HIGHLIGHTS OF THIS ISSUE:

☐ NEW SCIENCE RESULTS ON M87, CRAB PULSAR
☐ COSTAR PROGRESSING WELL
☐ ANSWERS TO YOUR QUESTIONS ABOUT HST DATA
☐ CYCLE 2 PEER REVIEW UNDERWAY

WF/PC OBSERVATIONS OF THE STELLAR CUSP IN M87

The photograph on the left shows one of a set of images of the central regions of the giant elliptical galaxy M87, obtained in June 1991 with HST's Wide Field and Planetary Camera (WF/PC). Analysis of these images has revealed a stellar cusp in the core of M87, consistent with the presence of a massive black hole in its nucleus.

A combined approach of image deconvolution and modelling has made it possible to investigate the starlight distribution in M87 down to a limiting radius of about 0.04" from the nucleus (or about 3 pc from the nucleus if the Virgo cluster is at 16 Mpc). The results show that the central structure of M87 can be described by three components: a power-law starlight profile with an $r^{-1/4}$ slope which continues unabated into the center, an unresolved central point source, and optical counterparts of the jet knots identified by VLBI observations.

In both the V- and I-band Planetary Camera images, the stellar cusp is consistent with the black-hole model proposed for M87 by Young et al. in 1978; in this model, there is a central massive object of about $3 \times 10^9 M_\odot$.

The central luminosity spike remains unresolved with the Planetary Camera, and is at least as blue as the rest of the M87 jet. In a paper reporting these results (now in press in The Astronomical Journal), the WF/PC Investigation Definition Team (IDT) argues that the central spike is entirely due to nonthermal (synchrotron) radiation.

The WF/PC images, as well as recent Faint Object Camera (FOC) images, also show M87's well-known jet with unprecedented optical resolu-
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### HSP Observations of the Crab Pulsar

In late October, the High Speed Photometer (HSP) team obtained photometry of the optical pulsar in the Crab Nebula. These data demonstrate the capabilities of HSP to observe short-timescale phenomena free of the effects of atmospheric scintillation.

The observations were taken through the F400LP filter with image-dissector tube 3, with a sample time of 10.74 microseconds. A total of 703,244,160 samples was collected during four intervals of about half an hour each. Each interval covered about 50,000 rotations of the pulsar. The sample arrival times were adjusted for the motion of the Earth about the barycenter of the solar system using the JPL DE-200 Planetary Ephemeris, and for the motion of HST about the Earth using the SOGS predictive ephemeris. An additional adjustment, tentatively identified as the difference between the true HSP clock frequency and the manufacturer’s specification value, has also been made.

In the accompanying figure, data covering one half-hour have been phased onto the known rotational period (33.396206 milliseconds) of the pulsar. The main pulse and the interpulse are shown with very high S/N. Details of the light curve, such as the luminosity between pulses and the pulse structure, are being analyzed now.

The HSP team will make more high-speed observations of this object in both broad and narrow wavelength bands in the visual and ultraviolet regions of the spectrum.

—Bob Bliss & Jeff Percival

### HST Scientific Program Makes Substantial Progress

The current scientific program of the HST is comprised of 347 individual observ-
Mean optical-band light curve of the pulsar in the Crab Nebula. A half-hour of HSP data obtained at 10.7 µs time resolution has been folded onto the 0.033-second rotational period of the pulsar. This light curve demonstrates the high S/N possible while maintaining high time resolution. Courtesy of the HSP Investigation Definition Team, Principal Investigator R. C. Bless.

Guaranteed Time Observer (GTO), Cycle 1 General Observer (GO), and Director’s Discretionary (DD) programs. These programs were approved for execution during Cycle 0 (the interval up to July 1, 1991) or Cycle 1 (July 1, 1991 through June 30, 1992), although the actual dates of execution have not necessarily been limited to those intervals.

Among the 100 completed programs are 75 GTO, 20 GO, and 5 DD programs. Of the remaining 247 scientific programs, 61 (31 GTO and 30 GO) have begun execution (i.e., some but not all of the proposed data have been obtained) and an additional 40 (16 GTO, 20 GO, and 4 DD) are planned to begin execution during the next two months.

The remaining 146 scientific programs consist of 56 programs that utilize the GHRs and 90 other programs. Implementation and scheduling of the latter group is under way, but work on the 56 GHRs programs has been suspended pending resolution of the operational status of the GHRs, or revision of the programs by the observers to use other scientific instruments. Nearly all programs will be completed by the end of Cycle 1, but due to scheduling constraints it will be necessary to complete some after the beginning of Cycle 2. For example, this will occur for those programs that contain observations that must be executed at a particular date, and may occur for some programs utilizing the GHRs due to the suspension of GHRs observations.

In addition to the scientific program, utilization of the HST Observatory is assigned to the Orbital Verification (OV), Science Verification (SV), and Engineering (ENG) and Calibration (CAL) programs. The Science Assessment Tests (SAT) and the Early Release Observations (ERO) were parts of the last category. The OV program is now nearly complete, with only two Fine Guidance Sensor tests remaining to be executed. The SV program has made substantial progress and will end on November 30, 1991, although a small number of tests will be executed after that date due to scheduling constraints. The Engineering and Calibration program is an ongoing effort that will utilize 10-15% of the observing time.

—Larry Petro & Duccio Macchetto

THE HST OBSERVATORY
FROM THE DIRECTOR’S OFFICE

For the STScI, which operates the science mission of the HST around the clock, the summer months are distinguished more by the steamy Baltimore weather than the peaceful study and spiritual healing longed for by the academician. With an orbiting spacecraft, the detailed planning and data handling cannot let up. New spacecraft problems must be addressed and observers notified.

This year, the HST proposal cycle also peaked in mid-summer, with last-minute updates and the flurry of incoming proposals. Those staff astronomers who traveled to the IAU General Assembly, or spent several weeks observing or at workshops, returned to new challenges and an increasing stream of General Observers, science data, calibrations, and the reviews needed before the next Telescope Allocation Committee meeting this December; in other words, "routine operations."

Despite its aberrated optics, the HST Observatory is providing the astronomical community with unique and exciting high-resolution UV, optical, and near-IR images and UV spectroscopy. Of the more than
300 GTO and GO science programs accepted for Cycles 0 and 1, we will have completed about one-third by the time this Newsletter appears.

Unfortunately, because of the failure of the Goddard High Resolution Spectrograph (GHRS) side 1 power-distribution system in July (see page 12), programs using the GHRS have had to be put on hold until the use of Side 2 can be restored. The calibration program for the Fine Guidance Sensors is beginning after an extensive collimation effort, and some early science observations will soon be executed. The science team for the High Speed Photometer has now essentially completed its calibration program, thus permitting the initiation of UV photometric and polarimetric observations.

We are pleased by the continuing strong demand for HST observations by the international astronomical community. As described in more detail on p. 19, we received over 480 proposals for Cycle 2 programs, requesting nearly 12,000 hours of spacecraft time. As gratifying as the demand was the breadth of international interest, indicated by the fact that the Principal Investigators represent 19 different countries. The number and quality of these programs will ensure a high scientific productivity for HST until the first servicing mission is able to restore its originally intended performance.

As discussed in the previous Newsletter and elaborated below, the planning and development required for the first shuttle servicing mission have intensified. With the second gyro failure in June, and the GHRS failure in July (both reported in detail elsewhere in this Newsletter), the menu of desired servicing activities has become extensive. The baseline mission now includes the installation of new solar arrays as well as at least two gyro assemblies (containing two gyros each).

The installation of the replacement Wide Field and Planetary Camera (WF/PC II) and COSTAR will retire the current WF/PC and HSP, respectively. In addition, there is a good chance that the GHRS can be repaired on-orbit during the same mission. In order to accomplish all these tasks with some contingency for unforeseen needs, the HST Project at Goddard Space Flight Center is working with the Johnson Space Center to develop a mission with two astronaut teams to carry out four extravehicular-activity periods. While efforts of greater magnitude will be required to construct the space station in the second half of this decade, the HST servicing mission is shaping up to be one of the most ambitious missions yet attempted.

—Peter Stockman

**HST's OBSERVING EFFICIENCY**

The August 1991 issue of the ST-ECF Newsletter contained an excellent article on HST observing efficiency by Piero Benvenuti and Benoit Pirenne. This article considered the actual amount of time HST devotes to collecting photons from targets, and plotted the amount of collection or "exposure" time per instrument for the period November 1990 to June 1991. The time that HST does not spend exposing on targets may be regarded as the overhead time required for the conduct of operations with the HST Observatory.

Both the ST-ECF analysis and our independent review of six months of operations (January to July 1991) indicate that the "exposure time" efficiency is about 9%. Since this differs significantly from the "time-on-target" efficiency of 30-35% that is our operational goal (see below), we have broken down the accounting of overhead activities to understand better how the remaining time is being used and where significant improvements may be made.

The utilization of the HST Observatory may be characterized by six types of serial activities: guide-star acquisition, target acquisition, exposure, control of the scientific instruments and spacecraft, Earth occultation of the target, and other overhead items such as passage through the South Atlantic Anomaly (SAA), slewing of the telescope, and unscheduled daytime.

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The average breakdown of HST time among spacecraft slews, Earth occultation, spacecraft and instrument overhead, and exposures. An "exposure" efficiency of about 9% is currently being achieved. On average, the "spacecraft-time" or "on-target" efficiency (i.e., the fraction of the time that HST spends acquiring targets, setting up the exposures, and actually exposing) is about 30%.
The typical proportions of time spent on these activities are shown in an accompanying figure, and are based on the recent months’ GO, GTO, and Science Verification programs. As mentioned above, the figure shows that scientific exposures account for an average of 9% of the Observatory time. This is the time spent actually integrating on targets. The remaining time spent pointing at a target is consumed by acquiring the guide stars used to control the telescope pointing (8%), acquiring the target itself in the scientific instrument aperture (3%), and configuring the scientific instrument for use and reading out the science data, usually to the onboard tape recorder (16%).

During a typical observation, time is also lost to occultation of the target by the Earth (typically 45%). The remainder of the Observatory’s time (about 19%) is comprised of time spent during passage of the spacecraft through the SAA (which affects both the guidance system and most of the instruments), to unscheduled time (usually short time intervals during which no short exposures are available to be scheduled), and time spent slewing to that target (at HST’s slew rate of 360 degrees per hour).

In the future, it should be possible to make incremental operational improvements in each of the five overhead categories. A task force led by the Science and Engineering Systems Division at STScI has been established to review current HST operations and recommend specific improvements. For instance, software improvements are about to be installed in the long-range planning system, which should significantly reduce the amount of time lost to target occultations and passage through the SAA. In addition, although we are currently using two-pair guide-star acquisitions for most scientific observations, experience has shown that single-pair acquisitions should be sufficient.

Although several such areas for reducing the overhead times have been identified, it is difficult to forecast the ultimate HST science efficiency in terms of exposure time. Many of the overheads are “built in” by the design of the current scientific instruments, or are required by the fact that we must operate at HST’s low orbital altitude.

However, we can gauge the capabilities of the ground system by referring to the goals that were established for on-target efficiency based upon pre-launch studies. The on-target time is defined as the elapsed time between the completion of the slew to a target and the completion of observations of that target, excluding target occultations, SAA passage, and end-of-orbit deadtime. In terms illustrated in the first figure, the on-target time is computed as the sum of exposure, S.I. control, guide-star acquisition, and target acquisition times. The goals established were for 20% on-target efficiency during Cycle 0, and an average of 27.5% efficiency during Cycle 1.

The efficiency achieved for external science targets during each week of the past year is shown in the second accompanying figure. The values achieved are typically within the range 25 - 35%, with the lowest values being due to the spacecraft or a scientific instrument being placed in safe mode. Thus the ground system is already surpassing the near-term goals for planning science observations. For Cycle 2, the goal is 32.5%, and for Cycle 3 it is 35%. The improvements mentioned above concerning the avoidance of SAA passages will probably be sufficient to achieve the Cycle 2 and 3 goals. Since the planning system will soon be near its ultimate performance level, further efficiency improvements must come from possible changes in the operation of the scientific instruments and the actual design of the scientific observations.

The scientific efficiency of the HST Observatory is affected strongly by the actual scientific programs specified by the observers. For instance, a program containing many short WF/PC images will have a small ratio of exposure time to instrument overhead due to the time required for

![Weekly mean "on-target" efficiencies achieved for external science targets during the past year. The efficiency is expressed as the percentage of each week spent on external science targets. Time utilized for calibration and snapshot survey observations has been excluded from the sum. The figure shows that, except during a few occurrences of spacecraft or instrument safing, an average of about 28% of the time has been devoted to on-target or "spacecraft" time. Thus the Cycle 1 goal of 27.5% has already been met.](image-url)
both the amount of time available for
been allocated to observers, in order to
serving and the number of executed obser-
fore the launch of
any experience
accounting has shown that the consumed
improve the on-target efficiency by more
required for a program, observers have
been provided with the Resource Estimator
Spacecraft Time is approximately 1.3 times
percentage points. This will increase
In summary, the goal for Cycle 2 is to
preflashes, shutter control, and data
Time, rather than exposure time, that has
been allocated to observers, in order to
them to optimize the exposure time ob-
tained within their spacecraft-time alloca-
tions. To calculate the spacecraft time
required for a program, observers have
been provided with the Resource Estimator
as a part of the Remote Proposal Submis-
sion System. The version of this estimator
provided for Cycle 1 was written well be-
fore the launch of HST and therefore before
any experience had been obtained in sched-
uling the science program. After-the-fact
accounting has shown that the consumed
Spacecraft Time is approximately 1.3 times
the value computed with the present Re-
source Estimator. Revisions to the Re-
source Estimator are in process with the goal of matching after-the-fact accounting
within 5% on average.

In summary, the goal for Cycle 2 is to
improve the on-target efficiency by more
than 5 percentage points. This will increase
both the amount of time available for ob-
serving and the number of executed obser-
vations. In addition, optimizing the opera-
tion of the spacecraft and the scientific in-
struments may realize a similar improve-
ment. Finally, the results of the study now
underway by the STScI Efficiency Task
Force will be useful in improving the accu-
acy of the RPSS Resource Estimator and
in helping observers optimize their science
observations.

—Larry Petro, Peter Stockman, & Brad
Whitmore

COSTAR PROGRESS

As described in previous Newsletters, a
strategy for recovering HST’s scientific ca-
pabilities has been developed. This strategy
calls for replacing the High Speed Photometer with COSTAR (the Corrective Opt-
ics Space Telescope Axial Replacement),
an instrument that will deploy corrective
elements into the optical paths in front of
the Faint Object Camera, Faint Object
Spectrograph, and Goddard High Resolu-
tion Spectrograph. Installation of
COSTAR, along with replacement of the
Wide Field and Planetary Camera by a new
camera (WF/PC II) with built-in corrective

optics, is expected to remove the effects of
the HST primary mirror’s spherical aber-
ration and restore the originally designed per-
formance of the scientific instruments.

Development of COSTAR has pro-
cceeded well since program inception in
January 1991. The conceptual definition
phase was completed on schedule in Febru-
ary 1991, and the Preliminary Design Re-
view (PDR) was completed as scheduled in
early May. The next major milestone is the
COSTAR Review held in late August at
Ball Aerospace Corp. showed the program
to be on schedule for this December re-
view. (Further details of this review are
given below.)

Future critical milestones to support the
December 1993 launch of the first HST ser-
vicing mission include completion of fab-
rication and assembly in September 1992,
followed by test and verification through
May 1993. Delivery of the instrument to
the Goddard Space Flight Center (GSFC)
will occur the following month. The inter-
val between delivery and launch is reserved
for testing at GSFC, and launch prepara-
tions at the Kennedy Space Center.

The PDR was a critical juncture for
COSTAR. The review was held at GSFC
with over one hundred people in attend-
dance. The outcome was that the technical
review committee found that, although
COSTAR would be challenging, they saw
no technical “showstoppers.” While some
details have changed since the PDR, the
fundamental design (see figure) has re-
mained unchanged since inception.

The STScI COSTAR project was con-
cerned with the relatively small clearance
between the FOS beams and the multi-
layer insulation (MLI) blankets that are in-
stalled at the interfaces between the four
axial Scientific Instruments. An optical re-
design that increases the nominal clearance
to greater than 28 mm at all points has al-
leviated concerns about possible vignetting
by bulging or displaced MLI.

The COSTAR optical design has now
matured, and the mirrors are on order from
two vendors, Tinsley and UTOS, each of
which will produce a full set of flight op-
tics. The first pieces are due for delivery in December 1991 and all the mirrors should be on hand in March 1992. The specifications for figure and surface roughness are exacting, to assure that the throughput and image-quality goals will be met, but are within the demonstrated capabilities of both manufacturers. A problem with the sizing of the FOS M2 mirrors was encountered in September, but was rapidly circumvented with an inventive adaptation of the mounting scheme that has been under development.

Topics discussed in detail at the August Quarterly Review included system design and performance, the end-to-end wavefront budget, the optics, the design of the refractive beam simulator (RAS) that will be used to test COSTAR, the Hubble Optical Mechanical Simulator that will hold COSTAR and the test components, and the plan for aligning and testing COSTAR. The project has reached the point that the detailed designs and analyses of the deployable optical bench, the mechanisms, and the optics can be compared to the error budget. This comparison shows that COSTAR can be built to stringent system-level specifications. Finally, Ball Aerospace Corp. showed enough detailed planning at the Quarterly Review to convince the HST Project and STScI that COSTAR can be aligned and tested within the time allotted in the schedule.

To ensure that COSTAR will work, there will be extensive testing using independent measurements and analyses by four groups. The European Space Agency (ESA) will provide a Structural and Thermal Model (STM) of the Faint Object Camera that exactly duplicates the optics of the in-flight FOC, although replacing the photon-counting detectors with CCDs. This will be tested in Europe with an aberration-beam simulator to verify that COSTAR corrects it exactly. The images will be analyzed by Ball, STScI, and ESA. The goal will be to check that COSTAR, when aligned properly, can deliver the performance outlined in the Level I specification for HST, and to investigate how the images can be used to align the instrument when deployed on-orbit.

Another level of verification will come from the Independent Verification Team, set up by the HST Project at Goddard to check independently the optical prescriptions and alignments and verify the test results. They will also perform their own tests of the RAS and COSTAR+RAS wavefront errors using a wavefront analyzer. These independent verifications of the critical aspects of the design will ensure that the type of error that led to the spherical aberration in the HST primary will not recur with COSTAR.

For readers who are interested in further details, the high-level specifications for COSTAR follow. Two specifications control image sharpness. The first is the Strehl ratio, which is the ratio of the peak intensity in the observed image to the peak intensity in the image from a perfect telescope. The second is the encircled energy. The Strehl ratio specification is that the corrected image quality for the FOC (96 channel shall give a minimum ratio of 0.55 at 6328 A, with a design goal of 0.60. Had the HST primary been within specifications, the Strehl ratio would have been approximately 0.8. The encircled-energy specifications are that 60% of the light must be within a 0.1 radius at the center of the FOC and FOS fields, and within a 0.125 radius at the center of the GHRS field. Scattering from the surfaces of the COSTAR mirrors in the UV is controlled by the specification that the rms surface roughness of the mirrors for all spatial scales less than 1 mm must be less than 10 A rms. Finally, the optical throughput of each pair of correcting mirrors must be no less than 56% at 1216 A and 72% at 6328 A.

—Jim Crocker, Holland Ford, George Hartig, & Robert Jedrzejewski

HST SPACECRAFT OPERATIONAL STATUS

Of the changes in HST's operational status that have occurred since the last issue of the Newsletter, the one with the greatest impact is the failure of a low-voltage power supply in the GHRS. This failure prevents use of side 1 altogether, and allows only intermittent readouts from side 2. Astronomers and engineers at STScI are working with NASA and Ball engineers on the failure analysis, on-orbit engineering tests, and development of work-arounds and side-switch procedures. For further details of this failure, see Ron Gilliland's article below (p. 12).

A number of operational improvements have been made since June. Several improvements have been made in the use of the Fixed Head Star Trackers, resulting in a reduction of the failure rate of position updates after slews to essentially zero. This in turn has removed the biggest source of failed guide-star acquisitions. In fact, all of the guide-star acquisitions in the last two months have been successful.

The planning system at STScI has been modified to schedule interleaved WF/PC Earth flat fields properly. Starting in July, we have been taking many Earth flats in support of the WF/PC calibration program, as described in more detail below (p. 9). We are in the last stages of testing modifications to the planning system that will allow us to obtain parallel observations (i.e., simultaneous observations with two of the scientific instruments). The first on-orbit test of parallel observations is expected in early January 1992.

While it had essentially no effect on ongoing scientific observations, there was another gyro failure (this time of gyro #4) this past summer. This gyro behaved intermittently for several weeks, and then apparently failed completely. At the time of the initial failure, HST was operating in its normal four-gyro configuration. The failure resulted in a saturated output from the gyro, e.g., it indicated the maximum possible rotation rate. The flight software recognized the erroneous input immediately and took the gyro out of the control loop, falling back to a three-gyro configuration. The saturated condition lasted for about 80 seconds, after which the gyro output returned to normal although the flight software remained in the three-gyro configuration.

After investigation, we returned gyro #4 to the control loop. A very similar event occurred again three days later, except that the gyro stayed saturated for 10 minutes.
Finally, a week later, the gyro failed with a saturated output and remained saturated. Analysis indicates that the likely cause of the failure was a failed wire bond in one of the hybrid circuits in the gyro electronics package. Although in a different circuit, it is a similar failure to the gyro #6 failure that occurred last December.

Gyro #4 was left running, although its output obviously was not used to control the telescope. In late October, it unsaturated again, and produced reasonable data for a period of about a week. The HST Operations Control Center at GSFC is continuing to monitor its performance.

Following the failure of gyro #4, we turned on the last spare gyro, gyro #1, and after calibration it was placed into the control loop, returning HST to a four-gyro configuration. The four-gyro configuration allows the flight software to perform checks on gyro data and detect failures, as it had done with gyro #4. Science operations are also possible with only three gyros, as indeed was done for a period this summer while the problems were being diagnosed. Vehicle pointing performance is essentially the same in the three-gyro configuration as in the four-gyro configuration.

These events led to a review of the flight software “sanity” checks that are available when operating in three-gyro mode and possible failure modes. As a result, modifications are being made to the flight software that will provide more robust checks of gyro performance while in three-gyro mode. A zero-gyro safemode that is designed to maintain the health of the spacecraft has also been added, but (obviously) it cannot carry out a science program.

In addition to the gyro #4 failure, there have been two other gyro anomalies since the last Newsletter. Gyro #5 has shown an increase in operating current, but there has been no change in its performance. Gyro #1 has had one short episode of increased noise. These anomalies are distinct from those exhibited by gyros #4 and #6 as they were failing. Both situations are being analyzed, but at this time they are not believed to be precursors of further failures.

-Rodger Doxsey

**HST GYROS**

Since its launch on April 24, 1990, *HST* has experienced failures of two of its six gyros, the mechanisms used to point and stabilize the telescope (see previous article). Because there are only four gyros left, and the telescope needs at least three to operate, it is natural to ask what the gyros are and how they work.

The principle of the gyros is similar to that of a child's toy gyroscope: the inertia of a spinning mass provides a restoring force that counters any displacement of its spin axis. In the *HST* case, the gyros have only one degree of freedom—the spin axis is supported by only one gimbal. In the accompanying diagram, rotation about the input axis causes the gimbal to precess about the output axis. (You can see why this happens if you remember that the angular-momentum vector is parallel to the spin axis.)

What our engineers call a “gyro” is actually composed of some very sophisticated electronics, which together with the above hardware form a feedback system that works in concert with the Fine Guidance Sensors and Fixed Head Star Trackers to point the telescope. These electronic “reference” gyros are called Rate Gyro Assemblies. They are made up of a Rate Sensing Unit and an Electronic Control Unit, both of which can be replaced in orbit.

There are three of these RGAs, each containing two gyros (x- and y-axes) whose input axes are skewed with respect to the telescope's axes. This offset means that three-dimensional control of the spacecraft can be maintained with any configuration of three or four gyros. That is, if the six gyros were aligned exactly with the telescope axes, and two on the same axis malfunctioned, then only the two remaining axes could be controlled.

The gyros are located on the equipment shelf near the back of the telescope, in order to isolate them from vibrations caused by the reaction wheels and the high-gain antenna. The reaction wheels are four flywheels, each with mass of about 45 kg, which control and modify spacecraft attitude based on RGA information processed and interpreted by the Control Law Soft-
asked Dan Schroeder to convene an optical alignment panel to review all the data, and propose additional observations as necessary to improve the collimation.

These observations consisted of a series of images at different coma settings to establish a more accurate zero-coma setting taken both in the FOC and the WF/PC. The secondary was then placed temporarily at this position, and a series of four pairs of images were taken with the FOC to fix the astigmatism. Finally a focus sweep was run in both cameras to see if the focus setting is optimal.

The conclusion of all of these experiments was that the day 323 position, modified only by the present desorption corrections, is optimal in astigmatism and focus but could be improved in coma. However, the effect of this improvement on the camera images is slight and was not felt to be of any scientific value.

Similarly the throughput of the spectrographs was not expected to be affected. A "five points of light" test was then run at the zero-coma position to assess the three FGSs; neither the astrometry nor the guiding was improved significantly. The residual amount of coma involved (about 1/15 wave) is not felt to be a problem for the next-generation instruments, although the telescope may be recollimated just before the servicing mission.

In conclusion, the telescope collimation is now better understood, and although marginal improvements are possible it was felt that they did not compensate for the increased spacecraft time that would be needed to repeat some calibrations. The secondary mirror will therefore be left in the day 323/90 position, and PSF observations taken since then will be applicable to almost all data taken since then (although there may be some differences in focus setting). The OTA has almost stopped shrinking, and the secondary will now be maintained within 5 microns of its present position.

—Chris Burrows

SCIENTIFIC INSTRUMENTS

WIDE FIELD AND PLANETARY CAMERA

1. WF/PC safing and thermal-anomaly history. The calibration of the Wide Field and Planetary Camera (WF/PC) is adversely affected by transient changes in its thermal state. Such changes have resulted from HST safing events, internal power cutoffs, and decontamination procedures. Nearly all of the calibration changes are the consequence of the removal of a part of the UV-flood charging while the CCD detectors are at an elevated temperature.

In-flight experience has shown that raising the CCD cold junctions above approximately -40 C results in the formation of a visible light contamination (known as "the measles"), which seriously degrades image quality. Since the equilibrium temperature of the cold junctions is about -35 C when the thermo-electric coolers are powered off, the WF/PC must be "decontaminated" following every such power-off episode. This is accomplished by warming the CCDs so that the cold junctions reach between -2 and +10 C for more than 1 hour. This causes some loss of UV-flood and,

<table>
<thead>
<tr>
<th>Date</th>
<th>Day Number</th>
<th>Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td>1990 Dec 31</td>
<td>365</td>
<td>Telescope Safes — FGE 3 bit flip</td>
</tr>
<tr>
<td>1991 Jan 26</td>
<td>026</td>
<td>De-Ice Decontamination (-82 C) — Failed to remove daisies</td>
</tr>
<tr>
<td>1991 Jan 28</td>
<td>028</td>
<td>Mini-Low Temp (-20 C) — Removed daisies; created measles</td>
</tr>
<tr>
<td>1991 Jan 29</td>
<td>029</td>
<td>Low Temp (-15 C) — Removed measles</td>
</tr>
<tr>
<td>1991 May 2</td>
<td>122</td>
<td>PSEA Hardware Safe Mode (CCDs at -35 C for 80 hours) — Measles</td>
</tr>
<tr>
<td>1991 May 8</td>
<td>128</td>
<td>Hot-Junction Decontamination (+12 C) — Removed measles</td>
</tr>
<tr>
<td>1991 Jul 3</td>
<td>184</td>
<td>WIDE turned WFC TEC off for 7 hours (WFC reached -25 C) — Measles on WFC CCDs</td>
</tr>
<tr>
<td>1991 Jul 5</td>
<td>186</td>
<td>Flash Decontamination (+6 C) — Removed measles</td>
</tr>
</tbody>
</table>
therefore, a calibration change in both photometric zero point and flat-field structure, since the UV flood increases the quantum efficiencies of the CCD detectors in a location-dependent manner.

Since the first on-orbit UV-flood of the WF/PC on December 27-28, 1990, detector warm-up episodes have occurred as described in the table.

2. Status of WF/PC flat-field calibration program. The current calibration being performed in the pipeline processing of WF/PC data is limited by the availability of calibration data and does not represent the full capabilities of the instrument. While this situation was expected during Science Verification (SV), it has continued into Cycle 1 because at present WF/PC is performing the GO/GTO Cycle 1 program while still taking the SV observations needed to populate the calibration data base.

As a result observers should plan on recalibrating their WF/PC data after the ongoing flat-field observations are completed, the WF/PC IDT has created flat-field calibration files, and these files have been placed in the STScI data bases. These tasks should be completed by late December 1991.

The WF/PC flat-field behavior changes greatly between the on-orbit UV-flooded state and the unflooded state in which it was launched. The first (and so far only) on-orbit UV flood was performed in late December 1990, as described above. In early 1991 a limited number of Earth-flat observations were made in a mode that prohibited any other observations during the unocculted part of the orbit. It was determined that a large number of exposures of the Earth during occultation would be required to obtain a sufficient number of properly exposed images at several roll angles (needed to remove the streaks in the images produced by spacecraft motion during the exposure).

As previously reported, the WF/PC contains contaminants that make observations shortward of 2000 Å impractical. These contaminants build up with time and decrease the throughput in the F230W filter at a rate of about 50% per month. Present evidence indicates that the sensitivity at F336W is decreasing by about 5% per month, and there are preliminary indications of a slight decrease at F439W. At longer wavelengths the throughput is stable to a few percent over several months. A spectrophotometric standard star is being observed in F230W, F284W, F336W, F439W, F555W, and F785LP on WF2 and PC6 once per month to monitor the WF/PC's quantum efficiency. A more complete photometric calibration by the IDT is scheduled for December 1991.

There are also indications that longer-wavelength observations may be affected by the contamination. At F555W we observe small dark regions that are growing in size with time. It may not be possible to correct these regions with flat-field observations. The amount of scattered light seen on the CCDs beyond the pyramid edges is also observed to increase with time and to decrease abruptly after a decontamination. The contamination is believed to be on the cold field-flattening windows in front of the CCD detectors.

At the start of April 1991, the following preliminary Planetary Camera flats were delivered by the WF/PC IDT to the STScI and placed in the calibration data base: F230W, F284W, F336W, F439W, F555W, F702W, F785LP, and F889N.

Since that time the WF/PC has been warmed twice to remove contaminants (following spacecraft and instrument safings). This changed all of the flat fields slightly (~1-2%) each time, but caused larger changes on CCDs P7 and P8 (as expected from ground-based testing). Except for the PC filters listed above, all data processed to date in the pipeline have been flattened with pre-launch flat fields or dummy flats—both of which yield rather limited results.

Starting in July 1991, interleaved observations have been supported and the WF/PC SV program has begun to collect large numbers of exposures of the Earth for the generation of flat-field reference files. As explained at the November 1990 Users' Workshop and in the June 1991 STScI Newsletter, the initial flat-field calibration of the WF/PC will concentrate on a limited set of camera/filter combinations (selected mainly on the basis of frequency of use). However, Earth flat-field exposures will be obtained during Cycle 1 for all camera/filter combinations scheduled for use in Cycle 1.

The following is a summary of the expected flat-field calibrations that should result from these efforts. It is expected that these observations will run until approximately November 1991. The main difficulty at present is that the shortest possible exposure (0.11 s) of the sunlit Earth often saturates frames taken through broadband filters.

WFC Flat-Field Calibrations:

PC Flat-Field Calibrations:

To determine which type of flat field has been used on an existing processed dataset, one should examine the keyword FLATFILE in the science image header. This gives the flat-field reference file name in the format: wref$<name> w.r6h. If the <name> field starts with one of the character strings "a9", "a1", "a21", or "a2m" then the reference file is a dummy flat field of all ones (i.e., it has no effect on the data). If <name> starts with "a2q" or "a3" the reference file is a ground-based pre-launch calibration file. If <name> starts with "b" the reference file is an on-orbit flat field from the preliminary IDT calibration delivery.
4. Interrupted Exposures. WF/PC exposures longer than 300 s may be interrupted if the FGSs lose lock on guide stars. In such cases the WF/PC shutter will be closed until lock is established again. The missing exposure time is not currently reflected in the keyword EXPTIME in the science image (.doh) file headers. This has been fixed in the next release of the ground-system software, scheduled for implementation in late October 1991.

If loss of lock was reported during an observation, the Standard Header Packet (.shh) file provided with the data should be examined. The keywords WFOCTM01, 02, 03, ..., 15 contain the shutter movement history. If WFOCTM02 is nonzero, then the exposure was probably interrupted (the trailer file should also be read). The actual exposure time may be determined by subtracting the lost time as recorded by the WFOCTMmx keywords (which is in units of 0.125 seconds mod 2^16) from the commanded exposure time.

—John MacKenty

FAINT OBJECT CAMERA

The importance of UV imaging as a unique capability of HST is now clear, and so it is reassuring that the UV response of the FOC has been measured (and monitored) since launch and shown to be close to the expected values as given in the FOC Instrument Handbook.

Near the end of November 1991, the calibration pipeline will be changed to improve the calibration of FOC science data. For imaging modes, the flat-field correction had been applied before the geometric correction. After the change the order will be reversed; the geometric correction will be applied before the flat-field correction.

Previously the data products of the pipeline for imaging mode had been: (a) a raw image, (b) a photometrically corrected image, and (c) a photometrically corrected image. The data products will be changed so that now there will be: (a) a raw image, (b) a geometrically corrected image, and (c) a geometrically and photometrically corrected image. The STScI Instrument Science Report FOC-051 describes the processing in more detail and the motivations for the changes. This document can be obtained from Nancy Fulton at STScI (410-338-4955, userid FULTON).

—Perry Greenfield & William Sparks

FAINT OBJECT SPECTROGRAPH

The Faint Object Spectrograph (FOS) is working well, with a combination of Science Verification (SV), General Observer (GO), and Guaranteed Time Observer (GTO) observations being scheduled and executed regularly. The programs that are part of SV are designed to verify and calibrate the basic modes of the FOS, allowing observers to acquire and analyze their scientific data properly. These programs have included the measurement of instrumental characteristics such as dark counts, scattered light, flat-field behavior, aperture positions, wavelength scales, and photometric and polarimetric performance and stability. In addition, the operational characteristics of the instrument are being determined, including background rates at various galactic and ecliptic latitudes, and wavelength offsets between the internal calibration lamps and external sources. Target-acquisition methods and techniques are being established and are discussed further below.

SV is progressing well, with approximately 90% of the necessary data in hand and undergoing analysis by FOS IDT members. Photometric stability appears to be good, including in the far ultraviolet. Time-resolved mode and spectropolarimetry mode have both been used successfully for GO proposals.

In addition to the SV program that was defined before launch, the discovery of geomagnetically induced motion (GIM) of the spectrum on the detectors (especially on the red side) created the need for a program to characterize this phenomenon. (See the article on the FOS in the March 1991 STScI Newsletter for more information.) Testing has shown this effect to be highly repeatable and readily modelled. The operational fix in the near term is to break long integrations into exposures of two minutes each. These separate integrations can then be shifted by the appropriate amount during data reduction, and then summed to yield the final corrected spectrum.

A new version of CALFOS that supports these operations has been submitted and will be the standard for pipeline processing by the time this Newsletter appears. In the long term, an operational "real-time" fix will simply dither the deflection coils by the appropriate amount to remove the effects of GIM during an observation. This fix will be included in a future operations software update, currently scheduled for February 1992.

Various target-acquisition modes have now been thoroughly tested. A bug in the way the scheduling program handled proper motions was revealed the hard way when a target acquisition failed for a long observation. Improved aperture positions and aperture-to-FGS alignments have reduced the need for "big" peak-ups (i.e., a 6 by 2 pattern with the 4:3 acquisition aperture) and targets are usually found within the initial 4:3 aperture position. BINARY SEARCH works well, although targets can still be left off center by as much as three pixels (0.24") with this acquisition mode, depending on the brightness of the target star and the effects of GIM and jitter during the acquisition. The user community should be aware of the importance of setting proper BRIGHT and FAINT limits in order to have successful results with BINARY SEARCH acquisitions.

WF/PC-assisted target acquisition has been tested on the blue side of FOS and has worked well, placing a target star within 0.25" of the desired location in the 4:3 acquisition aperture.

The instrument has gone into safe mode twice due to relatively minor technical problems that have now been resolved. In mid-July, a test star slightly exceeded the "overlight" limit, which had been set conservatively low, and safed the instrument. The value of this limit has been increased by 50% to prevent unnecessary future occurrences. At the end of July, a BINARY SEARCH target acquisition failed due to a combination of circumstances (GIM, spacecraft jitter, and the star’s initial position for the search). This should not normally safe the instrument, but the particular
circumstances caused the FOS to attempt execution of a vestigial program branch in the operations software, and the instrument safed. This problem has also been addressed and should not recur. It was during this “safed” period in July that the instrument was officially handed over from the IDT to STScI.

The special HST spectroscopy issue of Ap. J. Letters in August 1991 contains four articles by the FOS team, reporting observations of the quasars 3C 273 and UM 675, and the active galaxies NGC 1068 and NGC 1566. These papers contain considerable details on instrument performance that should be of interest to potential FOS users.

In addition to some early ERO and SAT observations, the remaining FOS GTO observations are in full swing. While some spectroscopy on QSOs and stellar objects has been done, much of the early GTO data have been in the form of “early-acquisition” images with either the PC or WFC. These images were intended mainly to set up future FOS spectroscopy, but many of the images are interesting in their own right. Considerable effort has gone into the proper reduction and analysis of these data. The issue of “accurate astrometry” has become a major concern as we try to prepare for the main body of our FOS spectroscopy program. Getting a 0”3 aperture onto a given knot in an active galaxy nucleus through a blind offset, for instance, is a non-trivial matter with HST.

GOS should be wary of such problems and be prepared with their own CCD images or other astrometric data for complicated acquisitions.

—William P. Blair

GODDARD HIGH RESOLUTION SPECTRограф

In July 1991 the Goddard High Resolution Spectrograph (GHRS) suffered a major component failure, which will have a significant impact on users of the spectrograph. The failure occurred in the low-voltage power supply on side 1 of the GHRS. It will have the following implications:

1. Side 1 of the GHRS, which carries out observations with G140L, Ech-A, and G140M (the prime far-UV capability), has become unavailable for scientific use, and is expected to remain so unless an on-orbit repair of side 1 can be performed during the first HST servicing mission.

2. Side 2 data are currently routed through a science data formatter (SDF) powered from the side 1 electronics; thus usage of side 2 has become unreliable, in addition to side 1 having failed altogether.

3. A solution that would restore reliable usage of side 2 would require switching communications for all of the scientific instruments, including GHRS, to the spare side (side B) of the HST electronics. (Side B is a redundant spare that duplicates the currently used Side A of the spacecraft electronics.) Sides 1 and 2 of the GHRS SDF interfaces are hard-wired to sides A and B of the spacecraft, respectively, requiring routing of communications from side 2 through side 1 when side A of the spacecraft is in use.

It should be noted that this new problem is not related to the earlier intermittent failure of the side 1 carousel control (reported in the June 1991 STScI Newsletter), which can be worked around effectively. The history and technical details of these failures, and current testing aimed at understanding the precise constraints on continued use of the GHRS, are discussed below.

During a routine science observation on July 24, 1991, the GHRS experienced its first loss of SDF interface control. The transfer of commands to the GHRS and return of data from the GHRS to the HST computer is routed through the SDF. Any transfer of information requires “handshakes” between the instrument and spacecraft sides; if such an acknowledgement is not received, then the SDF interface shuts down until a reset command is encountered. The glitch on July 24 was associated with a fluctuating current on the side 1 emission-line comparison lamp. It was suspected at that time that a problem with the lamp could have induced a voltage glitch in side 1, leading to failure of the SDF interface handshake. After an automatic reset, the interface worked without problems for the next ten days.

On August 5, 1991, however, the GHRS again had a loss of the SDF interface. This time, the SDF interface did not return to normal operations after a reset, suggesting a continuing problem. Normal full telemetry is returned from either side of the GHRS only when the low voltage is fully up for science operations, which is not the case for side 1 when it is only serving as a conduit for side 2 data. The August 5 observation used side 2. After the SDF problem continued for several hours, a decision was made to enable low voltage on side 1 to capture a telemetry profile of voltage and current distribution. This was done and resulted in (a) a good set of telemetry that has allowed a secure diagnosis of the failure point, and (b) confirmation that many voltages were detected as out of range by the instrument monitoring system, resulting in a safing of the GHRS.

Engineering analysis of the August 5 telemetry showed that the voltage distribution throughout the instrument could be explained in a unique way via failure of a specific solder joint in the low-voltage power-distribution system. Analysis (and ground-testing experience) also showed that an unbalanced power distribution, as sometimes exists on side 1 now, can lead to hard failures of other components. Therefore full low-voltage operation of side 1 has not been attempted since August 5, and is not likely to be attempted again in the future.

In the mode where side 1 operates only as a data conduit to side A of the spacecraft, the standby power-distribution system supplies proper voltages to all required elements. This includes instrument heaters, which have now been off-loaded to side 2. By this off-loading it was hoped that smaller currents across a (possibly) high-resistance solder joint failure might allow maintenance of sufficient voltage at the SDF for its continued operation. This has not turned out to be the case with any degree of reliability. Continued operations have shown only a 50% rate of success in recovering side 2 data without the SDF interface being lost.

An engineering test has been designed that will allow near-continuous testing of
the SDF interface once every 5 minutes. The purpose of this test (scheduled for late October) is to determine if certain operational conditions (e.g., electronics temperature) may be correlated reliably with the times when the SDF interface can be kept up. If such a robust correlation can be found, it might be exploited to restore reliable use of GHRS side 2.

If a reliable correlation that will allow continued, predictable use of GHRS side 2 cannot be found, then only three options remain:

1. Use the GHRS side 2 only for projects where very high priority for scientific return has been established that favorably balances the decreased probability of success. This would be the desired solution for conducting further GHRS science in the near future only if more positive options are not deemed possible. Under this scenario, time allocations would need to be balanced against the realized probabilities of any observation succeeding.

2. Switch all of the scientific instruments to side B of the spacecraft. The decision to do this will have to be considered in light of the risk this would entail for other components of the HST system.

3. Repair GHRS during the 1993 servicing mission. At this early stage of planning it appears that an astronaut could carry out a fix by: (a) opening the appropriate access hatch on the HST, (b) removing some 70 (!) screws holding a GHRS access panel in place, (c) either installing a spare low-voltage power supply, or simply wiring a bypass to the failed electronics line, and (d) closing up the original (or a newly designed) access panel and closing the hatch. It is believed that such a repair would restore the full capabilities of both sides of the GHRS.

—Ron Gilliland

A COMPARISON OF GHRS AND FOS SENSITIVITIES

To facilitate changes that may be necessary for Cycle 1 proposals that currently use the GHRS side 1 low-resolution grating, G140L, but will be changed to the FOS, the following table provides a direct comparison of GHRS and FOS photometric sensitivities for point sources well centered in the aperture.

The sensitivities in cols. 2, 3, and 4 are expressed in counts s⁻¹ diode⁻¹ (erg s⁻¹ cm⁻² Å⁻¹)⁻¹.

For the GHRS with the G140L grating, column 2 gives the sensitivity with the 2'0 square Large Science Aperture (LSA). For observations with the Small Science Aperture (SSA), the GHRS sensitivity should be multiplied by the ratio in the final column. With G140L the diode spacing is 0.572 Å, and the resolutions of the SSA and LSA are 1.1 and 2.0 diodes, respectively.

The FOS sensitivities are also on a per-diode basis, for the 1'0.-diameter circular aperture. The diode spacings are 1.0 Å and 1.46 Å for the G130H and G190H gratings, respectively, and the resolution of the 1'0 aperture is 1.4 diodes.

A sample calculation: at 1200 Å, one would infer from the above that GHRS G140L was a factor of 5 faster than FOS on a per-diode basis. On a per-Angstrom basis, the ratio at 1200 Å is 8.9. But the FOS does have greater wavelength coverage, and starts gaining ground rapidly with increasing wavelength in terms of relative sensitivity.

Throughputs for the various FOS apertures at 1500 Å, as determined from direct comparison on a point source, are as follows:

<table>
<thead>
<tr>
<th>Aperture (arcsec)</th>
<th>Throughput</th>
</tr>
</thead>
<tbody>
<tr>
<td>4.3 x 1.4</td>
<td>49%</td>
</tr>
<tr>
<td>1.0</td>
<td>27%</td>
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<tr>
<td>0.5</td>
<td>20%</td>
</tr>
<tr>
<td>0.3</td>
<td>13%</td>
</tr>
<tr>
<td>0.25 x 2.0</td>
<td>20%</td>
</tr>
</tbody>
</table>

The GHRS to FOS ratios derived from the table should typically be within 20% of truth, allowing for good exposure-time planning.

—Ron Gilliland & George Hartig

HIGH SPEED PHOTOMETER

As a consequence of the vastly improved performance of the HST pointing-control system and a long series of High Speed Photometer (HSP) tests, it is now possible to center a star in most of the HSP science apertures to within a few hundredths of an arcsecond. This has enabled much of the HSP SV program to be carried out. The instrument continues to perform well.

<table>
<thead>
<tr>
<th>COMPARISON OF GHRS AND FOS SENSITIVITIES</th>
</tr>
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<tbody>
<tr>
<td>Wavelength (Å)</td>
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<tr>
<td>----------------</td>
</tr>
<tr>
<td>1100</td>
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<tr>
<td>1150</td>
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<td>1850</td>
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<td>1900</td>
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</table>
FINE GUIDANCE SENSORS

The SV phase of operations for the Fine Guidance Sensors (FGS) has begun. SV and some parts of the Orbital Verification (OV) activities have been delayed owing to the continuing effort to find the optimum placement for the HST secondary mirror. Even so, both the Early Release Observations (ERO) and the Science Assessment Tests (SAT) have been completed and the data reduced. The former are in press (AJ, 1992), and the latter have already appeared (ApJ, 377, L17, 1991).

These activities have been carried out mainly by the University of Texas Space Telescope Astrometry Team, but STScI’s FGS Instrument Team has been busy too. The Instrument Scientist Cycle 1 calibration plan was finalized, the Version 1.0 astrometric data-processing pipeline has been completed (see below for a brief description), a new FGS Instrument Handbook—which will include examples of completed proposal forms—is being written, the Cycle 2 Instrument Scientist calibration program is in the design phase (the details depend on the SV and Cycle 1 observations), and we are starting to tackle the problem of jitter elimination using the 32 kilobit telemetry acquired on the Guide Stars. We also are supporting the re-reduction of the Guide Star Catalog (Version 1.2), using new methods developed at STScI. In addition, we are continuing to transform one of the engineering-only FGS modes into a GO mode because we expect it to minimize the deleterious effects of the spacecraft jitter. Finally, we are anticipating the data from the Fine Lock test that was designed to demonstrate that most of the loss of sensitivity induced by the primary mirror figure can be regained by better control of the Fine Guidance Electronics inside the FGS.

The scientific FORTRAN code for the astrometry pipeline has been completed. It contains three major components: (a) code to treat astrometric data (which arrive on the ground via the Astrometry and Engineering Data Processing telemetry channel rather than the Routine Science Data Processing telemetry channel as is the case for the other five instruments), (b) code to process TRANS-mode observational data, and (c) code to process POS-mode observational data. The latter includes all the basic astrometric corrections and therefore has pieces that will be used by TRANS-mode observers too. A scientific description of the code will appear in the forthcoming version of the FGS Instrument Handbook. At the moment the code is being reconfigured to reside in the IRAF format. After that there is one more stage of software configuration to go through before it becomes available to GOs in STSDAS.

—Mario G. Lattanzi and Larry Taff

NEWS FOR HST OBSERVERS AND PROPOSERS

FREQUENTLY ASKED QUESTIONS ABOUT HST DATA AND DATA ANALYSIS

We are moving into an era where increasing numbers of General Observers (GOs) are receiving HST data and/or coming to STScI to analyze their data. Here are some answers to a few of the most common questions that are asked by GOs, Archival Researchers, and other persons interested in HST data.

The text below is taken from a much longer article, which has been posted to observer/frequently Asked Questions on STEIS. The full version contains considerably more detailed information about the questions raised below and numerous other topics, and all observers should consult it.

1. What happens to the science data once an observation is made? The science data are separated from the engineering data, and passed through Routine Science Data Processing (the RSDP “pipeline”), where they are calibrated. They are then written into the archive and a copy is sent to the Principal Investigator (PI).

2. What am I going to receive? The PI will receive magnetic tapes containing the data in FITS format, a listing of the contents of the tape, a summary of the observations (if it exists) which complements the information in the files, and hard copies of
the data (either glossy photographs in the case of imaging data or plots for the spectra).

3. When will I receive the tape? The data are received by the Data Archive Operations Group (DAOG) approximately one day after they are taken. About 8 hours later the tape is written and sent to the PI (or to the person indicated in the Data Distribution Form), or kept at the DAOG office until picked up at STScI.

4. What is on the tape? The tape will have the raw (uncalibrated) data, plus all the files generated by the calibration pipeline. There are routines in STSDAS for reading the tape.

5. Are the data calibrated? Maybe. The data that the PI will receive have been calibrated with the best currently available calibration reference files. In some cases, however, complete sets of reference files for all the possible combinations of setups and filters are not yet available. Observers should contact us (410-338-1082, userid ANALYSIS) for further information. See also the discussion of WF/PC flat fields earlier in this issue (p. 9).

6. Are the calibration reference files included on the tape I will receive? No, the reference files are not routinely included in the data tape you will be receiving. However, all the reference files are public and can be requested to recalibrate your observations.

7. Are the images deconvolved? No, the data are not deconvolved routinely. Software for deconvolution of HST images and spectra is available in STSDAS.

8. Are there PSFs that will help me deconvolve my images? STScI maintains a library of point-spread functions (PSFs), both observed and calculated using the Telescope Image Modelling (TIM) software developed in house. (TIM can be downloaded from STEIS using anonymous ftp.)

9. Is it useful to visit STScI for the data analysis? Yes! We strongly recommend that you visit us at least the first time you receive HST data. We have the facilities to analyze your data. Also, all your instrument-specific queries can be addressed immediately by in-house experts. HST data are complex and unless you have had some experience with them, we would strongly advise you to visit us.

10. How can I arrange a visit to STScI? Contact the User Support Branch (USB) (800-544-8425 in the U.S. or 410-338-4413, userid USB). We request that you give us two weeks advance notice that you are coming.

11. Do I have to know IRAF/STSDAS before coming? No. Technical support staff can help you learn the data analysis system.

12. Where do I call if I have an STSDAS question? Call 410-338-5100, or send e-mail to userid HOTSEAT.

13. How can I obtain copies of non-proprietary data from the HST archive? See the article below (p. 18).

14. Is there documentation available? Yes, a large number of documents are available covering all aspects of STScI, HST, the scientific instruments, and data reduction and analysis. Please download the STEIS version of this article for a complete listing, or contact USB to request copies.

15. What if I am a European (ESA) HST user? European HST users with their own data or with a desire to make extensive use of the HST archive are strongly encouraged to visit the ST-ECF at ESO in Garching, Munich. Staff at the ST-ECF are available to help users begin to reduce and analyze their data. Limited facilities mean that, after an exploratory phase at the ST-ECF, most of the analysis will take place at the user’s home institute but considerable assistance can be given with instrument-specific questions and the full facilities of the archive are available for any recalibration work. In order to arrange a visit to Garching, contact: (e-mail on span/decenet) ESO: STDESK; (phone) +49 89 320 06 291 and ask for STDESK; (fax) +49 89 320 06 480, attention STDESK; or contact Bob Fosbury at ST-ECF.

—Daniel Golombek

USER’S GUIDE TO THE STSCI

We have just finished revising a short document called “A User’s Guide to the STScI,” and have mailed copies to the General and Guaranteed Time Observers. This guide is intended for users who wish to visit the STScI, and provides current information on travel directions, on-site “logistics,” technical and scientific support, remote and on-site information resources, hotels and restaurants. Two short forms are also included: one for user feedback and one for requesting institute documentation. The guide was prepared by Sheryl Fargout with help and input from many institute staff. If you are considering a visit to the STScI, we strongly recommend that you contact the User Support Branch and request a copy of the user’s guide.

—Bruce Gillespie

OBSERVATION PROBLEM REPORTS

STScI is most interested in receiving feedback from observers on the degree of success of their HST observing programs. Earlier this year, we developed the HST Observation Problem Report (HOPR, known locally as a “hopper” and available from the User Support Branch), which is a form to be filled out by GOs and GTOs when there are apparent problems with HST scientific and calibration data. This form was devised both to provide us with invaluable information on how well HST is performing in a scientific sense and to offer Principal Investigators (PIs) a way to request rescheduling of failed observations.

If you determine that data from your GO, GTO, or calibration programs are defective in any way, please let us know by submitting a Problem Report, even if you are not requesting that the observations be repeated. All types of problems should be reported, ranging from the obvious (e.g., no data due to loss of guide-star lock) to the more subtle (e.g., signal-to-noise different than expected).

Each problem report is examined by our Telescope Time Review Board and forwarded to expert staff for analysis. When a retake of a failed observation is specifically requested by the PI, the Review Board will make a recommendation to the STScI Director. The decision to repeat the observation will be based on the investigation of
the problem, within the context of how repeating the observation would contribute to the broader HST science program.

It is important to note that STScI will not initiate the retaking of failed observations without an explicit request submitted on an HST Observation Problem Report form and signed by the PI. The only exception to this policy is in the relatively rare case of observations lost during telescope and instrument “safing” events; observations lost due to safing will be rescheduled automatically where possible. Otherwise, we will only reschedule failed or defective observations when an explicit request has been received from a PI, following review and Director’s approval.

In all cases, the analysis and disposition of Observation Problem Reports are communicated to the PI, generally within a month of receipt. If you have questions on how to use the form or need additional copies, please contact the undersigned (410-338-4723, userid GILLESPIE).

—Bruce Gillespie

WF/PC-ASSISTED EARLY ACQUISITIONS

Some common problems related to WF/PC early-acquisition images (i.e., images obtained in order to determine the telescope pointing for subsequent observations with other instruments) may not have been taken into proper account by some observers. These problems are discussed in detail in the Target Acquisition Handbooks and in recent Phase II materials, but they are highlighted again here. This article also describes the corrective actions that STScI is taking.

1. WF/PC geometric distortion. This problem affects the ability to perform accurate relative astrometry within the WF/PC field of view. The distortion is introduced by the WF/PC optics, and the departure from linearity can be as high as 3 pixels over one CCD chip. We have obtained data to calibrate this distortion, and expect to have a preliminary calibration of W2 and P6 by year’s end, with the other chips following soon after. The calibration will be accompanied by a STSDAS tool that will enable observers to go from the x,y positions directly to right ascension and declination without having to worry about the geometric correction. Note that the WF/PC team has recently circulated a correction algorithm for the WFC based on a ray-tracing program.

2. WF/PC mosaicking. The data gathered for the calibration of the geometric distortion will also provide a very good estimate of the relative distance and rotation of the various CCDs with respect to each other. Until then, mosaicking of the CCDs will prove difficult, and, as in the past, we do not advise observers to attempt astrometry across CCDs. Moreover, each chip is treated independently by most of the software, and this will cause obvious problems if one wants to construct an astrometrically “sensible” mosaic. And in any case, the long-term stability of the CCD positions relative to one another cannot be assessed at the moment, so the advice to restrict oneself to a single chip for astrometry will remain valid.

—Roberto Gilmozzi

USERS’ COMMITTEE MEETS

The first meeting of the Space Telescope Users' Committee (STUC) in Cycle 1 was held on September 26-27, 1991. The three major issues which the committee addressed were the recent changes to the WF/PC II capabilities, the problems with the GHRS, and the on-going operations of HST, including the experiences and recommendations of the first General Observers (GOs). Joe Rothenberg, the HST Project Manager at GSFC, described the difficulties that the WF/PC II development had encountered at JPL. Faced with risks to both the on-orbit performance and development schedules, the WF/PC II science team agreed to a reduction in the number of relay camera/CCDs (from 4 to 3 in the Wide Field and from 4 to 1 in the Planetary Cameras) and the addition of on-orbit actuators on two of the three Wide Field relays (thereby ensuring good on-orbit optical performance over most of the original field of view). The STUC expressed concern about the WF/PC II development and recommended the highest management attention by NASA.

The STUC was briefed by Preston Burch, a NASA manager, on the technical status of the GHRS and the possible workarounds to the failure of the side 1 low-voltage power supply. The STUC recommended to NASA that procedures for switching data channels (which could restore the operation of GHRS side 2) be validated and that the method for restoring GHRS side 2 operations be established prior to the Time Allocation Committee deliberations. It also endorsed further study of recovering side 1 operations during the next servicing mission.

While the experiences of the early GOs have generally been positive, several early
GOs have taken the opportunity to communicate some criticisms and recommendations to the STScI Director and the STUC Chair. These and the corrective actions begun by the STScI were discussed at length. Progress in the development of parallel observations and tracking moving targets was also reviewed. The STUC commended all elements of the HST program for achieving a vastly improved level of operations. Future GOs are encouraged to communicate any concerns to the STScI and/or the STUC. The members of the ST Users’ Committee are listed in the table, along with the elected Chair and Vice-Chair.

—Peter Stockman

STAC MEETING

Partly in response to the power supply failure in the GHRS, NASA formally requested advice from the STScI Director concerning the development and priorities for future servicing missions. To consider these issues from the broadest scientific perspective, Riccardo Giacconi reconvened the Space Telescope Advisory Committee (STAC), with Jerry Ostriker as the Chairman. Meeting on October 9-10, the STAC received briefings from Joe Rothenberg, the HST Project Manager, on the current development plans; from Bruce Woodgate and Rodger Thompson, the PIs for the Space Telescope Imaging Spectrometer (STIS) and Near Infrared Camera (NIC); and from Ed Weiler, the acting HST Program Manager. The STAC was also provided extensive written material by the STIS and NIC science teams. Prior to the meeting, an independent technical review of the STIS, NIC, and COSTAR programs was conducted by astronomers from the STScI and five other research institutions. The results of that review were provided to the STAC and copies may be requested from the Chair of the review team, Chris Blades (userid BLADES).

In summary, the STAC recommendations to the STScI (which generally comprise the STScI response to NASA) place the highest priority on restoring the capabilities of the GHRS and the timely completion of WF/PC II and COSTAR for a late-1993 servicing mission. Since the scientific impacts of all three developments are comparable and complementary, the STAC did not attempt to prioritize among the three and urged tight management of their development. In this regard, the STAC commended the recent reduction of the WF/PC II as necessary to restore most of the original HST capabilities by the earliest possible date. As for the relative priorities of the second generation instruments (STIS and NIC), the STAC considered both instruments to offer compelling scientific capabilities in the ultraviolet and near-IR compared to current ground-based facilities and HST instruments. They urged NASA to develop both instruments in parallel for an on-orbit installation targeted for 1997. The STAC recognized that, with instrument costs around $100 million each, such a parallel development would not be feasible without further reductions in their capabilities and cost as well as belt-tightening in other HST Project elements.

The members of the STAC for 1991-92 are listed in the table. The STAC report may be requested through the STScI Director’s Office.

—Peter Stockman

STEIS USAGE INCREASES FIVE-FOLD

The Space Telescope Electronic Information Service (STEIS) is an anonymous ftp (file transfer protocol) account set up over a year ago to provide current information about HST to the astronomical community. Observers use STEIS to obtain observing schedules, instrument status reports, information about (and source code for) calibration and data-analysis software, and software to help in creating observing proposals. The ftp address is stsci.edu.

The figure shows that usage has increased five-fold since the beginning of the year. The large jump in July resulted from the August proposal deadline. This chart is based on the number of times the string “LOGIN” appears in the accounting file; each login does not necessarily represent a new user. All of the directories have shown an increase in activity—apparently STEIS users like to browse.

A questionnaire about STEIS has been posted on STEIS, and we have received many positive responses, as well as constructive criticisms and suggestions. Common requests are for immediate notification of newly posted items, on-line help, and greater ease in finding and downloading files. Some users have experienced trouble making connections with a particular brand of ftp, or are not fluent with available commands (the system is based in UNIX). For example, people often try to download directories, mistaking them for files. This problem is easily avoided by using the “ls -F” command to provide a listing that distinguishes directory names from file names.

The daily HST status reports written by Joe Ryan of NASA/GSFC have answered the demand for up-to-date HST news, and
are probably the most popular item on
STEIS. Sometime in the future these re­
ports might become accessible via telnet.

There are sometimes discrepancies in
our HST scheduling information, which
arise when the long-term scheduling is re­
vised in the short term. We have some pos­
sible solutions for this problem, but may
never be able to promise 100% concur­
rence, since schedules are frequently modi­
ied after the reports come out. The weekly
timeline is usually the most reliable
schedule.

As always, we welcome comments and
suggestions. Anyone wishing to post infor­
mation relating to HST should contact
the undersigned (410-338-4551, userid
REPPERT).

There will be a poster paper on (and
probably a live connection to) STEIS at the
January 1992 AAS meeting in Atlanta.

—Pete Reppert

**HOW TO OBTAIN ARCHIVAL DATA.**

Scientists who wish to obtain non-pro­
prietary archival HST data and who do not
seek funding for their Archival Research
may request copies of the data by filling out
the form "Request For Copy of HST Obser­
vations," which is available from the User
Support Branch or can be downloaded
from STEIS (file observer/dsob2.ps).

A list of the thousands of archived HST
images is available on STEIS, under the
filename AEC.CATALOG in the observ­
er/completed_observations directory.

A request must specify the "root" or
"dataset" name of the desired data. These
names can be obtained either from
AEC.CATALOG or by querying the HST
archive catalog using STARCAT, a men­
driven archive-searching system which
works on any standard terminal. A guid­
to

using STARCAT, which accesses stsci via
telnet, is available upon request from the
User Support Branch. STARCAT can dis­
play a field specifying the date on which
each observation will become public. (The
normal proprietary period is one year, but
some special observations may have
shorter periods, including the Science As­
sessment and Early Release Observations
and many calibration data.)

Questions about the data archive may
be directed to Mario Livio, head of the
STScI Data Management Facility (410-
338-4439, userid MLIVIO).

—Mario Livio & Pete Reppert

**PROPRIETARY STATUS OF HST CALIBRATION DATA.**

The following statements are intended
to clarify the policies related to the avail­
ability and release of HST calibration data.

1. All HST data, including calibration data,
are immediately available to STScI instru­
ment and calibration scientists for evalua­
tion and analysis.

2. Calibration and engineering data ob­
tained as part of the STScI Calibration
Program will become available to the astro­
nomical community as soon as the data are
placed in the STScI archive.

3. Calibration data obtained as part of the
OV/SV Program will become
publicly available
30 days following the
observation.

4. Calibration data obtained as part of and
charged to approved GTO and GO pro­
grams have the same proprietary period as
the associated scientific data, typical­ly one
year, unless released earlier by the PI or
released later following approval by the Insti­
tute Director. Note that these data may also
be used, as appropriate, by STScI staff for
updating the calibration pipeline.

—Kirk Borne

**AN HST USER SURVEY: THE PRO­
POSAL SUBMISSION SYSTEM.**

In both Phase I and Phase II of the pro­
posal process, HST observers are required
to fill out an electronic proposal template and use software (such as the Phase I Formatter and RPSS) that checks the proposal for syntactical and feasibility errors. The proposal is then submitted electronically and is eventually translated directly into telemetry commands that are sent to the spacecraft, which is why the proposal file must be carefully constructed.

We will be upgrading the proposal submission software in the coming year, and we are trying to identify hardware and software improvements that will best serve the HST user community. If you have ever submitted an HST observing proposal, Phase I and/or Phase II, the User Support Branch is interested in your comments and opinions regarding the current proposal submission system. This includes the Phase I template and formatter; the Phase II RPSS template, validation program, and spacecraft resource estimator; and any other resources you have used.

A questionnaire has been posted on STSci's main directory, and may be downloaded, filled out, and returned to USB. This is your chance to let us know how we can help with the difficult task of HST proposing and/or to vent your frustrations with the current system in a constructive way. Please return the questionnaire by January 17, 1992, by e-mail to userid LIBRARY.

Also, be sure to look for the STSci display at the AAS meeting in Atlanta. The USB will be demonstrating software tools that are designed to assist HST proposers, and we hope to get some immediate feedback from potential users.

—Max Mutchler

**PROPOSAL NEWS**

**CYCLE 2 PEER REVIEW UNDERWAY**

The deadline for submission of Cycle 2 HST proposals occurred on August 16, 1991. A total of 483 proposals was submitted. The proposals have now been sent out to the peer reviewers, who will meet at STSci in December to select programs to be recommended to the STSci Director for implementation.

Proposers will be notified of the outcome in January and successful proposers will then be asked to submit their Phase II information. Cycle 2 observations are expected to begin in the summer of 1992.

The tables present some statistics of the Cycle 2 proposal pool. Note that large proposals are defined as those requesting more than 100 hours of spacecraft and/or parallel

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**CYCLE 2 PROPOSAL STATISTICS**

<table>
<thead>
<tr>
<th>Number of proposals by type:</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>GO</td>
<td>429</td>
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<tr>
<td>GTO/Augmentation</td>
<td>38</td>
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<tr>
<td>Snapshot</td>
<td>7</td>
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<tr>
<td>Archival</td>
<td>9</td>
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<tr>
<td>TOTAL</td>
<td>483</td>
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| Number of large proposals:   | 19  |

<table>
<thead>
<tr>
<th>Total time requested (all types and cycles):</th>
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<tbody>
<tr>
<td>Spacecraft</td>
<td>11,796 hrs</td>
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<tr>
<td>Parallel</td>
<td>1,421 hrs</td>
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</table>

<table>
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<tr>
<th>Number of proposals and proposal fraction by instrument (all types and requests):</th>
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<tbody>
<tr>
<td>WF/PC</td>
<td>153 32%</td>
</tr>
<tr>
<td>FOC</td>
<td>78 16%</td>
</tr>
<tr>
<td>FOS</td>
<td>149 31%</td>
</tr>
<tr>
<td>GHRS</td>
<td>195 40%</td>
</tr>
<tr>
<td>HSP</td>
<td>9 2%</td>
</tr>
<tr>
<td>FGS</td>
<td>16 3%</td>
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<th>Number of proposals by Scientific Category (all types):</th>
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<tbody>
<tr>
<td>Galaxies &amp; Clusters</td>
<td>74</td>
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<tr>
<td>Interstellar Medium</td>
<td>92</td>
</tr>
<tr>
<td>Quasars &amp; AGN</td>
<td>92</td>
</tr>
<tr>
<td>Solar System</td>
<td>46</td>
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<tr>
<td>Stellar Astrophysics</td>
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<tr>
<td>Stellar Populations</td>
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<th>Number of proposals by PI country (*=ESA member state):</th>
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<td>Belgium*</td>
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<tr>
<td>Netherlands*</td>
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<tr>
<td>South Africa</td>
<td>3</td>
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<tr>
<td>Spain*</td>
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<tr>
<td>Sweden*</td>
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<td>USSR</td>
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</tbody>
</table>
PUBLISHED HST PAPERS

The following is a list of published papers containing results from HST. This list is maintained by the STScI Librarian, and the newest additions will be published in each Newsletter. Please note that this list is for information only, and that preprints and reprints of these papers are not available from STScI.


time. The proposal fractions by scientific instrument total more than 100%, since some proposals have requested more than one instrument.

—Kirk Borne & Howard E. Bond

APPROVED DIRECTOR’S DISCRETIONARY PROGRAMS

The following Director's Discretionary programs have been approved since the last issue of the Newsletter (PI and Proposal Title):

S. Shore, High Resolution Observations of Nova LMC 1991 (unsuccessful due to GHRS failure)

C. Leitherer, UV Spectropolarimetry of AG Car in its Current Outburst

J. Bahcall, Gravitational Lens Candidate 1208+101: Photometry

—Kirk Borne

SOFTWARE NEWS

STSDAS NEWS

The next major release of the Space Telescope Science Data Analysis Software (STSDAS Version 1.2) will be available by the end of this year. This release is being coordinated with the next release of IRAF, Version 2.10. Some 94 new tasks have been added to STSDAS since the release of V1.1, including both instrument-specific tasks and general-purpose tools. Several other tasks, including those for pipeline data reduction, have undergone major revision and/or enhancement.

Many of the new tasks are intended to facilitate the analysis required to generate the calibration reference files for each instrument, while several others provide additional plotting and analysis capabilities. As with all STSDAS software, these new tasks support the GEIS (or multi-group) format data structures that are used for HST data files. Some of the new tasks also use the Data Quality Files to mask bad pixels from a calculation or operation, where relevant.

One new package, pipeline, may be of particular interest for users who wish to recalculate their data. Since the launch of HST, substantial revisions and enhancements have been made to the header records of HST data files. The bulk of these changes are scheduled to be implemented by the time STSDAS V1.2 is released. The header changes are being done in preparation for a reprocessing of all HST data taken since launch. This reprocessing is intended to populate the raw and processed data headers, and the data bases, with more correct and/or complete information, and to recalibrate the data with improved calibration reference files. As the headers have changed, so has the calibration software. However, until all the data are reprocessed, a few incompatibilities will exist between some data files as they currently exist in the archive and the most recent version (CALxxx) of the STSDAS calibration tasks. The most substantial revisions affect the GHRS and FOS.

In order to provide continued access to currently archived data for recalibration, we provide all older versions of the CALxxx tasks in the pipeline package. A translation task is now available in each of the hxs and fos packages to make the headers compatible with Version 28 of SOGS. Users should run the task pipeline versions to see which version of the software was used for the initial calibration of their data, and be aware that choosing the most appropriate version of the software and calibration reference files may require some consultation with Institute staff.

—Dick Shaw & Bob Hanisch

AURA NEWS

AURA APPOINTS NEW VICE PRESIDENT

The Association of Universities for Research in Astronomy (AURA), Inc. is pleased to announce the appointment of Harry W. Feinstein as Vice President for Administration, effective September 1, 1991. Mr. Feinstein, formerly Head of Administration at the Space Telescope Science Institute, has over 25 years of experience as a professional business manager (including 6 years with STScI).

AURA will miss Jay Gallagher, who has served as Vice President since June 1989. Dr. Gallagher took up a position on the faculty of the University of Wisconsin on August 1 as Professor of Astronomy. During his appointment at AURA, he contributed significantly to the development of the Gemini telescopes project and worked closely with the astronomy community. Jay will continue his association with AURA as a senior scientific advisor.

—Goetz Oertel & Lorraine Reams

BOARD MEMBER TO SERVE ON PRESIDENTIAL SCIENCE COMMITTEE

Congratulations! President Bush has appointed France Córdova, AURA Director-at-Large from Pennsylvania State University, to the President’s Committee on the National Medal of Science.

—Goetz Oertel & Lorraine Reams

HUBBLE FELLOWSHIP PROGRAM

THIRD SELECTION CYCLE UNDERWAY

The Announcement of Opportunity for the third round of competition for Hubble Postdoctoral Fellowships was issued at the beginning of September 1991. The deadline for submitting applications was November 15. The applications received by that time will be considered by the Review Panel that meets in late January 1992. Offers to successful candidates will be made by February 1, 1992. Further information on the Hubble Fellowship Program can be obtained from Nino Panagia (410-338-4916, userid PANAGIA), or by e-mail to userid HFELLOWS.

FIRST HUBBLE SYMPOSIUM

On October 22-23, 1991, the current Hubble Fellows met at STScI to present and discuss the results of their Hubble Fellowship research projects. It is expected that the Hubble Symposium will be an annual event.
INSTITUTE NEWS

A DIGITAL ALL-SKY SURVEY

As part of the effort to construct the Guide Star Catalog (GSC), STScI digitized Schmidt plates covering the entire sky. The plate collection consists of materials from the UK Schmidt in Siding Spring, Australia, operated by the Royal Observatory Edinburgh until June 1988 and thereafter by the Anglo-Australian Observatory, and from the Oschin telescope on Palomar Mountain, operated by the California Institute of Technology. These digitized scans (of order $10^{12}$ bytes of data) are stored on optical disks at STScI. Details of the digitization program, in particular the survey and scan characteristics, are described in the Astronomical Journal (1990, AJ, 99, 2019).

The purpose of this announcement is to ask whether your institution might be interested in purchasing a copy of the digitized sky. The northern sky images that will be offered are from the original POSS E (red) plates. The southern sky will be covered by the SERC J survey. In addition we expect to add other digitized surveys to this collection as appropriate arrangements are completed.

With the cooperation and encouragement of Caltech, the National Geographic Society, the UK Science and Engineering Research Council, and NASA, the STScI is currently planning to distribute moderately compressed images of the digital scans. Extensive tests have shown that essentially no astrometric or photometric information is lost through the compression and decompression processes. Relative positional accuracies significantly better than 1 arcsecond, and stellar brightnesses accurate to better than 0.5 mag, are routinely obtained except near plate flaws and edges. The compression algorithms and tests were reported at the Digital Optical Sky Surveys Conference in Edinburgh this past June, and the report will also appear as an STScI preprint.

The breadth of the community interest will enable STScI to decide whether to proceed with the survey distribution and to estimate better the costs of production. Any distribution of digitized surveys by STScI will be done on a cost-recovery basis.

The per-copy cost of the all-sky digitized survey will depend on the number of copies ordered. If demand is about 100 orders, then the survey cost should be approximately $6,000 per complete set, and if 500 orders are received, the cost per set should be reduced to under $1,500.

Of the many different mass-storage and distribution media in widespread use, CD-ROMs (Compact Disk Read Only Memory) appear to be the most stable and cost-effective technology available. We propose to distribute the survey as a set of about 100 CDs. Software to read, decompress, and display sky images on certain workstations, and to obtain celestial coordinates from the images, will also be distributed free of charge to survey customers.

If your institution might be interested in purchasing a CD copy of the digitized sky survey, please contact Michael Shara at STScI (410-338-4743, userid SHARA). Be sure to indicate the type of workstation and operating system you would prefer to use with the digitized scans. Such preliminary
expressions of interest, of course, imply no commitment to purchase the survey.

—Michael Shara

YEAR OF FIRST LIGHT PROCEEDINGS AVAILABLE

The Proceedings for the Year of First Light workshop held at STScI May 14-16, 1991 are now published and are being sent to Guest Observers, Guaranteed Time Observers, members of the Instrument Development Teams, members of the STScI proposal panels, and to university libraries. Copies will also be available at the 179th meeting of the American Astronomical Society, held in Atlanta, Georgia. There is a limited number of additional copies available. If you would like one, please contact Sarah Stevens-Rayburn, STScI Librarian (userid LIBRARY).

OCTOBER MINI-WORKSHOP

The final STScI mini-workshop of the year, attracting more than 70 participants to Baltimore on October 8-10, 1991, concerned “Nonisotropic and Variable Outflows from Stars.” Theoretical models rely largely on the idea that stars and their environments can be described under the assumption of spherical symmetry and time-independence. However, recent observational data—including HST results—suggest that the outflow properties are widely dominated by disks, jets, and clumps, which often display significant time variability. A variety of objects, including pre-main-sequence stars, early-type stars, and novae were discussed during the workshop, and the need for more elaborate models and observations was emphasized.

The proceedings of this mini-workshop will be published in the Astronomical Society of the Pacific Conference Series.

—Claus Leitherer

WORKSHOP ON STATUS OF WOMEN IN ASTRONOMY

The Space Telescope Science Institute is planning a workshop on the Status of Women in Astronomy, to be held at STScI on September 3-4, 1992. The workshop will be geared toward graduate students, post-docs, junior and senior astronomers, and administrators. The agenda will include discussions of the current status of women in the field, the particular challenges women face, and ways to improve the recruitment and retention of women in astronomy.

The organizing committee for the workshop includes (*=local): Neta Bahcall, Peter Boyce, France Córdova, Laura Danly*, Doug Duncan*, Riccardo Giacconi*, Anna Kinney*, Ethan Schreier*, Meg Urry*, and Sidney Wolff. If you are interested in receiving further details about the workshop, including registration information, please contact: Barb Jedrzejewski, Conference Coordinator (410-338-4836, userid ELLER), or one of the local organizers (userids DUNCAN, GIACCONI, KINNEY, SCHREIER, CMU).

—Meg Urry

SABBATICAL & LONG-TERM VISITORS AT STScI

In order to promote the exchange of ideas and collaborations in HST-related science, STScI expects to provide limited funds to support visiting scientists who wish to spend extended periods of time (three to twelve months), typically on sabbatical leave from their home institutions or during the summer, doing research at STScI.

In general, these visitors will have a status similar to STScI employees and have access to the facilities available to staff members.

Established scientists who might be interested in such a visit during the summer of 1992 or during the academic year commencing in September 1992 should send a letter specifying the suggested period for the visit and other relevant details to the Visiting Scientist Program, c/o Tim Heckman (410-338-4442, userid HECKMAN), at STScI. It will be helpful if candidates include a recent curriculum vitae and a short description of their research plans.

—Tim Heckman

RECENT STAFF CHANGES

Mario Livio has joined STScI as Astronomer and Chief of the Data Systems Operations Branch. Mario comes to us from the Technion Institute of Technology in Israel and has much experience with research and teaching in Physics and Astronomy. His research interests include theoretical studies of novae, supernovae, accretion disks, and the interactions of close binary stars. Mario will be taking over DSOB from Jerry Sellwood, who is leaving the Institute for a position at Rutgers University.

New Assistant Astronomer Stefi Baum was most recently a Hubble Postdoctoral Fellow at Johns Hopkins University. She has joined the SCARS/DSOB as the archive scientist. Her research centers on optical and radio observations of extranuclear signs of activity in active galaxies.

Rex Saffer has joined the Institute as a STScI postdoctoral fellow. He recently completed his Ph.D. at the University of Arizona, and specializes in spectroscopic studies of hot subdwarfs, single and binary white dwarfs, and horizontal-branch stars.

Brad Whitmore has been appointed Associate Astronomer with tenure. He continues as Deputy Division Head of the Science Programs Division.

After seven years of enthusiastic service, Colin Norman has stepped down as Head of the Academic Affairs Division to devote more time to research. Nino Panagia, at STScI since September 1984, and on the Academic Affairs staff since July 1988, will assume the position of Head of Academic Affairs on December 1, 1991. Nino has wide-ranging research interests but is perhaps best known for his recent study of SN1987A with the HST, in which he determined an extremely accurate distance to the LMC via analysis of the ring around the supernova.
RECENT STScI PREPRINTS

The following papers have appeared recently in the STScI Preprint Series. Copies may be requested from Sharon Toolan (410-338-4898, userid TOOLAN) at STScI. Please specify the preprint number when making a request.


568. "Two High-Velocity Stars Shot out from the Core of the Globular Cluster 47 Tucanae," G. Meylan, P. Dubath, and M. Mayor.


GRADUATE STUDENT RESEARCH ASSISTANTSHIPS

STScI invites applications from advanced graduate students to pursue Ph.D. thesis-level research with members of the Institute staff. The scientific fields represented at the Institute cover much of modern astronomy, including theoretical, observational, and instrumental programs. Since STScI is not a degree-granting organization, all students must be enrolled in the graduate program at their home university. Applicants must have completed all required graduate course work and have been admitted to the Ph.D. program at their home university, which must give permission for them to work at STScI. An affiliation with The Johns Hopkins University may be arranged for students while they are in Baltimore.
The program is intended for students who will spend at least one year at the Institute, but proposals for shorter visits will also be considered. Applications from students at both U.S. and foreign institutions are invited. Applications for this program should be sent to the Personnel Manager, Space Telescope Science Institute, 3700 San Martin Drive, Baltimore, MD 21218, and should be clearly marked "Graduate Student Program." They should include a curriculum vitae, a statement of research interests, and a letter from their advisor or departmental chair giving permission for the student to work at STScI. Applicants should arrange for their transcripts and three letters of recommendation to be sent directly to the Personnel Manager. The deadline for receipt of applications is February 1, 1992. EOE/AAE.

ESA FELLOWSHIPS AT STScI

Astronomers of European Space Agency (ESA) member countries are reminded of the possibility of coming to STScI as ESA Fellows. Prospective fellowship candidates should aim to work with a particular member or members of the ESA staff at STScI, and for this reason applications must be accompanied by a supporting letter from STScI.

Details of the interests of staff members at STScI can be obtained from Dr. J. E. Pringle in the Academic Affairs Division (410-338-4477, userid PRINGLE). Details of the fellowships and application procedures can be obtained from the Education Office, ESA, 8-10 rue Mario Nikis, 75738 Paris 15, France. Completed application forms must be submitted through the appropriate national authority and should reach ESA no later than March 31 for consideration in May, and no later than September 30 for consideration in November.

HOW TO CONTACT STScI

Telephone: The area code for Baltimore has changed from 301 to 410. Thus the telephone numbers for staff members are now of the form 410-338-xxxx, where xxxx is the extension number. Two exceptions are the Grants Administration Branch (410-516-8611) and the SDAS Hot Seat (410-516-5100). If an individual staff member's extension is not known, call the STScI receptionist at 410-338-4700.

Fax: 410-338-4767

Mail: STScI
3700 San Martin Drive
Baltimore, MD 21218
USA

E-mail: It is possible to reach most staff members at STScI on NSI/DECnet (formerly known as SPAN), BITNET, and Internet. Address formats are as follows:
NSI/DECnet: stscic::userid
or 6559::userid
BITNET: userid@stsci.bitnet
Internet: userid@stsci.edu

In most, but not all, cases the "userid" is the staff member's surname. Alternatively, many userids are published in the Membership Directory of the American Astronomical Society. If you have difficulty reaching someone, please send the mail to the User Support Branch (userid USB), which will forward it. The USB is the central point of contact for scientists who wish to conduct research with HST.

NEWSLETTER NOTES

Comments on the STScI Newsletter should be addressed to the Editors, Howard E. Bond (410-338-4718, userid BOND) and Meg Urry (410-338-4593, userid CMU). Mailing-list corrections should be sent to Amy Connor (userid CONNOR).

Persons who assisted in the preparation of this issue include John Godfrey, Dave Paradise, and Pete Reppert.

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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.

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