.”



Well, that day is here! The “Hubble Deep Field” is one of five interactive lessons on the World Wide Web produced this past summer at the Space Telescope Science Institute. The institute’s Office of Public Outreach (OPO) recruited 10 classroom teachers from all levels (K to 12), and teamed them with Institute scientists and engineers to develop educational resources that highlight *HST* observations and technology. The five main lessons, “Hubble Deep Field”, “Student Astronaut Challenge”, “Solar System Trading Cards”, “Stars: Birth, Life, Death, and Re-Birth” and “Aiming the Hubble Space Telescope,” use information from *HST* and other NASA missions to engage students in creative activities that will improve their math and science concepts and skills. All lessons include ties to the National Science Standards and Benchmarks to guide mapping to state standards and local curricula.

Pioneers of the Web

The five-week program was very demanding on its participants. The teams learned that writing a lesson plan for the Web is very different from writing a lesson plan for the classroom. A well-designed computer lesson plan should be laced with adequate navigational tools to avoid getting lost. When using the Web, the teachers had to remember that users can link from many locations to the current “page.” For NASA-related information, the teachers quickly learned that acronyms and abbreviations must be avoided or defined clearly in each document page.

Teachers are most experienced writing lessons and preparing activities for their own classroom use. The lessons created with OPO are designed with the idea that many teachers will use them in many different environments, so clarity is a must! Most teams also quickly discovered that use of NASA information required some education on their part. Observations from *HST* and other NASA missions are “cutting edge” in that they are mostly only available through recent press releases, the Internet or through highly technical documents. Textbooks cannot keep up with the pace of new discoveries. Many times workshop participants found themselves spending long hours doing research, or being tutored by their lesson scientists and engineers. This was true even when the lesson themes were narrowly defined, and Web resources and expert scientists were available. The team writing the servicing mission lesson, for example, found that they needed to refer extensively to technical manuals describing scientific equipment that is still being designed.

The workshop might be better described as a think tank for ideas on specific topics. In creating the lessons, teachers and OPO staff were constantly editing, learning, and changing strategy. All were committed to producing a stellar final product, but their methods weren’t very efficient. Evaluations and revisions continued through the fourth week. During the fifth week, the teachers presented their lessons to their peers and outreach members. Probably the teacher’s biggest frustration was the open-ended methodology of the think tank — no length or specific approach was recommended for the lessons, although extensive computer template files, used as a basis for lesson design, were provided. In any such situation, the balance among guidelines, requirements, and creativity is a delicate one, for which there is no magic recipe. Public outreach staff tried to anticipate these situations, but they found that moral support, coaching, and encouragement worked most effectively. This workshop was a first for the teachers and institute staff. In one sentence: we all became pioneers of the Web!

Teachers, Scientists and Engineers — Excellent Working Teams

Fortunately, by creating a focused, five-week workshop orchestrated and supported by the outreach office, the teachers could rely on an infrastructure they seldom experienced in their own schools. The entire public outreach staff supported the teachers’ work; this included a group with video, animation, graphics, cartooning, science writing, Web, and education expertise. Institute facilities also provided the teachers with powerful and fast computers and even extensive photocopying services. The teachers-scientist-engineering teams became excellent working groups. All parties found their expertise used at their maximum potential. The teachers offered their experience in formulating lesson ideas, the knowledge of child psychology, and the familiarity of the workings of a classroom. The scientists provided their expertise, thus guaranteeing scientific accuracy. The engineers and student interns provided their knowledge of computer technology, Web resource creation, and the Space Telescope's technical details.

Customize Your Own Interactive Lesson Using the Grab Bag

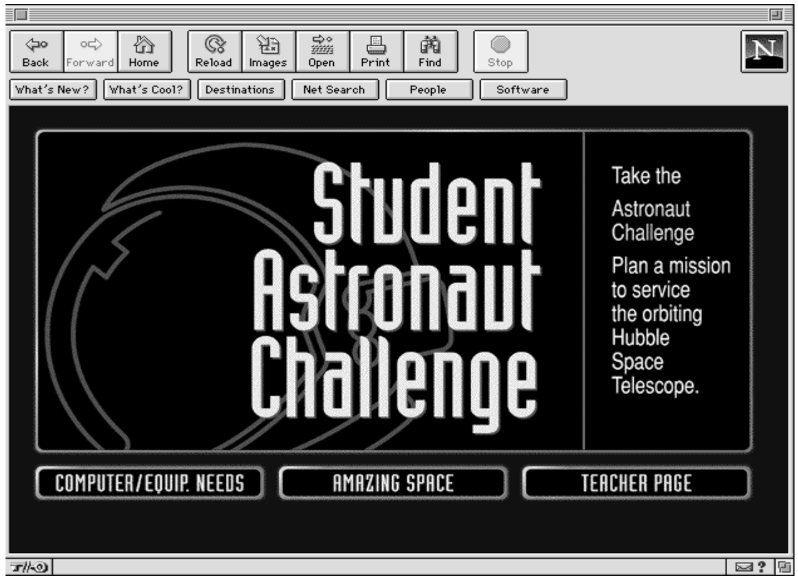
Part of the summer effort was spent in creating a teacher page for each lesson to assist teachers in leading the lessons in their classrooms. One of the best features of the teacher page is a grab bag of resources. In this area teachers can find all the individual images, movies, animation clips, worksheets, etc., used in the lesson plans, as well as links to other resources at related Internet sites. This section allows teachers to customize their own interactive lessons and use individual items as they desire.

About the Lessons

Take your pick: Accompany professor Wifpic on a trip to study the galaxies of the Hubble Deep Field; join the crew of STS-82 in the "Student Astronaut Challenge" as they service *HST* during the 2nd Servicing Mission; increase your knowledge of the planets as you collect "Solar System Trading Cards"; see stars as they evolve from birth, through life, death, and re-birth.

Hubble Deep Field

Professor Wifpic, a four-armed extraterrestrial being, leads middle school students on a trip to the Hubble Deep Field. Through this exercise, students, working as scientists, try to determine the number of objects in the deep field image. They also classify the objects and determine the distance to some of them. Each section in the lesson plan offers students the opportunity to verify their answers with those from professional astronomers who are members of the Hubble Deep Field team. For schools not yet connected to the Web, OPO will release this lesson through a set of lithographs and a poster for classroom use.



Student Astronaut Challenge

HST will be serviced by NASA astronauts in February, 1997. The "Student Astronaut Challenge" lesson challenges middle school students to establish the order of events of this servicing mission. Students who successfully complete the challenge will receive a Mission Certificate from their teachers.

Solar System Trading Cards

"Solar System Trading Cards" is a lesson that challenges elementary school students to recognize the planets, Sun, asteroids, and comets by using *HST* and other NASA data. As the students collect their electronic "Solar System Trading Cards," they read about objects in our solar system. ST ScI has plans to make this lesson available to those without Internet access in a series of Solar System Trading Cards.

Stars: Birth, Life, Death, and Re-Birth

"Stars: Birth, Life, Death, and Re-Birth" is a high school lesson in which students examine *HST* observations of stars at different stages of their long evolution. The topic comes alive with the impressive images taken by the Hubble Space Telescope, along with colorful graphics, animation, and movies provided by the outreach office staff. These visual aids describe each stage of a star's life as it recycles its material into space. OPO will offer this lesson as an educational poster for those schools without Internet connections.

For More Information

ST ScI's Office of Public Outreach plans to introduce these lessons both locally and nationally through teacher development days and regional and national educational conventions. Materials for the "hands-on" versions of the lessons will be distributed at these conventions and by other methods still to be determined.

Institute News

Science with the Hubble Space Telescope II

Proceedings of the Paris meeting on Science with the Hubble Space Telescope II were recently published and distributed to participants and a select list of astronomical libraries. There are a few copies remaining that will be sent on a first-come, first-served basis to libraries that did not receive one in the initial distribution and would like to. Requests should be sent to `library@stsci.edu` and should include the library's full mailing address.

Searching the *HST* Bibliography

S. Stevens-Rayburn, ST ScI

Several people recently have asked about access to the *HST* bibliography and specifically how they can obtain a list of papers using a specific instrument, such as the GHRS. There are several ways to get such a list, some more user friendly than others:

1. The librarian (`library@stsci.edu`) can send you an electronic copy of the full bibliography or you can scoop it up directly from the library section of the Institute's anonymous ftp (`ftp.stsci.edu`). This can be arranged either alphabetically by first author or in reverse chronological order by instrument. Either way, you'd have to do some editing to get just the GHRS papers. The current version is about 5600 lines long.

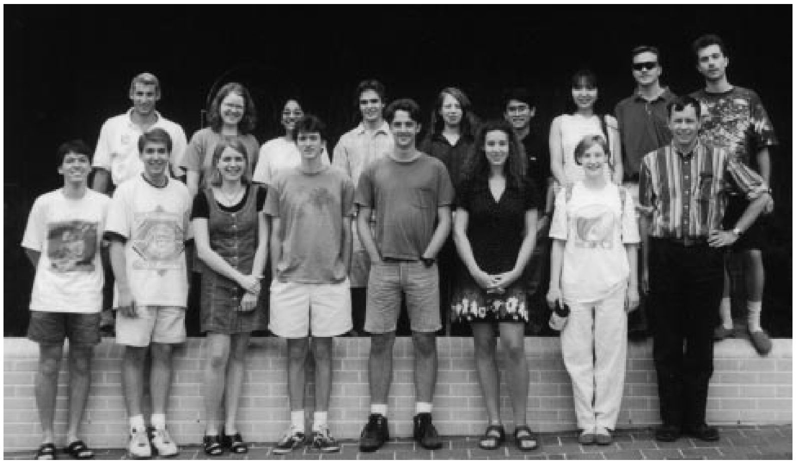
2. You can search the library's homepage version:
`http://www.stsci.edu/cgi-bin/search-wais-dash/hst-paper-db`
or if that's too hard to remember, you can go directly to the Library's homepage:
`http://sesame.stsci.edu/library.html`
and then click on Preprint Services. The tricky part of this method is that you have to search by the correct specification for each year; e.g., 91ghrs, 92ghrs, etc. You may enter these in one search, but the retrieval limit appears to be 200, so to get them all (currently >240), the search needs to be done one year at a time. The results can be printed or e-mailed to oneself using standard browser functions.

3. Search the European Coordinating Facility (ECF) version of the Library database:
`http://archive.eso.org/wdb/wdb/hst/publications/form`
to which there is also a link from the ST ScI Library's Preprint Services page.

Search under "preprint id" for "ghrs" and be sure to set the "use full screen output" button at the bottom of the search screen, or you'll be clicking forever. There are other neat features of this search that you may wish to explore: e.g., search for similar proposals or the ADS database. Unfortunately, the automatic mechanism that creates the updated ECF version every other week doesn't always work, so searching the ST ScI local version is the only way to be absolutely sure of getting the most current edition.

Finally, let me explain briefly the structure of the database entries:
94-21 MINN-94/233 DAVIDSON, K.; EBBETS, D.; WEIGELT, G.; HUMPHREYS, R.M.; *HST*+95FOS HAJIAN, A.R.; WALBORN, N.R.; ROSA, M. "*HST*/FOS spectroscopy of eta Carinae: the star itself, and ejecta within 0.3 arcsec" AJ 109: 1784-1796, 1995

The first column is a chronological designation for when we got the preprint. The lists are updated every two weeks, so that 94-21, for example, means the 42nd week of 1994. The second column gives the observatory series number, if there was one, the *HST* designation (year of publication and instrument, + means it was in a refereed journal, - means it was not (usually a conference proceedings), and the grant number(s) if mentioned in the paper. The third column includes all authors (up to 25), full title, and full citation for papers that have been published (the database includes both preprints and published papers). We make a determined effort to include all refereed papers based on *HST* observations in the database and most of those in the unrefereed literature as well, but do understand that this is all done by mere mortals, so there are likely to be typos, mis-identified instruments, omissions, etc. and I'd be most grateful if corrections and additions were brought to my attention.



The 1996 Summer Student Program at ST ScI

David Soderblom, ST ScI

Each year since 1993 ST ScI has hosted a Summer Student Program (SSP). The goals are to introduce undergraduate students to a working research environment, to help focus ST ScI staff members on a research project, and to have some fun in the process. In 1996 we had 16 students, as we did in 1995, but we ran for 10 weeks instead of the previous 8. This year we had two students from Europe, many from the greater Baltimore area, and others from all over the U.S.:

Student	*Home Institution*	*ST ScI Supervisor*
Todd Barto	Washington College	Todd Henry
Gregory Bosworth	Georgia Tech.	Todd Henry
Steven Drasco	College of the Redwoods	Anne Kinney
Amy Germida	Notre Dame College of Maryland	Anne Kinney
Stefano Giovanardi	Univ. of Bologna	Nino Panagia
Jennifer Graham	Wittenberg Univ.	Kailash Sahu
Regina Jorgenson	Univ. of Puget Sound	Antonella Nota
Jessica Kim	Towson State Univ.	Meg Urry & Joe Pesce
Katrina Koski	Lake Forest College	Claus Leitherer
Catriona Maclean	Cambridge Univ.	Bill Sparks
Christian Marois	Univ. of Montreal	Howard Bond
Bryan Mendez	Univ. of Michigan	David Soderblom
Sergey Movshev	Johns Hopkins	Mike Fall
Sripriya Natarajan	MIT	Barry Lasker
Carolyn Pointek	Notre Dame College of Maryland	Peter Stockman
Michael Wang	CalTech	Anuradha Koratkar & Mike Goad

The SSP is supported by funds from within ST ScI and by individual grant holders. We now have stable funding and can announce that there will be a 1997 SSP. Those interested should check the ST ScI web page after January 1, 1997. If that is not possible, please send a self-addressed stamped envelope (a single stamp is sufficient) to:

David Soderblom, SSP Coordinator
Space Telescope Science Institute
3700 San Martin Drive
Baltimore MD 21218.

Due to the large volume of mail received, only requests that include a SASE will be answered, and they must not be sent until after January 1. The deadline for applications will be February 28, 1997.

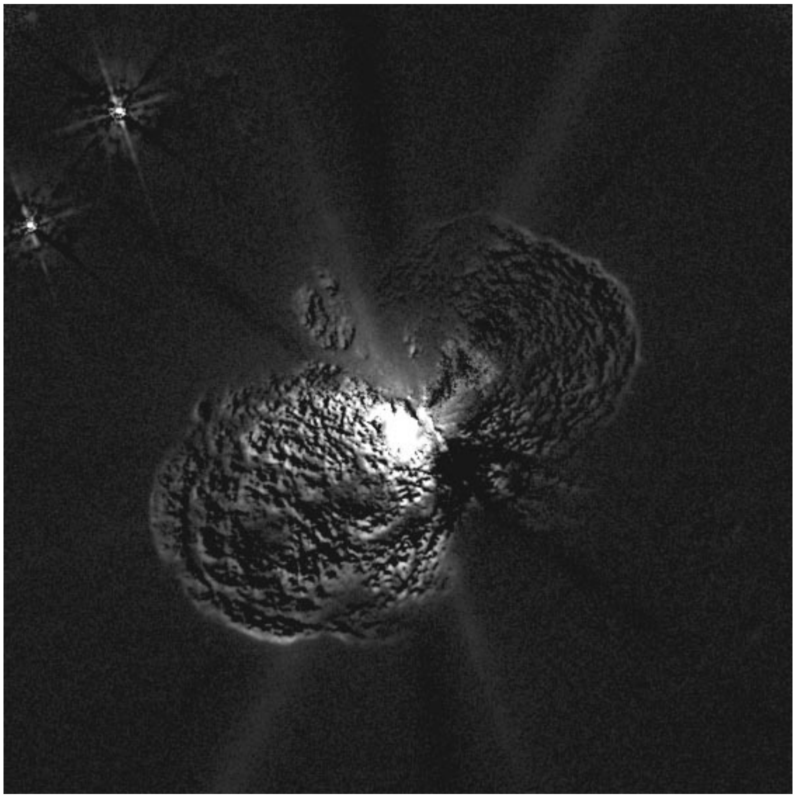
An Astrometric Recalibration of the GSC

Jane Morrison, Siegfried Röser, Astronmisches Recheninstitut, Heidelberg
Barry Lasker and Brian McLean, ST ScI

An astrometric recalibration of the Guide Star Catalog, designated as GSC 1.2, has been completed. The new calibrations are on the system of the PPM. Plate-based systematics have been removed with a mask technique. Also, a magnitude equation, empirically determined by comparing GSC and AC (Astrographic Catalog) data, has been applied. The improved accuracy is expected to be particularly useful where an important consideration is external error, e.g., source identifications made at non-optical wavelengths.

The preliminary release of GSC 1.2 consists of a description of the calibration and a facility for small-area access to the data; these may be found at URL `http://www-gsss.stsci.edu/gsc12/gsc12.html`

The overall RMS position errors of GSC 1.2 for $V > 8$ are 0.31" in each coordinate (compared to 0.65" in α and 0.53 in δ for GSC 1.1), and the distortions at the plate edges are greatly reduced. Continuing work on GSC 1.2 includes a more complete error analysis, complete plate-to-plate overlaps, preparation of a journal article, and release of the entire catalog. A few caveats on GSC 1.2 are also appropriate. First, this is a provisional rereduction, which clearly will need to be repeated when reference objects based on the Hipparcos catalog become available. Second, it must be remembered that astrometric header information in the ST ScI Digitized Sky Surveys is consistent with GSC 1.1, not 1.2. Finally, as GSC 1.2 has not been installed in the *HST* ground system, *it must not be used for HST observation planning*.



HST Recent Release: Eta Carinae

This is a difference image of two pictures taken 17 months apart, using WFPC2 in the violet. The black portions are material in April, 1994, while the white portions represent September, 1995. This illustrates how material nearer the star moves faster than material that is farther away. This work was done by Jon Morse (U. Colo.) and Kris Davidson (U. Minn.).

On the WEB

Some items on ST ScI's web pages you may find of interest:

1 **Science with the Hubble Space Telescope:**
The proceedings from "Science with the Hubble Space Telescope II," the meeting held in Paris last December, are available on-line, under "ST ScI," then "On-Line Conference Proceedings."

2 **HST @ 5 dex:**
HST has taken more than 100,000 exposures.
See this and more under "Public".

3 A web page for the **Space Telescope Users Committee** has been set up under "ST ScI." The most recent report of the STUC can be found there.

4 **The Advanced Camera for Surveys**, a new instrument for HST, is described under "Instruments," then "Future Generation Instruments."

5 **A second Hubble Deep Field** is being planned. Details are being worked out, but some preliminary information can be found under "Observer," then "Hubble Deep Field," then "What's New?"

Tenure for Marc Postman

Editor's note: Four Astronomers at ST ScI were granted tenure recently; they are Mike Hauser, Marc Postman, Abi Saha, and Bill Sparks. All will be profiled over the next year.

Dr. Marc Postman was recently promoted to Associate Astronomer with tenure at ST ScI. Marc came to the Institute in 1989 as an Assistant Astronomer in the Catalogs and Surveys Branch (CASB). He started work on a second Guide Star Catalog, which involved a comprehensive survey of the sky for both stars and galaxies. You may know him best for one specific product: the compressed Digitized Sky Survey, now available on-line or on CDROMs.

Marc grew up in Flushing, NY, in an academically-oriented family. His interest in astronomy is life-long, sparked in a time of Apollo flights, Star Trek, and 2001, although he confesses that Jacques Cousteau almost won out in pulling him toward oceanography. He graduated from M.I.T. in 1981 with a degree in physics, and then went down Mass. Ave. to get a Ph.D. at Harvard in 1986, working with Margaret Geller on large-scale structure in the universe. He spent a post-doc at Princeton with Jim Gunn before coming to ST ScI.

Marc has continued to play a leading role in studies of large-scale structure, mostly recently with a

controversial study with Tod Lauer on the distribution of mass that is implied by the distribution of distant clusters of galaxies. He is using *HST* to observe galaxy clusters near z ~ 1 to study the evolution of cluster properties, large-scale structure, and galaxy morphology.

Marc has been Chief of the Archive Branch for a year now, and is responsible for the maintenance and improvement of the Hubble Data Archive. A current challenge is the greater data flow that will result from instruments like STIS and NICMOS, but ST ScI and the Archive Branch are also looking into providing data archives for astronomical observations from other space missions or from ground-based telescopes.

Marc's wife, Barbara, has a background in art history and works at the Baltimore Museum of Art. They have two daughters, ages 3 and 7. What little time they leave gets spent at the beach, skiing, or playing tennis or the guitar.

Calendar

Cycle 7

TAC panels meet	28 Oct. to 6 Nov. 1996
TAC meets	18 to 20 Nov. 1996
Decisions mailed to proposers	31 Dec 1996 (tentative)
Phase II Proposals due (all but STIS)	15 Feb. 1997 (tentative)
Phase II proposals due for STIS-CCD	25 Mar. 1997 (tentative)
Phase II proposals due for STIS-MAMA	1 May. 1997 (tentative)
Start of science observations	1 July 1997 (approximate)

Cycle 8 (tentative):

Call for Proposals issued	June 1997 (tentative)
Phase I proposals due	September 1997 (tentative)

Second HST Servicing Mission Launch

13 Feb 1997, 07:59 UT (tentative)

Meetings and Symposia

ST ScI May Workshop The Hubble Deep Field	6 to 9 May 1997
Space Telescope Users Committee	7 to 8 Nov 1996

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How to contact us:

First, we recommend trying our Web site: `http://www.stsci.edu` You will find there further information on many of the topics mentioned in this issue.

Second, if you need assistance on any matter send e-mail to `help@stsci.edu` or call 800-544-8125. International callers may use 1-410-338-1082.

Third, the following address is for the HST Data Archive:
`archive@stsci.edu`

Fourth, if you are a current HST user you may wish to address questions to your Program Coordinator or Contact Scientist; their names are given in the letter of notification you received from the Director, or they may be found on the Presto Web page (`http://presto.stsci.edu/public/propinfo.html`).

Finally, you may wish to communicate with members of the Space Telescope Users Committee (STUC). They are:

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