HST SCIENCE HIGHLIGHTS

A LARGE NUCLEAR ACCRETION DISK IN NGC 4261

During a survey of a complete sample of elliptical galaxies in the Virgo Cluster (Jaffe et al. 1993) we took two F555W exposures of 1700s and 700s of NGC 4261 with the Planetary Camera. Cosmic rays were removed by combining the images with the STSDAS task combine. We used Lucy deconvolution and Fourier filtering to improve the contrast in the original image. Both images showed the same features, all of which can be seen in the unsharpened image, albeit with lower contrast.

A smooth absorbing disk with sharp edges and a point-like nucleus is visible. The disk is elliptical, with axes of $\sim 1.7''$ by $\sim 0.7''$. Assuming the disk is intrinsically circular, the plane of the disk is inclined $64^\circ$ to the plane of the sky.

We assume that the distance to NGC 4261, which is in the “Virgo West” cloud, is that of the Virgo Cluster, 14.7 Mpc (Jacoby et al. 1990). The diameter of the disk is then $\sim 120$ pc. If the Virgo West cloud is at about twice the distance to the main Virgo cluster as assumed by many workers, the physical dimensions of the disk will be doubled. The nucleus within the disk is unresolved ($\sim 0.1''$) and has an apparent magnitude $m(5500\,\AA) \sim 23.6$.

The central dust absorption was noted by Mollenhoff & Bender (1987) and Kormendy & Stauffer (1987), but the disk structure was not evident in either case. Our preliminary analysis shows that the optical depth perpendicular to the disk is approximately 0.3. Radio and optical spectra show that in addition to dust the disk contains HI, CO, and HII. Jaffe & McNamara (1993) used the VLA and JCMT telescopes to detect HI and CO absorption in front of the nucleus at the galaxy’s systemic velocity. Long slit William Herschel Telescope optical spectra obtained for us during good seeing show a LINER spectrum with unusually broad lines of H-alpha, [NII], and [SII]. The nuclear H rotation curve is linear, showing that the portion of the disk which can be resolved from the ground rotates as a solid body.

NGC 4261 is the radio galaxy 3C 270, which has been mapped at various frequencies (Birkinshaw & Davies 1985, Jaffe & McNamara 1993). The radio source consists of a nuclear point source, two jets, and two outer lobes. The $88^\circ$ position angle of the jets is essentially parallel to the minor axis of the disk. The dynamical time scale of the disk, $\sim 10^6$ yr for a rotation speed of $\sim 100$ km/s, is comparable to the characteristic lifetime of radio sources. Similarly, processes for transport of angular momentum, and thus inward transport of fuel in the disk also occur on timescales rel-
evant to the radio jets (Pringle 1981). These facts, combined with the alignment of the disk with the radio axis, lead us to the conclusion that the disk is the “fuel” supply for the central engine, which is most likely a massive black hole. The alignment of the large scale radio axis with the minor axis of the nuclear disk suggests that the angular momentum in the disk determines the direction of the pair of collimated jets which originate near the black hole. After the forthcoming HST repair mission we plan to map the rotation of the disk near the nucleus to obtain an estimate of the central mass which is free from the ambiguities of masses derived from stellar orbits.

—Holland Ford (Johns Hopkins / ST ScI), Walter Jaffe (Leiden), Laura Ferrarese (Johns Hopkins / ST ScI), Frank van den Bosch (Leiden) and Robert W. O’Connell (Virginia)

WF/PC IMAGES OF SHOCKS IN THE CYGNUS LOOP

Despite extensive ground and space-based work on radiative shock fronts, direct investigation of the structure of post-shock cooling and recombination regions has remained the turf of model builders. This is because the scale length for cooling typically about $10^{16}$ cm remains unresolved from the ground, even for relatively nearby objects. The high spatial resolution of the HST has now been used to address this problem, with very interesting results. The image above, obtained by the WF/PC IDT, shows a WF/PC image of [SII] emission from a field on the eastern limb of the Cygnus Loop supernova remnant. Images were also obtained in H and [OIII] emission. While [OIII] emission is formed in relatively hot regions close behind the shock, [SII] emission is seen only further behind the shock where the gas has cooled to around $10^4$ K. Together, these data show the structure of the post-shock flow under the wide variety of physical conditions found throughout the field.

For example, the isolated filament in the lower portion of the field was studied in great detail by Raymond et al. (1988, ApJ, 324, 869). They determined that shock velocity increases from right to left along this
instability in which a bump on the surface of the shock grows as post-shock gas moves laterally to "fill in" the bump, and thereby increases the post-shock momentum at this location. Such instabilities have been discussed for some time, and it is nice to finally see one developing. It is also quite interesting that in a field such as this, we see only one instability developing.

The new data also allow the shock front to be used as a probe of the very small scale structure of the ISM. In the right hand portion of the field there are a number of very small V-shaped structures with bright knots at their apexes. The knots are unresolved even in these images, meaning that they are no more than a few hundred AU in size. The end result of the shock/ISM interaction at these locations will be solar system sized clouds of gas which have been significantly compressed by the passage of the shock wave. While the densities in this region are probably far too low for anything to come of these small knots, the significance of this process for shock triggered star formation in denser environments is clear.

—Jeff Hester (Arizona State University)

EVIDENCE FOR A TIDAL INTERACTION IN THE SEYFERT GALAXY MARKARIAN 315

The Seyfert galaxy Markarian 315 is noteworthy for its extraordinary 80 kiloparsec long jet-like feature visible in redshifted [OIII] 5007 and H emission (MacKenty 1986, ApJ, 308, 571). While a tidal tail had been considered a possible explanation of this feature, its nature was unclear. The jet-like feature is extremely linear with a sharp "hook" at its end, and the galaxy itself is fairly symmetric without signs of a nearby neighboring galaxy. As part of a HST Snapshot survey being conducted by John MacKenty (ST ScI), Richard Griffiths (Johns Hopkins University), and Susan Simkin (Michigan State University), this galaxy was observed with the Planetary Camera in the F785LP passband in June 1992. The HST image (see accompanying figure) shows a second galaxy nucleus with a gaussian FWHM of 0.66 arcseconds (0.5 kpc) which is displaced about 2 arcseconds.

filament while the column of gas swept up by the shock decreases. They also found that near the center of the filament the structure must be supported by nonthermal pressure. All of these effects are clearly seen in the WF/PC images. Near the right end of the filament the [SII] emission collapses into a very sharp filament which lies immediately behind the end of the [OIII] zone, as predicted by models. However, no such sharp structure is seen further to the left along the filament because here the compression is limited by magnetic and cosmic ray pressure. Moving further toward the left side of the field, the [SII] filament grows progressively thinner and finally vanishes as the swept up column drops to the point that almost none of the shocked gas has cooled enough for [SII] emission. Along the whole length of the filament [SII] emission trails [OIII] emission, with the separation between the leading edges of the [OIII] filament and the [SII] filament becoming greater as the preshock density decreases, the shock velocity increases, and the time taken for shocked gas to cool to [SII] temperatures becomes longer.

In addition to adding a new dimension to the comparison of shock models with observations, these data also shed light on the sorts of physical processes which are important in the interaction of shocks with interstellar material. An especially nice example of this is seen in the upper left corner of the field where a very small but very bright hook-shaped structure fits neatly into a V-shaped protrusion of the shock front seen in [OIII]. The best explanation of this feature may be as a developing "thin-sheet"
Deconvolved image (upper panel) and the corresponding surface plot of Markarian 315 (extent = 6.45 arcseconds = 4.9 kpc). A second nucleus with FWHM of 0.66” is present 2.27” East of the Seyfert nucleus. (Courtesy J. MacKenty)

East from the Seyfert nucleus. The second nucleus detected by HST is ~1/10 the brightness of the Seyfert nucleus and thus, despite its 2 arcsecond separation, is not visible in images from Mauna Kea in 1 arcsecond seeing. The ability to discern structures close to the bright active nucleus is an important benefit of the HST observations.

This observation, combined with VLA radio maps obtained by Andrew Wilson (ST ScI) and his collaborators which suggest a widespread burst of star formation in this galaxy and which do not detect any signs of a radio jet, argues strongly for a tidal origin of the jet-like feature. Markarian 315 appears to be a good example of a Seyfert with a tidal interaction in which gaseous material has been perturbed deep within the galaxy.

—John MacKenty

THE HST OBSERVATORY
FROM THE DIRECTOR’S OFFICE

The news of Dr. Robert Williams being named as the next Director of the Space Telescope Science Institute arrives just as this Newsletter is going to press. I have enjoyed knowing Dr. Williams since 1975, when I joined the research staff at Steward Observatory, and I share the astronomy community’s admiration for his superb leadership of the Cerro Tololo Inter-American Observatory (CTIO). Bob brings to the ST ScI his great enthusiasm for science, a dedication for service to the community, and an open, straightforward style of leadership. Speaking for myself and the ST ScI staff, we look forward to Bob’s and Elaine’s arrival in late Summer with great pleasure.

As we who are near the Nation’s capitol have learned to say, this will be a very challenging period for HST and the Institute. We are working hard to initiate the third observing cycle this Spring; we are in the process of distributing the Call for Proposals for the fourth cycle of HST observing the first cycle after the Servicing Mission; and we are completing our preparations for the Servicing Mission and the commissioning period which follows. And that’s the easy part!

The hard part is accomplishing these activities while simultaneously improving the efficiency with which we schedule the Obser-

ervatory and the service we give observers and visitors. In the former area, we are placing more emphasis on establishing a large pool of programs ready to execute and are developing a new optimization tool to fit these programs into the weekly schedule. The ever changing conditions of the spacecraft, new capabilities or workarounds, make these tasks difficult and never-ending. In the area of better user support, the Space Telescope Users Committee (STUC) has made several excellent suggestions, including ideas for simplifying the proposal process and requests for easier access to calibration data. Users should see some improvements in the next few months. For Cycle 4, we have lessened the amount of financial information required for submitting proposals. And, the recent opening of remote access to the HST archive should provide easy access to both archival data and calibration files.

As we look beyond the first Servicing Mission, we see a period of great promise and perhaps greater challenges. For those who have worked with HST or followed its successes and difficulties, it is clear that the upcoming servicing mission and those which follow are essential to the success of the overall program. From the outset, HST was designed to be periodically serviced by the Space Transportation System the shuttle. Only on the basis of a long life and periodic upgrading to the state-of-the-astronomical-art, could NASA and the Nation rationalize the large investment and risk involved in the development of the Space Telescope. The growing manifest of the servicing mission attests to the reality that most orbiting observatories have a range of useful lifetimes between 2-4 years. Similarly, the ability to correct the telescope’s spherical aberration and the new capabilities offered by the Near-Infrared Camera and the ST Imaging Spectrograph for installation in 1997 support the concept of planned and adaptive improvements to the scientific payload. However, the servicing costs remain substantial: similar to those of an ongoing major Explorer program producing an E.U.V.E., XTE, or FUSE every three years. In an era of tight budgets, the challenge for HST is to keep on deliver-
Two significant developments in the operations of the HST spacecraft are described below.

**Gyro Failure**

Gyro #1 failed on 18 November 1992, and the failure signature was different from that of the previous two gyro failures. All telemetry output from the gyro ceased at the same instant, as if it had been turned off, or power removed from it. Several attempts were made by control center personnel to command it back on, but all were unsuccessful. The HST project at GSFC has established a failure review board that will try to determine the precise location of the failure. The consequences for the servicing activities on the first servicing mission, in December 1993, are also being reviewed. Installation of two replacement gyro units was already in the plan, and it is now possible that all three will be replaced.

At the time of this failure, the HST was operating with four gyro, in a mode where the redundant information is used to detect anomalies in any one of the four active gyro. These gyro reasonable tests made by the flight software correctly recognized the improper output from the failed gyro and automatically switched to a control law using only the remaining three gyro. The drift rates were re-calibrated within a few hours, so very few observations were affected. The pointing and slewing performance with three gyro is essentially indistinguishable from that with four gyro, so there has been no direct performance degradation as a result of operating on only three gyro.

The problem now is that there are no more spare gyro available, three being the minimum set necessary to carry out science observations with HST. Should another gyro fail before the servicing mission replaces the failed gyro, HST will enter and remain in safemode configuration for an extended period of time. After the second gyro failed (in August 1991), a version of the flight software was developed that has a safemode control law which will work with no operating gyro. This control law was successfully tested on 26 January 1993.

A working group has been formed, within the HST project, to evaluate the possibility of designing a vehicle control law which will work well enough with two gyro to support continued science observations. Those familiar with IUE history know that a succession of clever control law modifications have kept it operational as the number of working gyro has decreased to one. The first analysis of the HST situation indicates that we could get excellent performance while guiding in fine lock with only two gyro. The problem with HST will be during slews, SAA passages, and target occultations when the Fine Guidance Sensors (FGSs) cannot be used. As a result of the low earth orbit and its large size, the gravity gradient and aerodynamic torques on HST are significant and can lead to substantial drift if not measured in three axes, a function normally performed by the gyro.

**Pointing Performance Improvements**

Substantial progress has been made in improving the pointing performance in coarse track and in reducing the frequency of loss of fine-lock by the FGSs. These developments are partly a result of a sustained effort made at LMSC in Sunnyvale in upgrading their software simulation of the pointing control system to include actual flight performance data rather than pre-launch design data. In particular, the simulator now has accurate models of the point spread function as seen by the FGSs and a good model of the disturbances excited by the solar arrays during the day/night terminator crossings. The output of the simulator is now much more consistent with the flight data and has made it easier to assess the impact of changes to the system.

The improvement in coarse track jitter performance will be roughly a factor of two, and is due to a modification of the control law gains. This change was made early in January 1993; data on the improvement will be available for the next Newsletter.

The reduction of loss of locks in fine lock is a result of a detailed study with the simulator which shed much light on the ac-
tual detailed process by which lock is lost during the terminator crossings. This has allowed development of modifications to the flight software which will reset the FGSs to the proper place to regain lock, in most cases. The loss of lock rate has been about 20-30% over the last six months, but is expected to drop substantially after this new software is installed, also at the beginning of January. Initial indications are that the loss of lock rate has been reduced to 1-3%. There is a wide range in excitations from the solar arrays and the largest of these will probably still cause fine lock to be lost. Assuming that this is successful, we will once again pursue methods for allowing fine-lock guidance on fainter guide stars. Previous attempts at this had dramatically and unacceptably increased the incidence of loss of lock, but this software change should help in those cases as well. The ability to use fainter guide stars would increase the availability of guide stars and ease scheduling problems that are sometimes encountered in regions of the sky where the guide star population is sparse.

—Rodger Doxsey and Robert Milkey

COSTAR UPDATE

COSTAR has moved from design and fabrication to assembly and alignment. Essentially all of the work in the mechanical shop has been completed. Approximately 5000 parts were machine processed and assembled for COSTAR and ancillary alignment and test fixtures. The COSTAR Team at Ball began critical optical-mechanical alignment activities just after the beginning of the year.

During assembly and testing of the mechanisms carried by the deployable optical bench, Ball engineers found workmanship and reliability problems with the small motors which deploy the COSTAR mirror support arms. As a precaution against problems with these critical motors, we had bought backup motors from another vendor. Because of the problems with the original motors, we made a decision in December 1992 to increase the margins for reliable deployment of the arms by using the backup motors. Although the required processing and retesting of the motors and mechanisms resulted in a loss of three weeks from our extremely tight schedule, we think the increased reliability justifies the delay. Ball is making every effort to accelerate the work to compensate for the lost time.

For optical alignment, COSTAR will be latched into a mechanical fixture (the HOMS) which simulates the HST focal plane and Hub structure. After alignment, COSTAR will be tested by illuminating the optics with beams which have the same spherical aberration as the HST. The Refractive Aberrated Simulator (RAS), which simulates the HST, has been completed and aligned, and will be mounted on the HOMS by the end of January. The RAS/HOMS will then be tested and certified by the Independent Verification Team from Goddard.

Early in February 1993, the European Space Agency (ESA) will send a team to Ball to set up an engineering model of the Faint Object Camera (the FOC/ST) in the RAS/HOMS. The images obtained from the FOC/ST will be used to confirm that the RAS produces images like those seen on orbit. Later in the year the ESA team will return to Ball for tests which will image corrected beams from COSTAR through the FOC/ST f/48 and f/96 optical paths onto CCD cameras. The images will be used to verify that the COSTAR optics correct the HST spherical aberration and that the COSTAR optics are in the correct position, i.e., to verify that the light from COSTAR will go into the FOC. The corrected images produced by COSTAR for the FOC, FOS, and GHRS will also be analyzed by taking direct CCD images at the appropriate focal positions in the HOMS, and by using an interferometer to measure the wavefront errors in the corrected images.

Optical alignment of COSTAR will continue into March, and system integration should be completed in April. Extensive performance and environmental testing will occur throughout April and May in preparation for shipment to Goddard. After arriving at Goddard, COSTAR will be fitted in the protective enclosure which will carry it into orbit in the Space Shuttle. Next, COSTAR (and WFPC2) will be installed into a high fidelity, mechanical replica of the aft portion of the HST. This installation will verify critical fits and show that there are sufficient clearances between COSTAR, the HST and the WFPC2. COSTAR will then be tested with an electrical replica of the HST to verify that the electrical interface works properly and that COSTAR responds correctly to the commands which will be used for deployment of the optical bench and alignment of the optics.

The next 12 months will be very challenging. The teams at ST ScI. Goddard and Ball are working long hours to complete this critical instrument for delivery to Goddard in mid May and launch in early December 1993.

—Jim Crocker, George Hartig and Holland Ford

HST OBSERVES ITS FASTEST MOVING TARGET

On 10 December 1992 the HST obtained four PC images of asteroid 4179 Toutatis during its close approach to the Earth. At the time of the observation Toutatis was only 4.4 million kilometers from the Earth, about 11.5 times the distance to the moon, and moving with a geocentric apparent motion of 0.6 arcsec/sec. Parallax correction added as much as 0.25 arcsec/sec to the tracking rates. Toutatis' apparent motion was nearly ten times greater than that of any previous science target.

The observations were carried out under gyro control. The tracking performed flawlessly and the final images are consistent with an unresolved source (2.8 km upper limit).

New software now being tested will allow future observations of fast moving targets to begin under guide star control using the FGSs and switch smoothly to gyro control without interruption of science observations. Observers planning programs for targets with apparent motions of 0.02 arcsec/sec or greater should contact either
Keith Noll or Alex Storrs in the Science Planning Branch for more details.

—Keith Noll

**UPDATE ON OBSERVING EFFICIENCY**

In the November 1991 edition of the Newsletter we presented some results on the observing efficiency which had been achieved during the first 13 months of HST scientific observations. The purpose of this article is to update that discussion by presenting the efficiencies achieved during the past two years. In Figure 1 is shown the Spacecraft Time efficiency for external, primary mode targets. This measure of efficiency accounts for the time devoted to exposures of primary mode (i.e., parallel mode exposures are excluded) external targets and the associated time required for guide star acquisition, target acquisition, and Science Instrument control. Time lost to spacecraft and Science Instrument safeties is excluded and is the reason for the weeks of lowest efficiency in the figure. During the past four months the efficiency has averaged 33%, whereas during the preceding year the efficiency averaged 28%. Both values are consistent with our goals 27.5% for Cycle 1 and 32.5% for Cycle 2. The increased efficiency has been achieved through improved ground operations and more effective use of the spacecraft. For example, the preparation of proposals for scheduling has been made more efficient through the teamwork of members of the Science Planning and Scheduling Branch, Science Planning Branch, and User Support Branch, as recommended by the Scheduling Efficiency Task Force. These teams are called Proposal Implementation Teams. The improvement in proposal implementation productivity has in turn allowed more time to be devoted to the efficient scheduling of observations. During the past year additional observing time has been made available through improvements in the guide star acquisition process, especially by the routine allocation of only one pair of guide stars rather than two pairs as was formerly the standard. As can be seen in Figure 1, the effect of all the improvements has been to significantly decrease the number of low efficiency weeks during the past four months, as well as to increase somewhat the peak efficiency during that same interval. Through these improvements and others, it is our goal to maintain the efficiency at the present level through Cycle 2 and to then increase the efficiency to 35% during Cycle 3.

While Spacecraft Time efficiency is of relevance for gauging the effectiveness of spacecraft operations, the exposure time efficiency is of more direct relevance for gauging the scientific productivity of the Observatory. That efficiency is shown in Figure 2 for the past two years. The data plotted in the figure are the total Science Instrument exposure time for each month.

![Spacecraft Time Efficiency 1991-1992](image)

Figure 1—Weekly mean “on-target” efficiencies (expressed as the percentage of each week) achieved for external targets during the past two years. Time utilized for earth calibration, snapshot survey, and parallel mode observations has been excluded from the sum. (Courtesy L. Petro.)

![Exposure Time Efficiency](image)

Figure 2—Monthly mean exposure time efficiencies (expressed as the percentage of each month) achieved for all targets. Time utilized for internal targets, calibration targets, snapshot surveys, and parallel mode observations are included in the sum. (Courtesy L. Petro.)
updated presented as a percentage of the number of hours in that month. Unlike the Spacecraft Time efficiency presented in Figure 1, internal targets and parallel mode targets are included in the total exposure time of each month. As also seen in Figure 1, the observing efficiency has increased during the past few months. The increase of total exposure time during the past few months is relatively larger than the increase of external, primary target Spacecraft Time, which is due in part to the increasing amount of parallel science observations.

—Larry Petro

UPDATE ON HST'S FIRST SERVICING MISSION

The servicing mission is still on the Shuttle manifest for a December 1993 launch aboard Endeavour and the full crew has been selected:

Richard O. Covey, Mission Commander
Kenneth Bowersox, Pilot
Story Musgrave, Payload Commander
Tom Akers, Mission Specialist
Claude Nicollier, Mission Specialist
Kathryn C. Thornton, Mission Specialist
Jeffery A. Hoffman, Mission Specialist

The suite of activities to be accomplished on HST's First Servicing Mission has increased since the article in the last Newsletter. The DF-224 Co-Processor has been added to the list of activities in the primary objective category. This addition was made as a result of a second failed memory unit in the spacecraft control flight computer in late July 1992. Another gyro package and work on both magnetometers have been added to the list of secondary objective activities. The gyro #1 RSU/ECU/fuse plug addition will address the failure of Gyro #1 experienced in mid-November 1992. The magnetometer work is intended to address occurrences of intermittent magnetometer #1 problems that occur when the +V61 side of the spacecraft is allowed to get cold (i.e., at an anti-sun pointing). The servicing mission now includes installing a new magnetometer directly over the existing magnetometer #1 and installing a thermal blanket on magnetometer #2.

The payload has been prioritized to achieve the mission health and safety, performance and redundancy restoration as primary objectives with secondary objective hardware carried into orbit and installed if time permits. The current EVA timelines indicate that all of the primary objectives and some of the secondary objectives can be achieved within the planned 3 EVA (6 hour) days. It is possible that a completely nominal, smooth mission may provide the opportunity to complete all of the EVA activities. The following activities, not necessarily in priority order, are included in the current list of objectives.

Primary Objectives
WFPC2
COSTAR
SOLAR ARRAYS
RSU #2 (gyros #3, #4)
RSU #3 (gyros #5, #6)
ECU #3 (electronic control unit)
DF-224 CO-PROCESSOR

Secondary Objectives
GHRSt Repair Kit
Magnetometer #1 Replacement
GYRO #1 RSU/ECU/Fuse Plug
(gyros #1, #2)
Magnetometer #2 Blanket

—Peg Stanley

SCIENTIFIC INSTRUMENTS
FAINT OBJECT CAMERA

The F/48 relay of the FOC continues to work very well and to gather exciting new astronomical data in a wide variety of applications. The same cannot be said, unfortunately, of the F/48 relay. As the latter was becoming the workhorse of the FOC in the Fall of 1992 with its larger field of view and use in a number of astronomical surveys, the high-voltage supply tripped off due to an overload condition. Use of the F/48 was put on hold while the situation was analyzed in detail by the FOC team at the ST ScI and the detector contract (see description in October 1992 Newsletter). At issue was the nature of the overload and the possible causes. Of particular importance was to ascertain whether the degradation was limited to the high-voltage turn-on or off process or whether it depended also on the amount of time the detector was left on. The consensus was that in the absence of hard data either way the on-off procedure would be softened as much as possible by reducing the slope of the high-voltage applied vs. time curve for the device and to limit the number of on-off cycles to the absolute minimum. All science proposals requesting the F/48 relay were reviewed by the FOC team at the ST ScI for potential for transfer to the F/96 side. A few were deemed to be executable only with the F/48 if it were brought back to full operational status.

A series of tests in November 1992 to bring the detector up to full voltage with a more deliberate procedure carried out manually were completely successful as the instrument attained and remained at its nominal high-voltage for the duration of the tests (several hours spread over two weeks). Dark and calibration flat images indicated that the instrument had returned to the conditions existing prior to the overload. The latter include indications that a corona discharge may be taking place between the potting and the outer wall of the glass body of the intensifier tube as evidenced by regions of enhanced noise in the dark images. The success of these tests convinced the team to resume operation at a drastically reduced rate and only for those programs that either absolutely required the F/48 relay or were required to gather calibration data necessary to reduce observations obtained before the overload event. In the course of another turn-on attempt in early January 1993, the detector high-voltage tripped off again at a value just below the nominal. It is clear then that F/48 operation is intermittent and marginal at best. Strategies to deal with this problem presently under discussion include the possibility of reserving a week of continuous F/48 use for the calibration and science programs mentioned above to be carried out in the late Spring 1993 followed by a shut down of the detector until after the COSTAR refurbishment. In any case, analysis of the latest
event continues and the results will certainly influence the future approach to be taken with respect to its utilization. The critical factor will be its conservation for the corrected long slit spectrographic applications expected with COSTAR.

—F. Paresce

WIDE FIELD PLANETARY CAMERA

Mission Milestone

On 15 November 1992 during HST orbit #13949 the 10,000th WF/PC exposure was obtained. Approximately 50% of these exposures have been calibration observations (e.g. earth flats, internal flats, biases, and PSF stars).

WF/PC Information on STEIS

As the contents of the Calibration Data Base (CDB) continues to increase, observers are reminded that the Science Instruments Branch (SIB) is maintaining memos in the instrument_news section of STEIS documenting the availability of pipeline reference files, delta flats, and PSF calibration images. Also, abstracts of technical reports created by the WF/PC group within the Branch are posted on STEIS and these reports are available from the SIB secretary (fulton@stsci.edu) or from John MacKenty (mackenty@stsci.edu).

Stability of the Persistent Measles Contamination

Experience with the persistent measles contamination (which has been present in the WF/PC since 3 February 1992) has shown it to be stable over time. Efforts to remove this contamination without resorting to a UV flood were unsuccessful and plans for a UV flood are presently on indefinite hold due to problems with a magnetometer which occur whenever HST is pointed at the anti-sun (required for the UV flood).

The evident stability of the persistent measles features permits the delta flat calibrations (previously obtained weekly) to be binned together over the periods between decontaminations. Since the delta flats correct for changes in the flat field pattern caused by the partial removal of the UV flood which occurs with each decontamination, as well as partially correcting for the measles pattern, a delta flat is still required for each such period. The new delta flat calibrations are less impacted by cosmic rays and have higher signal to noise ratios. Details on the delta flats, including their CDB names, are contained in the "wfpc_delta_flats" memo on STEIS.

—John MacKenty

WIDE FIELD PLANETARY CAMERA-2

Due to the important role in the HST mission of the WF/PC, NASA decided to build at JPL a backup clone of the WFPC1, a second Wide Field and Planetary Camera (WFPC2). This version of the WF/PC was in the early stages of construction at JPL at the time of HST launch. A modification of the internal WF/PC optics is able to correct for the spherical aberration and restore most of the originally expected performance. WFPC1 is expected to be replaced by WFPC2 in the December 1993 servicing mission, as mentioned previously.

The WFPC2 is now in the final stages of assembly, scheduled for completion in time for the commencement of system level testing at JPL in April 1993. The period between May and November 1993 is scheduled for comprehensive instrument tests at JPL, payload compatibility checks at GSFC, and payload integration at KSFC. We can predict with some confidence that the WFPC2 will meet its engineering performance requirements on the basis of component and sub-assembly tests to date.

With the commencement of Cycle 4 observations, the General Observer community will have access to WFPC2. WFPC2 is a wide-field photometric camera which covers the spectrum from 1200 to 11,000 Å. Besides optical correction for the
aberrated HST primary mirror, the WFPC2 incorporates evolutionary improvements in photometric imaging capabilities. The CCD sensors, signal chain electronics, filter set, FUV performance, internal calibrations, and operational efficiency have all been improved through new technologies and lessons learned from WFPC1 operations and HST experience since launch.

The Principal Investigator for WFPC2 is Dr. J. T. Trauger of JPL. The IDT is C. J. Burrows, J. Clarke, D. Crisp, J. Gallagher, R. E. Griffiths, J. J. Hester, J. Hoessl, J. Holtzman, J. Mould, and J. A. Westphal.

**Single Camera**

A reduction in scope of the WFPC2 instrument was mandated in August 1991 due to budget and schedule constraints. The result was a reduction in the number of relay channels and CCDs. The WFPC2 field of view is divided and distributed into four cameras by a four-faceted pyramid mirror near the HST focal plane. Three of these are F/12.9 Wide Field cameras (WFC), and the remaining one is an F/28,3 Planetary camera (PC). There are thus four sets of relay optics and CCD sensors in WFPC2, rather than the eight in WFPC1. The pyramid rotation mechanism has been eliminated, and all four cameras are now located in the field camera relays. These positions are denoted PC1, WF2, WF3, and WF4, and projection of their fields of view on the sky is illustrated in the figure. Each shutter opening provides a mosaic of three F/12.9 images and one F/28.3 image.

**Optical Correction**

Two new mechanisms have been introduced in WFPC2 to provide small amounts of alignment correction as may be required in the Hubble environment. The 47 degree pickoff mirror has two-axis tilt capabilities provided by stepper motors and flexure linkages, to compensate for uncertainties in our knowledge of HST's latch positions, i.e., instrument tilt with respect to the HST optical axis. These uncertainties would be insignificant in an unaberrated telescope, but must be compensated in a corrective optical system. In addition, three of the four fold mirrors, internal to the WFPC2 optical bench, have limited two-axis tilt motions provided by electrostrictive ceramic actuators and mirror flexure mountings. Fold mirrors for the PC1, WF3, and WF4 cameras are articulated, while the WF2 fold mirror has a fixed mirror mounting identical to those in WFPC1. This arrangement of mirror actuators allows compensation for potential pupil image misalignments in all four cameras, with the expectation that mirror adjustments will be infrequent following the initial on-orbit alignment.

**CCDs**

The WFPC2 CCDs are thick, frontside illuminated devices with a Lumogen phosphor coating, while the WFPC1 CCDs are thinned, backside illuminated devices with acorophosphor. Based on the results of CCD screening tests at JPL the main differences may be summarized as follows:

Read noise: WFPC2 CCDs have lower read noise (7e^- rms) than WFPC1 CCDs (13e^- rms) which improves their faint object and UV imaging capability.

Dark noise: Inverted phase operation yield slower dark noise for WFPC2 CCDs. Thus, it is possible to operate at higher temperature (70^o C) than WFPC1, which helps in reducing the build-up of contaminants on the CCD windows.

**UV Imaging**

The contamination control issues for WFPC2 may be best understood in terms of the problems experienced with WFPC1. Since launch, WFPC1 has suffered from the accumulation of molecular contaminants on the cold (-80^o C) CCD windows. This molecular accumulation results in the loss of ultraviolet (1150-3000 Å) throughput and attenuation at wavelengths as long as 5000 Å. Another feature of the contamination is the means contamination patches which have become progressively more difficult to remove with time. In addition to the loss of a UV imaging capability, these molecular contamination layers scat-
ter light and seriously impact both the long and short term calibration of the instrument. WFPC2 requires a factor of $10^4$ to $10^5$ reduction in material deposited on the cold CCD window, compared to WFPC1, to meet the project’s goal of achieving 1% photometry at 1470 Å over any 30 day period. This goal corresponds to the collection of a uniform layer of no more than 47 ng/cm$^2$ on the CCD window in the same period. The changes involved are:

1. The venting and baffling of the electronics has been redesigned to isolate the optical cavity.
2. There has been an extensive component bake-out program, and changes in cleaning materials and procedures.
3. The CCDs operate at a slightly higher temperature than WFPC1, which reduces the rate of build-up of contaminants.
4. Molecular absorbers (Zeolyte) are incorporated in the WFPC2.

**Flat-field Reference Channel**

An internal flat-field system will provide reference flat-field images over the spectral range of WFPC2. The system contains tungsten incandescent lamps with spectrum shaping glass filters and a deuterium lamp. The flat-field illumination pattern will be uniform for wavelengths beyond about 1600 Å, and small differences between the flat-field source and the OTA will be handled in terms of correction ratio calibration images. Short of 1600 Å the flat-field is distorted due to refractive MgF$_2$ optics, and at these wavelengths the channel will primarily serve as a monitor of changes in QE. This system physically takes the place of the WFPC1 solar UV flood channel, which is unnecessary for WFPC2 and has been eliminated.

**Spectral Elements**

Revisions have been made to the set of 48 scientific filters, based on considerations of the science effectiveness of the WFPC1 filter set, and as defined in a number of science workshops and technical reviews. The filter set preserves the WFPC “UBVI” and Wide “UBVRI” sequences, while extending the sequence of wide filters into the far UV. The set now includes a Stromgren sequence. Wide-band UV filters will provide better performance below 2000 Å, working together with the reductions in UV absorbing molecular contamination, the capability to remove UV-absorbing accumulations on cold CCD windows without disrupting the CCD quantum efficiencies and flat-field calibrations, and an internal source of UV reference flat-field images. We expect substantial improvements in narrow-band emission line photometry. All narrow-band filters were specified to have the same dimensionless bandpass profile. Center wavelengths and profiles are accurately uniform over the filter clear apertures, and laboratory calibrations include profiles, blocking, and temperature shift coefficients. The narrow-band set now includes a linear variable filter which provides a dimensionless bandpass FWHM of 1% over the 3700-9800 Å range.

—John Trauger, Chris Burrows, Mark Clampin & the WFPC2 IDT

**GODDARD HIGH RESOLUTION SPECTROGRAPH**

**Side 1 Revival**

As we mentioned previously, plans for the December 1993 Servicing Mission call for the installation of a GHRS relay box that will allow either Side of the GHRS to communicate directly with the spacecraft. That means that Side 1 can attempt to be revived without risk of losing the long-wavelength capabilities of Side 2.

At the moment, the installation of the GHRS relay box is planned for the end of the first Extra-Vehicular Activity on the Servicing Mission, just after replacement of the solar arrays. If the box is installed and operates properly, attempts will be made to revive Side 1 in incremental steps during Orbital Verification. Side 1 would then be calibrated and ready for science observations perhaps as early as the second half of Cycle 4 of the HST observing program.

**Personnel Changes**

Ron Gilliland was recently promoted to Chief of the Science Instruments Branch. Contacts for the GHRS are as follows:

- David Soderblom
  Senior GHRS Instrument Scientist
  410-338-4543
  soderblom@stsci.edu

- Steve Hulbert
  GHRS Instrument Scientist
  410-338-4911
  hulbert@stsci.edu

- Lisa Walter
  Technical Assistant
  410-338-5036
  lisa@stsci.edu

**New Instrument Handbook**

A new GHRS Instrument Handbook (version 4.0) has been written to go with the Call for Proposals for Cycle 4. The Handbook has been completely revised and incorporates the changes to the telescope and instrument anticipated as a result of the installation of COSTAR. We hope to re-vamp GHRS user documentation so as to provide everything an observer needs to know in one place (the Handbook). Only those users with truly unusual requirements should then need additional material. We welcome your comments and suggestions.

**Recent Calibrations**

- Recent tests of GHRS sensitivity show no detectable changes and the coefficients for wavelength solutions remain unvarying as well.
- Blind offsets from the large aperture (LSA) to the small aperture (SSA) the only way now available to place a star in the SSA have not always resulted in perfect centering, as evidenced by reduced throughput. Thus the improved centering discussed in the last Newsletter is not always reliable. The implementation of a PEAKUP capability in the SSA will obviate the problem, and we anticipate that capability to be tested by the time you read this.
The ability of the GHRS to automatically return to the brightest object found during an acquisition’s spiral search has now been tested and shown to work well. BRIGHT=RETURN should always be used for any acquisition of a point source unless its presence in a crowded field prevents it.

—D. Soderblom, Steven Hulbert & Lisa Walter

FAINT OBJECT SPECTROGRAPH

All modes of observation with the Faint Object Spectrograph (FOS) are working, and observing is proceeding normally. The test of the on-board correction to the geomagnetically induced image drift was performed, and the results are summarized. Also, the FOS has suffered a number of failed on-board target acquisitions when attempting to acquire variable objects. An alternative target acquisition strategy is described.

Since launch, FOS has suffered from a geomagnetically induced image drift due to inadequate magnetic shielding of the detectors. On January 6-7 a test was performed to attempt to change the internal FOS magnetic field so as to exactly cancel the unshielded geomagnetic field and thus cancel the undesired image drift. Several errors were found in the execution of the program. Although the deflections in the (FOS) X and Y directions were sent up to the spacecraft, and were in phase with the earth’s magnetic field, both the sign and the amplitude of the deflections were incorrect. The sign and the amplitude have been corrected and are now incorporated into the software. In addition, a status buffer error due to a benign error in commanding was received. The origin of the status buffer error is well understood and is being corrected. The intention is to correct the image drift test and to run the test again by the end of February. If the test is successful, on-board image drift correction will be active by the end of March 1993.

A number of automatic on-board target acquisitions have failed for objects that are variable and for objects with poorly known color. Hence, any object with variability in flux of greater than 0.5 magnitudes, or with an unknown color, must be acquired with a peak-up sequence (ACQ/PEAK) rather than the standard binary search (ACQ/BINARY).

—Ann Kinney

FOS spectral flat field summary

FOS spectral flat field observations were originally obtained during SV in October, 1990 and June, 1991. The resultant flat field reference files for both FOS/RED and FOS/BLUE were installed in the PODPS pipeline in October, 1991. These results are thoroughly discussed in FOS ISR CAL/FOS-075, S.F. Anderson, February, 1992.

Inspection of routine FOS/RED G190H, G160L, and, to a lesser extent, G270H science and calibration spectra taken throughout 1991 revealed dramatic changes in the high frequency flat field granularity in the 1800-2100 Å region and a substantial decrease in instrumental sensitivity over the same wavelength range.

Proposal 3975 commenced monthly monitoring of the flat field structure for FOS/RED gratings G190H, G270H, and G160L in January, 1992. Observations were made only with the 4.3 x 1.4 arcsec aperture on standard stars G191B2 and BD+28D4211. Provision was made in CDBS and the PODPS pipeline for the utilization of a USE _AFTER_ date (date after which a reference file may be valid) for each FOS flat field reference file, so that a series of reference files that characterize temporal changes could be maintained.

The initial observation of proposal 3975 (2 Jan 1992) revealed an approximate 10-15% degradation of instrumental sensitivity in the 1800-2100 Å region since the October, 1990 SV observations. Some high frequency granularity in the same region displayed even more substantial growth.

The continua in these flats, like those of the SV flats, are characterized by approximately 2% rms deviations. At the time it was noted that the granularity structure could be characterized as growing at the rate of about 1% per month, however, it was unknown whether the growth was continuing.

The subsequent six proposal 3975 observations showed no more systematic growth of the features. A number of additional features whose depth is approximately 2% of local continuum do appear and disappear from one observation to the next in these observations, but there does not seem to be any substantial systematic growth of either new or previously existing features. Our current analysis suggests that these weak changes are most likely due to the slightly different centering of the target stars in the 4.3 aperture, hence slight different relative sampling of the granularity of the photocathode in each observation. As a result, no new flat field reference files based upon proposal 3975 observations have been delivered to PODPS after those corresponding to the second epoch (29 Jan 1992) of observations.

The FOS/RED monitoring has continued in Cycle 2 as proposal 4123, which will execute quarterly. This proposal also obtains for the first time flat exposures for the 0.25 x 2.0 arcsec slit, which is a commonly used aperture. Qualitative evidence had indicated that the slit flat field features were substantially narrower and deeper than their 4.3 aperture counterparts. The first set of proposal 4123 observations (late November, 1992) has confirmed this appearance. Further, the structure of the 4.3 aperture flats has changed substantially since the last proposal 3975 observation in June, 1992! As a result, a delivery of new reference files based upon the November, 1992 observations has been made. The _USE _AFTER_ date of these new flat filed reference files is 15-SEP-1992.

A full re-examination of FOS/BLUE and FOS/RED flat fields for all usable spectral elements with 4.3 and 4.1 apertures and for all usable polarimetry setups with 4.3 and 1.0 apertures will be made in Cycle 2 following implementation of the onboard GIMP correction.

Current PODPS-pipeline FOS flat field calibration ANOMALY

The current build of the PODPS pipeline software, Build 30.1, incorrectly deter-
mines the appropriate reference file for ANY calibration situation in which a choice based upon reference file USE file date is required.

The result of this error is that ALL FOS/RED G190H, G270H, and G160L non-polarimetric observations obtained between 21 September 1992 and 14 February 1993 have had the wrong flat field reference file applied in pipeline processing. The effect is that the most out-of-date, hence least appropriate, flat is used. A software fix was installed in PODPS on 10 February 1993. We recommend that any affected observation be re-processed with the correct reference file. The newly delivered flats mentioned in the previous section are appropriate for ALL of the affected observations.

The names of the new reference files may be found in a file named readme_newest_flats in the fos sub-directory of the instrument_news directory on STEIS (access via anonymous ftp to stsci.edu). Queries can also be made to the Analysis Hot Line at 410-338-1082 or via e-mail to analysis@stsci.edu.

—Tony Keyes

SPACETELESCOPE IMAGING SPECTROGRAPH

The Space Telescope Imaging Spectrograph (STIS) is planned for launch on the second HST servicing mission, currently scheduled for 1997. STIS will extend the Observatory's spectroscopic functions, and provide a major extension of capability by the use of two dimensional detectors. The scientific objectives of the STIS team cover a wide range of topics from planetary science to cosmology, and will ensure an instrument of broad utility. STIS is being developed by the Goddard Space Flight Center (Bruce Woodgate, Principal Investigator), and the prime contractor for the instrument design and fabrication is the Ball Aerospace Systems Group.

Instrument Capability

The wavelength range covered is 1150-10000 Å, in 4 bands. The detectors have 1024 x 1024 pixel format, sampling with 2 to 2.5 pixels per resolution element. The two UV bands, 1150-1700 Å (Band 1) and 1650-3100 Å (Band 2), use photon-counting Multi-Anode Microchannel Array (MAMA) detectors with solar-blind CsI and CsTe photocathodes respectively. The two longer wavelength bands, 3050-5550 Å (Band 3) and 5500-10000 Å (Band 4), both use a single CCD Detector.

For each band, a low resolution mode with resolving power in the range 500-1500 is provided, which covers the entire band in one exposure and has long slits covering 25 arcsec in the UV and 50 arcsec in the visible/IR. For each band, a medium resolution mode with resolving power 5000-18000 is provided, which covers 5-10% of the band per exposure, with the long slits.

For the two UV bands, echelle modes are also provided. The medium resolution echelle modes, with resolving power 23000, cover band 1 in 1 exposure and band 2 in 2 exposures. The high resolution modes, with resolving power 105000, cover band 1 in 3 exposures and band 2 in 6 exposures. Band 2 also has a very low resolution prism mode with resolving power 26-200.

Autonomous target acquisition will use camera modes, which are available in each band. These will also allow a high spatial resolution broad band image of the spectroscopic target to be taken. The on-board calibration system provides for wavelength calibration and flat fields to be taken.

The spectrograph is preceded by an internal 2-mirror corrector for the spherical aberration and astigmatism. Focal plane coronagraph stops are available for spectroscopic and camera modes, with pupil plane apodizing stops for the visible/IR modes.

Improvement Examples

The following examples illustrate the improvement of capability compared to the first generation HST spectrographs:

For studies of the intergalactic medium or stellar atmospheres, the spectral coverage will be 550 Å in the 1150-1700 Å band at resolving power 23000, a factor 11 broader than the GHRS. Also, lower background rates per pixel should provide fainter sensitivity limits.

For studies of the interstellar medium, the spectral coverage will be 180 Å in the 1150-1700 Å band at 105000 resolving power, a factor 36 broader than GHRS.

For studies of the velocities near nuclei of galaxies, with a resolution of over 5000 in the visible/IR, the combination of detector efficiency and simultaneous spatial coverage provides an improvement of over a factor 40 compared to the FOS.

Technical Status

The STIS program is ramping up into the detailed design and early fabrication phase, to be ready for an early 1997 launch. Three demonstration MAMA detectors, two with CsI and one with CsTe, have been made, between them achieving the demonstration specifications and most of the flight specifications. A combined demonstration system comprising an optical breadboard with a CCD camera and instrument computer has operated together. Several gratings from the custom masters developed for STIS have been obtained and are under test.

—Bruce Woodgate

FINE GUIDANCE SENSORS

Progress continues to be made in the calibration of the astrometer Fine Guidance Sensor (FGS). All the Cycle I Instrument Scientist Calibration observations have been completed and the data retrieved. This was a “Fifteen Points of Light Test” modeled after the generic “N Points of Light Tests” used to help collimate the Optical Telescope Assembly (OTA). As one consequence of the availability of this data, both engineering usage and scientific calibration of the FGS TRANSfer scan Mode will be improved. Because the interferometer response appears to vary across the FGS field-of-view, owing to aberrations in the OTA and inside of each FGS, an increased probability of Fine Lock and a more accurate rectification of double star and angular diameter observations will be possible with a finer network of calibrated places in the astrometer FGS field-of-view.
In further calibration news for the FGSs, all the Cycle 2 Instrument Scientist Calibration proposals have been completed and are in the scheduling system. Similar advances continue to be made on the residual of Science Verification observations for the astrometry FGS. The most important news in this regard is the completion of the Optical Field Angle Distortion (OFAD) calibration measurements during January 10-11, 1993. A precise knowledge of the OFAD is the largest source of uncertainty in the astrometric reduction of FGS POSitional Mode data. Results of the analysis of the OFAD data are expected by April 1. Since the ongoing Long-Term Stability Test uses the same field (i.e., M35) as the OFAD measurements, differential corrections to the OFAD will be available.

Finally, the Science Verification Plate Scale test has been re-configured. The success of the European Space Agency astrometry satellite HIPPARCOS has provided a better calibration standard than a minor planet. The HIPPARCOS catalog is being searched by the Space Telescope Astrometry Team for suitable pairs of stars; namely those of comparable magnitude, color index, proper motion, and separation in the 10-20 arcminute range.

—Larry Taff and Mario Lattanzi

NEWS FOR HST OBSERVERS AND PROPOSERS

CYCLES 3 AND 4 PROPOSAL REVIEWS

The review and selection of the HST Cycle 3 General Observer programs has been completed. The Solar System Panel met at ST ScI during November 9-11, 1992 and all other Subdiscipline Panels November 16-18, while the cross-discipline Telescope Allocation Committee held preliminary meetings on November 16-17 and its final sessions 19-20. The TAC recommendations were subsequently reviewed by the ST ScI Director, and notifications of the results were mailed to all proposers during mid-December. The three accompanying tables present the complete membership of

PANEL AND TAC MEMBERSHIP FOR CYCLE 3

Telescope Allocation Committee
Dr. Richard McCray, Chair ................................................... JILA

Panel Chairs
Dr. Bruce Carney (Cool Stars) .............................................. University of North Carolina
Dr. Richard S. Ellis (Galaxies & Clusters) ...................... Durham University-United Kingdom
Dr. Carl E. Heiles (Interstellar Medium) ......................... University of California, Berkeley
Dr. James W. Liebert (Hot Stars) ........................................ Steward Observatory
Dr. Wallace L. W. Sargent (Quasars & AGN) ........ California Institute of Technology
Dr. Alan Stern (Solar System) ............................................. Southwest Research Institute

Members-at-Large
Dr. Michael Dopita ...................................... Mount Stromlo & Siding Spring Observatories-Australia
Dr. Giuseppina Fabbiano .............................................. Harvard College Observatory
Dr. Robert P. Kirshner .............................................. Harvard University
Dr. Robert Millis .......................................................... Lowell Observatory
Dr. Virginia L. Trimble .............................................. University of Maryland
Dr. Lodewijk Woltjer .............................................. Observatoire de Haute-Provence-France

Panels

Cool Stars
Dr. Alexander Brown ............................................. University of Colorado
Dr. Andrea K. Dupree ................................................ Center for Astrophysics
Dr. William E. Harris ................................................... McMaster University-Canada
Dr. Kenneth Janes ........................................................ Boston University
Dr. Burton F. Jones ..................................................... University of California, Santa Cruz
Dr. Robert D. Mathieu ................................................ University of California, Santa Cruz
Dr. George Wallerstein .............................................. University of Washington
Dr. Lee Anne Willson ................................................ Iowa State University

Galaxies and Clusters
Dr. George P. Efstathiou ........................................... University of Oxford-United Kingdom
Dr. Debra M. Elmegreen ............................................ Vassar College Observatory
Dr. David A. Hanes ..................................................... Queen's University-Canada
Dr. David A. Hartwick ................................................ University of Victoria-Canada
Dr. J. Patrick Henry ..................................................... University of Hawaii
Dr. Robert D. Joseph ................................................ University of Hawaii
Dr. Robert C. Kennicutt ............................................. University of Arizona
Dr. Tod R. Lauer ........................................................ Kitt Peak National Observatory

Hot Stars
Dr. Charles D. Bailyn ................................................ Yale University
Dr. Ganesh Channugam .............................................. Louisiana State University
the Panels and TAC, a list of all approved (High and Medium priority) programs, and summary statistics of the review results. The deadline for Phase II submissions of approved programs was February 15, 1993.

The Cycle 3 review included several procedural innovations. The former Stellar Astrophysics and Stellar Populations Panels were revised to Hot Stars and Cool Stars, resulting in a more even distribution of the numbers of submitted proposals. The full TAC met on the evening of November 16 to make recommendations regarding the Large/Key programs, considered earlier in the day by the appropriate Panels, and to recommend a preliminary subdiscipline balance to guide the subsequent Panel deliberations. In addition, the At-Large Members of the TAC met with the Chair the following day to discuss in detail a representative cross-section of proposals from all the subdisciplines. Finally, a very specific procedure suggested by the Chair, Dr. Richard McCray, was adopted in the final TAC meetings to determine the boundaries between selection priorities in the ranked lists from each Panel. Two proposals at a preliminary target boundary were presented by the corresponding Panel Chair and discussed, followed by a vote of all Members (except any with conflicts). Depending on the results of the votes, the target boundary was then moved upward or downward and the process repeated, with convergence to a consensus boundary being achieved in no more than two or three iterations in every case. In view of the success of this procedure, it will be retained in future reviews.

Cycle 3 also required special definitions of the selection priorities because of the planned HST refurbishment mission in December 1993, and the attendant possible uncertainty in the duration of the cycle. Accordingly, three selected priority levels were adopted High, Medium, and Supplemental each corresponding to approximately one-third of a normal one-year cycle. It is intended to implement High priority programs first, but some Mediums may also be executed early due to scheduling and other feasibility constraints. The

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## APPROVED HST OBSERVING PROGRAMS FOR CYCLE 3

### GO PROGRAMS

#### Cool Stars

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<td>Wahborn</td>
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**Interstellar Medium**

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<td>USA</td>
<td>ST Sc</td>
<td>Disks Around Main Sequence Stars</td>
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<td>Clayton</td>
<td>USA</td>
<td>University of Colorado</td>
<td>A Critical Extension of the Interstellar Polarization Curve</td>
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<td>Davidson</td>
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<td>Spectropolarimetry of Four Sight Lines with Extreme Values of Lambda-Max</td>
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<td>De Boer</td>
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<td>Universitat Bonn</td>
<td>UV Spectroscopy and Imaging in the Crab Nebula</td>
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<td>Doppita</td>
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<td>Rice University</td>
<td>Post Asymptotic Giant Branch Evolution in the Magellanic Clouds</td>
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<td>HST Imaging and Spectroscopy of the Dusty SMC HII Region N88</td>
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<td>Interplanetary/Interstellar Connection: Search for the Local Interstellar Cloud</td>
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<td>Parallel High Resolution Imaging of Diffuse Objects in the Magellanic Clouds</td>
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**Quasars & AGN**

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<td>Polarization Imaging of Radio Galaxies</td>
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<td>Bahnecall</td>
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<td>Institute for Advanced Study</td>
<td>Quasar Absorption Line Survey - Cycle 3 Observations</td>
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<td>The Origin of the Blue Featureless Continuum in Seyfert 2 Nuclei</td>
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<td>Testing the Accretion Disk Line-Profile Hypothesis in ARP 102B</td>
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<td>Space-UV Imaging of Nearby Powerful Radio Galaxies</td>
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<td>The Jet of Centaurus A and Its Host Galaxy</td>
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<td>Polarization Imaging of the Jet in Markarian 463</td>
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Solar System

AHARIN USA UNIVERSITY OF MARYLAND OUTGASSING FROM CERES
BEN JAFFEL FRANCE INSTITUT D'ASTROPHYSIQUE DE PARIS, CNRS ABUNDANCE AND DISTRIBUTION OF ATOMIC DEUTERIUM IN THE JOVIAN UPPER ATMOSPHERE
BRANDT USA UNIVERSITY OF COLORADO THROUGH THE D-LYMAN ALPHA LINE PROFILE ANALYSIS AT THE PLANET LIMB IMAGING OF NEAR NUCLEAR PLASMA IN COMETS
CLARKE USA UNIVERSITY OF MICHIGAN FUV SPECTROSCOPY OF ICS S02 ATMOSPHERE AND SURFACE
CLARKE USA UNIVERSITY OF MICHIGAN JUPITER'S H-LY ALPHA AURORAL AND AIRGLOW EMISSION LINE PROFILE
ESPOSITO USA UNIVERSITY OF COLORADO-LASP HIGH RESOLUTION SPECTROSCOPY OF VENUS CLOUDS
FOX USA SUNY AT STONY BROOK HIGH RESOLUTION OBSERVATIONS OF THE JOVIAN UV AURORA
GERARD BELGIUM UNIVERSITE DE LIEGE MULTI TIMESCALE MULTISPECTRAL OBSERVATION OF THE JOVIAN AURORA
MCGRATH USA ST ScD HUBBLE SPACE TELESCOPE IMAGING OF IO
NOLL USA ST ScD SEARCH FOR EVIDENCE OF ACTIVE ICE VOLCANISM ON EUROPA
NULL USA JET PROPULSION LABORATORY DETERMINATION OF THE MASSES AND DENSITIES OF PLUTO AND CHARON
SITKO USA UNIVERSITY OF CINCINNATI ULTRAVIOLET SPECTROPOLARIMETRY OF COMET P/ENCKE
STERNE USA SOUTHWEST RESEARCH INSTITUTE AND COMET P/WEST-KOHOUTEK-KEMURA
WEAVER USA ST ScD EXPLORING TRITONS UV SPECTRUM: THE FIRST 1800-2500 A UV SURVEY
WEAVER USA ST ScD THE COMPOSITION OF COMET ENCKE: IS THERE EVIDENCE FOR VOLATILE DEPLETION?
WHIRLE USA MCDONALD OBSERVATORY THE VOLTILE COMPOSITION OF NEW COMETS: INTERFEROMETRIC SEARCH FOR MULTIPICITY OF NEAR SMALL ASTEROIDS

SNAPSHOT PROGRAMS

BOND USA ST ScD SNAPSHOT SURVEY FOR COMPANIONS TO PLANETARY-NEBULA NUCLEI
ILLINGWORTH USA LICK OBSERVATORY THE NUCLEI OF NEARBY S0 AND SPIRAL GALAXIES: A PC SNAPSHOT IMAGING SURVEY
ZELLNER USA CSC ASTEROID SHAPE AND DUALITY
TYTTLER USA CENTER FOR ASTROPHYSICS AND SPACE SCIENCES, UCSD GSO ABSORPTION SYSTEM SNAPSHOT SURVEY
KRAFT USA LICK OBSERVATORY IS THERE AN AGE SPREAD AMONG LOW-MASS MEMBERS OF THE ALPHA PEGASI CLUSTER?

ARCHIVAL RESEARCH PROGRAMS

CASTELAZ USA EAST TENNESSEE STATE UNIVERSITY HIGH DENSITY CONDENSATIONS IN EXTENDED NEBULAR ENVELOPES OF YOUNG STARS IN THE ORION NEBULA
EVANS USA ST ScD ULTRAVIOLET AND OPTICAL NEBULAR DIAGNOSTICS FOR PHOTOIONIZED AND SHOCK HEATED EMISSION LINE GAS
BEEBE USA NEW MEXICO STATE UNIVERSITY TEMPORAL VARIATION OF JUPITER'S ATMOSPHERE
PLAVEC USA UNIVERSITY OF CALIFORNIA, LOS ANGELES THE INTERACTING BINARY W SERPENTIS: MODELING USING GHRS SPECTRA
CLARKE USA UNIVERSITY OF MICHIGAN ARCHIVAL STUDY OF H-LY ALPHA EMISSION FROM THE LOCAL INTERSTELLAR MEDIUM ASSOCIATED C IV ABSORPTION COMPLEXES: CLUSTERS OR NOT?
EINUNSSON USA CASA, UNIVERSITY OF COLORADO SUPERNOVAE AND THEIR LOCAL ENVIRONMENT
FILIPenKO USA UNIVERSITY OF CALIFORNIA, BERKELEY ARCHIVAL STUDY OF POTENTIAL LYMAN-EDGE FEATURES IN GSO SPECTRA
ZHENG USA JOHNS HOPKINS UNIVERSITY UV SPECTRA OF QUASARS: TESTING THE ENERGY SOURCE AND THE NATURE OF THE BROAD LINE CLOUDS
KINNEY USA ST ScD THE CENTRAL ENGINES IN LOW LUMINOSITY AGN:
MALKAN USA UNIVERSITY OF CALIFORNIA, LOS ANGELES THE UV CONTINUUM OF POWERFUL RADIO GALAXIES
BAUM USA ST ScD
THE OPENING OF THE HST ARCHIVE

The HST data archive is a large and growing resource, and archival research is an increasingly important part of the HST program. At the end of 1992 the data accumulated since launch occupied 922 GBytes on nearly 550 optical disks. The HST data archive contained 24,000 public datasets 60% of which are scientific (not internal calibration) data.

The current archive system, the Data Management Facility (DMF) has been augmented to serve as the interim user service facility until ST DADS (the Space Telescope Data Archive and Distribution Service) comes online. The augmentation included improving the archive catalogue and producing better and more uniform data products (through reprocessing), adding capabilities for the remote user to access the catalogue, retrieve small amounts of data directly and request larger amounts of data for later delivery on tape (through STARCAT), and providing support of archival research.

Reprocessing is now complete. Approximately 26,900 datasets, comprising all data obtained from launch to July 1992, were reprocessed. The HST archive was formally opened for archival research on 1 February 1993.

Astronomers who want to use the archive should telnet to the VMS workstation stdin.astro.stsci.edu or the Unix workstation stdin.astro.stsci.edu. In either case, log in with username guest and password archive. Archive users should type readnews to read the archive news. Guest users will be placed in the guest directory. Astronomers using the general guest account will be able to peruse and extract information from the catalog using the STARCAT program. Simply type starcat to start the program. Details and a tutorial may be found in the new HST Archive Primer, available from the User Support Branch. More complete information may be found in the HST Archive Manual. The archive primer and manual are also maintained as postscript files on stdin and stdin and can be ftp-ed to your computer. Instructions are provided in the archive news.

Users must register in order to retrieve data from the HST archive using the workstations. Registered users receive a small personal disk area on either the Unix or VMS workstation and can access a large scratch area to which public HST data may be retrieved. To request a registration form, send e-mail to archive@stsci.edu or type register from the guest account to enter an editor session and complete a form electronically.

Astronomers who register will be able to use STARCAT to retrieve up to 50 MBytes of public data to the workstation scratch area. Archival researchers can also submit requests for larger amounts of data (up to 500 MBytes) to be written onto 9-track or 8mm tapes and shipped to the user's home address. The requests can be submitted electronically using STARCAT or on paper by completing the Request for Archival Data form.

The Data Systems Operations Branch (DSOB), which is responsible for the HST Archive, maintains an "archive hotseat" to assist off-site astronomers in their archival research. The archive hotseat can be contacted by sending e-mail to archive@stsci.edu or by phoning 410-338-4547 during normal working hours. The hotseat will respond to questions concerning the user interface (STARCAT), the archive, or datatapes provided by DSOB to an astronomer. The hotseat will also provide limited advice concerning basic search strategies and will investigate and document any problems reported by users. Please direct your initial communications about the archive to the hotseat.

DSOB has begun to host visits to the Institute by off-site archival researchers. To assure that the time spent at ST ScI is productive, DSOB needs time to properly plan your visit. Therefore, both funded and unfunded researchers need to obtain approval from the DSOB chief for the timing and duration of their visits. To arrange a visit, contact the archive hotseat. A visitor hosted by DSOB will meet with an archive scientist (a PhD astronomer) to discuss the visitor's needs while at ST ScI, but most of the support will be provided by an archive specialist (with bachelor or masters level degrees in physics or astronomy) who will be available as needed throughout the visit.

—Knox Long

LISTSERVER FOR STEIS FILES

The Space Telescope Science Institute has augmented its anonymous ftp account, (called STEIS for the Space Telescope Electronic Information Service) with listserv capabilities. Users can subscribe to certain popular files, which will be mailed automatically whenever they are updated. It is also possible to request items from the archive of previous files. The list of available files may be expanded to include other frequently accessed ascii files.
Please send any requests for new listserver files to asb@stsci.edu.

Currently available files are:
- long_range_plan:
  lists observations for the coming year
- weekly_timeline:
  detailed weekly schedule of observations
- HST_status:
  daily activity/instrument status reports
- completed_observations:
  list of all observations completed to date
- wpfc_psf_library:
  point spread functions for wpfc
- wpfc_diam_flats:
  flat field information for wpfc

To subscribe to a listserver file, send a message with a blank subject line to listerv@stsci.edu and the following text:

subscribe file name Your Name

Where file name is one of the above file names and Your Name represents the user's full name. Your return e-mail address is copied from this message and added to the list of subscribers. To unsubscribe from a list, just replace subscribe with unsubscribe in the above message.

For a quick overview of commands, send a message with a blank subject line to the same e-mail address but with the word HELP as the message. Lisservers is a UNIX utility. For further assistance contact Fred Romelanger (fred@stsci.edu, phone: 410-516-8641) or Pete Reppert (reppert@stsci.edu, phone: 410-338-4551).

--- Pete Reppert

**HST Users Committee Report**

The committee met on February 4-5 at GSFC. This is a summary of the report submitted to ST ScI and NASA. Users are encouraged to contact committee members (cf. ST ScI Newsletter of October 1992) about issues they wish raised.

The committee was pleased at the continued success at improving observing effi-

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<th>CYCLE 3 PROPOSAL STATISTICS</th>
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<td>Distribution of Proposals by Peer Review Outcome</td>
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USA/ESA/OTHER DISTRIBUTION OF PROPOSALS AND SPACECRAFT HOURS APPROVED

(High/Med.) GO Programs by PI

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<td>(%)</td>
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<td>(%)</td>
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DISTRIBUTION OF HIGH/MED. GO AND SNAP PROGRAMS BY SCIENTIFIC INSTRUMENT

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Number of Cols by Country:

- Australia: 4
- Belgium*: 3
- Brazil: 2
- Canada: 5
- Chile: 2
- Denmark*: 1
- France*: 21
- Germany*: 18
- Israel: 1
- Italy*: 4
- Japan: 2
- Mexico: 7
- Netherlands*: 7
- Sweden*: 6
- Switzerland*: 4
- United Kingdom*: 33
- USA: 250

Number of PIs by Country:

- Australia: 1
- Belgium*: 1
- France*: 3
- Germany*: 5
- Italy*: 1
- Mexico*: 1
- Netherlands*: 1
- Switzerland*: 1
- United Kingdom*: 6
- USA: 81
- Total: 101

Note:
Asterisks denote ESA member states.
ST ScI ESA PIs appear under USA here.

Note:
Cols appearing on more than one proposal are counted multiple times.

ciency, and the plans for further improvement. We are also pleased at the successful trial of the zero gyro safemode, and the plans for a two-gyro operational mode. We are impressed with the jitter statistics and the good performance of both coarse and fine lock. We note that the archival system work has proceeded on schedule and commend the work in that area, particularly the manuals available for this. We are pleased with the continued work on the “breathing” and the plans to do a multi-orbit test to characterize this more fully. Finally, the committee was impressed by the state of the repair mission planning, and feels considerable confidence that there is an excellent probability of success.

The committee is very concerned at the probable budget cutting that lies ahead, while appreciating that the HST project has done well in a time of great funding difficulty. We have recommended that P. Feldman be the committee representative in the group planning on how operations funding may change as a result of budget cuts.

The following are summaries of the detailed points discussed:

1. The problem arising with the time-dependent flat field for FOS-Red was discussed.

   a) We recommend that all the monitoring flats obtained in 1992 be placed in CDIBS as quickly as possible, so that individual users can then use them as seems most appropriate to them for reducing their spectra. A new flat field exposure has been scheduled for this month, which is very important in view of the significant change between the June 92 and November 92 FOS-Red flat fields.

   b) We strongly recommend that a small “Flat Field Action Group” be set up soon. This group would be charged with: 1) recommending an appropriate suite of one-time and recurring flatfield observations to deal with the FOS; 2) recommending to interested users the appropriate reduction techniques for dealing with FOS-Red spectra; 3) making other appropriate recommendations.

The committee hopes that such an action group would serve as a successful
model for other similar small groups to be set up as needed arises.

2. We discussed the proprietary time rules. Requests for departure from the rules must be explicitly included in the proposal, and considered by the TAC. Later requests for extension might be based on a) needing special calibrations; b) needing processing with corrected calibrations; c) incompleteness of the large statistical database; d) proposal use of several instruments. Later justification solely on points c) and d) would need to be very strong as individual observations may have other value to the science community.

3. We suggest that continuation proposals should be allowed an extra section to give the current status of their continuing proposal. We think it would be fair to allow continuing proposers to mention updates as a result of, for example, new calibrations becoming available, new small science that has become known since the last proposal, or small changes in "HST" or instrument performance. We also note that officially designated continuation proposals will frequently have to be proposed BEFORE observations from the previous cycle have been reduced or even obtained.

4. We would like to see a system of informing observers of HST scheduling and changes up to the time it is fixed. Even in cases where the program is not "time-critical", many observers do set up supporting ground-based observing, and may travel to observe. An e-mail to observers giving such information would be much appreciated. It should also be stressed to proposers that time-critical observations are harder to schedule and should thus be labelled as such only when essential. The TAC should be informed that time-critical observations are in general less efficient to schedule.

Points 3 and 4 might be made in the instructions to proposers. It would be useful to remind deferred Cycle 1 and 2 observers that they need to reapply in full.

5. We would like to see a system where an observer has the same contact person (or two coordinated persons) at ST ScI, from proposal submission to the end of data processing (so as to deal with issues of calibration or other problems with the data).

6. We are in agreement that the AO for a 4th generation instrument be deferred to 1994. We appreciate that work should start now and that it is reasonable to have a directed AO for an Advanced Camera, based on a phase A study now under way. We regret that the budget for this instrument is threatened, and urge that a collaboration with ESA or another partner be pursued.

7. We are pleased to see that the OTA shrinkage has been followed and the focus adjustments modified. We would like the policy to be followed of keeping the focus within 5 microns of the optimum, at all times, by moving focus as often as necessary. This way, users will not have to worry about the focus as an uncontrollable variable.

8. The WFPC2 IDT presented its thermal vac and orbital verification plan. The ground tests are designed to minimize the on-orbit calibrations. Many instrument characteristics will be explored in TV tests only, and there is a Wood's filter that is new. We thus urge that the ground test schedule at both JPL and GSFC be well coordinated and have contingency built in. The user community should understand the provisional nature of the WFPC2 calibration cycle 4.

9. We commend the ST ScI for its response to the moving target working group (MTARG). The user community is pleased with the recent successes in moving target observations, and awaits the imminent implementation of the guide star handoff capability. We also encourage further work in the area of moving target scheduling procedures.

10. We support the work of the STSDAS group, and would like to see assured funding for them. In the event of budget problems, we stress that a group of experts in the details of HST data processing is an extremely valuable user resource. We hope that closer collaboration with GTO teams may also help to improve the STSDAS package capabilities.

11. We commend the work which has increased the efficiency of parallel observations. We suggest that efforts be made to assure that potentially long parallel orbit (or more orbits) always get scheduled as their scientific potential is very high and opportunities are few. We would also like to see the ability to read out parallel images into occultation.

12. We accept the proposed GHRS side 1 policy, with one suggestion. If GHRS side 1 does become operational, it should be offered as an option to FOS observers (presumably using G130H/blue) who would benefit from this alternative, with no additional observing time. TAC would award time based on the use of the FOS only.

13. We suggest that the GTO catalogue be entered in STARCAT as a general user reference.

14. Many users would appreciate help at ST ScI after hours (i.e., after 2pm Pacific time, and evenings and weekends) if at all possible. We suggest that ST ScI contact people be put on the finger system for outsiders who may wish to know if they are available. ST ScI might post their schedules on a file readable by observers. Two miscellaneous points: ST ScI could be more sympathetic towards many users on UNIX-based systems; some ST ScI software, e.g., proposal preparation, on STEIS is VMS. Finally, calibration reference files in synphot on STEIS are out of date.

15. We are concerned over media coverage of HST performance after the repair mission. We suggest that the ERO program observations be confined simply to a few fields (such as star clusters) where the change in PSF will be very apparent for media purposes but which do not carry a new science story. We caution against using targets with visual appeal and no clear improved science return. New science stories should be released as they happen later in the course of regular observing.

16. We suggest that calibration files be included with the data in the case of all spectroscopic data. For imaging data we suggest that the appropriate files be available in DMF, and that the data be delivered with a simple recipe for getting the calibration files, if they are wanted.

The next STUC meeting is planned for May 27-28. Topics for this meeting should
include Cycle 5 planning, FOS scattered light, HST observing efficiency plans, image restoration. User input is welcomed by the committee.

—John Hutchings (chair), for the HST Users Committee.

EDUCATIONAL AND PUBLIC AFFAIRS OFFICE: KEEPING THE PUBLIC TUNED-IN TO HST SCIENCE

An estimated 14 million Americans are attentive to the space program and prefer that it be oriented toward scientific research. Yet only half of this group feels that they are well informed about the research underway.

Public science communication is integral to the success of the Hubble Space Telescope project. Public affairs activities in support of HST go beyond merely reassuring taxpayers that they are getting a return on their investment. HST's discoveries are inherently exciting and compelling for the attentive public when translated into interesting, accurate, and understandable articles.

In 1992 the Educational and Public Affairs Office (EPAO) issued 28 press releases on scientific findings made with Hubble. These results were presented in hundreds of newspaper articles, and highlighted in magazine stories around the world. Video news releases prepared by EPAO were featured on all the major networks and used extensively by Cable Network News.

Recent newspaper headlines about Hubble are increasingly far more upbeat than in the past: Hubble’s Successes Mount Up, Tampa Tribune; Hubble Keeps Finding New Wonders Despite Blurred Vision, Boston Globe; Not all Is Flawed in Hubble Images, Christian Science Monitor. HST observations were noted in Time Magazine’s “Best of 1992” review. Five out of thirteen astronomy discoveries highlighted in Science News Magazine’s 1992 year-end summary were attributed to Hubble observations.

EPAO is ready to further assist GTOs and GOs in disseminating research results to the public. Our press releases go to an international mailing list of several hundred science writers and reporters. The releases are also electronically distributed by NASA. The NASA program Space Astronomy Update allows investigators to present and discuss major HST findings.

Contact EPAO if you think you have results that might be of interest to the public. Of course, not every observation can be a "new discovery" or "significant breakthrough". However, HST research that touches on such popular topics as black holes, extrasolar planets, or cosmology is always widely accepted. Even HST research that might not be of broad public interest receives coverage in popular science magazines and the science sections of major newspapers.

If you have scientific results you want to release to the public, the first step is to mail or e-mail to us a summary of your research along with a draft of your paper. EPAO will draft a press release tailored to communicate your results in an accurate and understandable manner for general reporters. The draft is then e-mailed back to you to review for scientific accuracy.

The date of the press release usually follows the acceptance of a scientific paper for publication or presentation of results at a scientific conference. We will assist your university press office in co-releasing the results to news media. News is also simultaneously released by NASA and ESA, assuring wide international coverage. Additional releases are also posted on Spacelink, an electronic bulletin board maintained by NASA.

Most news announcements are accompanied by HST imaging data and/or graphics and artwork. EPAO has worked out routines for the regular transfer of scientific imaging data to the Astronomy Visualization Lab (AVL). The AVL provides a number of services for image enhancement, color compositing and annotation. These data are then sent to the photo lab for producing high-quality photographic negatives and prints.

The photolab has exceptional quality control that ensures that reproduction-quality prints are available for newspapers and magazines. EPAO also has the capability of printing descriptive captions on the back of each photo along with diagrams and supporting graphics.

This is a time of unprecedented progress in astronomy. Help us share in the excitement of exploration and discovery with the public.

—Raymond Villard

POLICIES FOR PUBLICATION OF HST RESEARCH

We wish to remind all authors again that research papers based on HST data must carry the following footnote:

"Based on observations with the NASA/ESA Hubble Space Telescope, obtained at the Space Telescope Science Institute, which is operated by the Association of Universities for Research in Astronomy, Inc., under NASA contract NAS5-26555."

If the research was supported by a grant from ST ScI, the publication should also carry the following acknowledgment at the end of the text:

"Support for this work was provided by NASA through grant number from the Space Telescope Science Institute, which is operated by the Association of Universities for Research in Astronomy, Inc., under NASA contract NAS5-26555."

So that your work can be included in official lists of HST research, please send two preprints of any research paper based on HST data to:

Librarian
ST ScI
3700 San Martin Drive
Baltimore, MD 21218
USA

Finally, please reference the relevant HST observing program identification number(s) in your papers, so that we can cross-index scientific papers with the original observing proposals.

If you have questions regarding these instructions, please contact Sarah Stevens-Rayburn (410-338-4961; userid LIBRARY).

—Sarah Stevens-Rayburn
HST-RELATED PUBLICATIONS

The following is a list of published papers containing results from HST that have appeared in refereed journals since the last issue of the Newsletter. The list is maintained in the ST ScI Library. Please note that this list is for information only, and that preprints and reprints are not available from the ST ScI Library.


Guhathakurta, P.; Yanny, B.; Schneider, D.P.; Bahcall, J.N. “Globular cluster photometry with the Hubble Space Telescope. I. Description of the method and analysis of the core of 47 Tuc” AJ 104: 1790-1817, 1992


Paresce, F.; De Marchi, G.; Ferraro, F.R. “Possible cataclysmic variable in the core of the globular cluster 47 Tucanae” Nature 360: 46-48, 1992


SOFTWARE AND DATA ANALYSIS NEWS

HST IMAGE RESTORATION PROJECT

During the last several months work has finally gotten underway on an 18-month project dedicated to the restoration of images from HST. Participating in this effort are Bob Hanisch (project leader), Rick White, Jinger Mo, and Nai long Wu. We expect to collaborate with several groups outside ST ScI, including Bobby Hunt (U. Arizona), Dave Redding (JPL), Ivo Busko (INPE, Brazil), Bob Goncalves (Tufts), and several staff members at the Space Telescope - European Coordinating Facility (ST-ECF). If you are working on or interested in HST image restoration and wish to participate in this project, please contact us.

We have three primary objectives: 1) expand our knowledge of the HST point spread function (PSF) and improve our ability to model the PSF, 2) develop a toolkit of restoration algorithms for HST data (with particular attention to the problem of the space-variant PSF of the WFPC) and provide a quantitative assessment of the relative merits of each technique, and 3) document the algorithms and approaches used for HST image restoration for GOS and provide advice on observing strategies for optimizing results from restoration.

In the first area we have begun a series of quantitative tests aimed at understanding the sensitivity of various image restoration algorithms to the accuracy of the PSF. Effects such as spacecraft jitter, the S/N ratio in the PSF (for empirically measured PSFs), and uncertainties in focus are being examined. Our initial results indicate that with the current spacecraft pointing performance (i.e., after the new on-board pointing software was installed) jitter is usually a negligible effect on the PSF for observations taken in fine-lock. It is clear that a noiseless PSF is superior to an observed PSF, however the standard PSF modeling packages TIM and TinyTIM are known to provide only a poor match to observed PSFs, especially in the UV. Thus, one of our current projects is to improve the PSF model via a phase retrieval technique. We are also testing a preliminary version of a PSF modeling package from JPL that uses a more sophisticated model of the telescope and camera obscurations than TIM or TinyTIM. Finally, numerical simulations are being run to determine our sensitivity to focus errors. First results indicate that systematic errors introduced into a restored image are generally negligible for errors of less than 5 microns in the position of the secondary mirror, but are significant for focus errors of 10 microns or more. Further work is required, however, using better PSF models.

Further enhancements to the Lucy-Richardson algorithm have been developed by Rick White. In addition to being able to mask bad pixels, the algorithm is now able to suppress noise amplification in low S/N regions. Rick is preparing a detailed paper which describes many aspects of the Lucy-Richardson technique. Nai long Wu has developed a maximum entropy method (MEM) package for IRAF/STSDAS that does not depend on any commercial software, and is preparing a report that describes MEM and the differences between his implementation and the popular MEMSYS5 package from Maximum Entropy Data Consultants, Ltd. As was announced previously, ST ScI is now able to provide the MEMSYS5 software to HST observers via a redistribution license we have negotiated with MEDC. The MEMSYS5 libraries are accessed via a front-end program developed by Nick Weir (Caltech) which Nick has kindly granted us permission to distribute. Please contact us if you are interested in using this software for your HST data.

As our work progresses, we intend to keep HST users informed via this Newsletter, technical reports, papers, and a user's guide to HST image restoration. We also expect to host a second workshop on image restoration either later this year or early in 1994.

—Bob Hanisch

STDSAS PROJECT STATUS

A status report in the last ST ScI Newsletter suggested that we would have to decrease our level of support for off-site users of STDSAS. Since then, the HST Project and the Institute have agreed upon a “System Enhancement Plan” (SEP) to fund certain enhancements to the hardware and software infrastructure of the Institute. A portion of the SEP calls for enhancements to user support software, and provides for the continuing distribution and support of STDSAS for off-site users.

As a part of the SEP, the STDSAS Group will be taking on two new projects during the next two to three years. The first is to provide programming support for the image restoration project that began last fall at the Institute. The algorithms that are developed (or adapted) during the course of this research that are most useful for the restoration of HST images and spectra will be incorporated into STDSAS, so that all GOS/GTOs/ARs will have access to them for their own research. The second project will be to port STDSAS that software which is being written for astrometric analysis with the Guide Star Catalog (GSC) V1.2. Our goal will be to provide GOS with portable analysis tools for accessing the GSC and the compressed plate scans (if they have the CD-ROM set) from workstations at their home institutions.

STDSAS Version 1.2.2 Released

The second update to Version 1.2 of the Space Telescope Science Data Analysis Software (STDSAS V1.2.2) was released in January, along with V1.2.2 of the TABLES external package; this version is now the default for most machines at the Institute. Off-site users may obtain this update, or “patch”, via anonymous ftp from STEIS in the directory /software/stdsas/v1.2. Users who do not have access to ftp may request a distribution tape and installation instructions from the STDSAS System Administrator (hotseat@stsci.edu). If you retrieve the software electronically please send us the electronic registration form (which is located in that same directory) so we may keep you up to date regarding revi-
sions to the software and documentation. We anticipate releasing another update (V1.2.3) in the Spring of this year.

As the STSDAS system grows and matures, some task/package reorganization and housecleaning is occasionally necessary. The next opportunity for such changes is in the next major release of STSDAS (V1.3), which we are planning for the Summer of this year. At that time we will eliminate the code redundancies between the TTOOLS and TABLES packages by using the TABLES source exclusively. This change should be transparent to most users, but off-site IRAF managers will need to install both the STSDAS and TABLES external packages to use all the capabilities of our software. We also intend to place the STSDAS.PIPELINE package (which contains all past and present versions of the RSDP reduction code) into its own external package. The need for the earlier versions of the RSDP is greatly diminished now that the reprocessing of all HST science data is complete. Users who wish to use this code after V1.3 is released will need to install PIPELINE separately. These two changes will reduce the disk space requirements for STSDAS V1.3 by 25-30%, without losing any functionality, yet make the code easier to install and maintain.

**New Features of STSDAS**

Several new or improved tasks have appeared since the last incremental release of STSDAS (V1.2.1) in July, 1992. New tasks that relate to adaptive filtering of images are: adaptive, filter, and hsmooth, which can all be found in the PLAYPNG package. Another new task is available to users who are running IRAF V2.10.2 or later: chcalpar in the TOOLS package provides a unified interface for retrieving and editing the calibration parameters (i.e., the processing switches and the reference file names) for all science instruments. Other tasks have been enhanced. The forward and inverse tasks in the FOURIER package now do transforms much faster, thanks to improved memory management.

The STATISTICS package, which is based upon the ASURV package from Penn State, has been upgraded to V1.2 of that software. The TABLES package now has the ability to operate on ASCII files (i.e., without first having to convert them to the binary TABLES format with tcreate.) The igi task can now read IRAF images of all types and dimensionality (including OIF, QPOE, and GEIS files), as well as table columns. Various color capabilities are available in igi, skymap, and other graphics tasks through the new PostScript kernel, or directly through the pskern task.

A few tasks have been contributed from the HST and other user communities. They are distributed with STSDAS (in the CONTRIB package) as a service to the HST community, but the responsibility for the code, the accuracy of the output, and advice for using this software rest with the authors. One new task for analyzing spectra, called speclf, was written by G. Kriss at JHU. Another, called accod, is based on an algorithm developed by L. Lucy and R. Hook (ST-ECF) for optimally coadding images with differing resolution. We are interested in expanding the available science applications to STSDAS users through GO/GTO/AR contributed software. If you have developed an interesting application, and would be willing to make it available to the STSDAS community, please contact us. Packages developed within the IRAF/STSDAS environment are especially suitable, but limited resources may be available for IRAF ports and/or collaborative software developments in some cases.

Upcoming features that will appear in the Spring (in V1.2.3) include a task to create WFPC flat-field reference files from streak flat observations. The “streakflat” task was based upon the algorithm that was developed by J. Hester of the WFPC Instrument Definition Team. This task will be especially useful for those G0s who obtain WFPC images using filters for which calibration observations exist in the archive, but for which reference files are not available in the calibration database. Also in the V1.2.3 release, the lacy image restoration routine will be enhanced to mask pixels with extremely negative val-

ues, rather than adding a large DC offset to the whole image.

Users who would like more details about STSDAS software may wish to receive the STSDAS Newsletter, which is prepared two or three times per year. The Newsletter provides many useful insights into using some of the more complicated tasks, advice on which STSDAS tasks are most appropriate for particular types of analyses, and descriptions of new tasks that are being developed. Please contact Mark Stevens (stevens@stsci.edu) to obtain the next issue. Users who have problems with the installation or use of STSDAS software should send a description of their problem (and the text of the error message, if any) to the STSDAS HotSeat (hotseat@stsci.edu). Inquiries sent to HotSeat will be acknowledged quickly, and any problems will be resolved as soon as possible.

**New/Updated Documentation Available**

For those who are interested in writing their own IRAF/STSDAS applications, or who wish to put an IRAF “front-end” on their favorite routines, we have revised and updated the SPP Reference Manual. This manual now includes a description of the TABLES interface.

A new manual, the IGI User’s Guide, describes this very powerful graphics utility within STSDAS. (This guide includes a Quick Reference Card.) The IGI manual was prepared using the hypertext utilities that are available in the Framemaker document preparation software. Many users find this point-and-click style of help to be very useful, particularly if they are novice users. Users who have the Framemaker package available on their computers and who wish to try out this form of the IGI manual may contact Mark Stevens (stevens@stsci.edu) to retrieve an electronic copy of the text.

—Dick Shaw

**A LOOK AT AURA: 1992**

A report on AURA's 1992 activities is hot off the press! The report highlights the Gemini Project, AURA relations in Chile,
and the Women in Astronomy Workshop held at the Space Telescope Science Institute in September. Also available is an updated brochure describing AURA. Both are free of charge.

To obtain copies, contact AURA at: 1262 Massachusetts Avenue, N.W., Suite 701, Washington, DC 20036; phone: 202/483-2101; fax: 202/483-2106.

—Lorraine Reams

INSTITUTE NEWS

THE BALTIMORE CHARTER

The ST ScI meeting on Women in Astronomy (WIA) last September was the birthplace of the Baltimore Charter, a set of guidelines for improving the situation of women in astronomy. The WIA meeting organizers had the lofty goal of producing something like the Declaration of Independence and the Bill of Rights combined. The final Charter has turned out to be an inspiring and, we hope, a powerful document for change.

The Baltimore Charter had its origin in the collective ideas of concerned people. During the September WIA meeting, over 200 participants were assigned to small discussion groups and asked to address various issues relevant to women in astronomy. The discussion topics ranged from abstract issues like how scientific excellence is judged, to practical problems like maternity leave, child care, and dual-career families. Each group produced a written report to be used as input to the Charter.

Because of the small size of the groups, discussion was intense and ideas flowed freely. The concerns and opinions of each conference participant were heard, and these ideas form the heart of the Charter.

Reports from the working groups were distilled and assembled into a draft document by the integration team, which consisted of the meeting organizers and an outside consultant, noted authority on science education, Sheila Tobias. The final version of the Charter states our fundamental beliefs, explains the underlying philosophy, issues a set of recommendations for action, and calls upon our astronomical colleagues to join in an effort toward change.

The completed Baltimore Charter was circulated in February to the meeting participants, who were invited individually to be listed as authors. The Charter appears at the front of the Proceedings of the meeting on Women in Astronomy, an ST ScI publication edited by Meg Urry, Laura Danly, Lisa Walter, and Shireen Gonzaga.

The Proceedings are being distributed to everyone who attended the meeting, to U.S. astronomy and physics departments, and to the ST ScI mailing list of departmental libraries. If you are not included in this list, and would like to receive a copy, please send your request via e-mail to Dorothy Whitman (schlogel@stsci.edu).

The Baltimore Charter may not solve the problems of women in astronomy but we hope it is a step in the right direction. Rather than addressing the larger problem of under-representation of minority groups in science, we elected to focus on women because that was our area of expertise. Many of the problems faced by women and minorities are similar, arising from similar climates of exclusion, while other aspects of the two situations differ enough that the issues might best be dealt with separately. We also focussed on astronomy rather than science in general, again restricting ourselves to our area of expertise and our sphere of influence. It is our fervent hope that the Baltimore Charter will inspire equivalent documents for other minority groups and for other scientific disciplines.

The Baltimore Charter is not an end in itself but an opportunity, for those who care about change and science education, to take action and to make a difference. Our goal is that the face of astronomy reflect the face of the society that both supports and learns from us. We thank our colleagues for their help in producing the Charter and we ask all astronomers to work together toward this goal.

—Meg Urry

ANNUAL ST ScI MAY SYMPOSIUM

The topic of the ST ScI May Symposium this year is Extragalactic Background Radiation. The Symposium in honor of Riccardo Giacconi will be held at the Institute on May 18-20, 1993. The purpose of the Symposium is to review observations of the background radiation at all wavelengths and to consider how these may be explained by physical processes operating at various epochs of cosmic history.

The invited speakers include Jim Peebles, Peter Jakobsen, Jill Bechtold, Anthony Tyson, Simon White, Gianni Zamarani, Rashid Sunyaev, Mike Hauser, Carol Lonsdale, John Peacock, Malcolm Longair, Neil Gehrels, John Mather, Phil Lubin, Nicola Vittorio, and Martin Rees.

Shorter contributions will be in the form of poster papers. The proceedings will be published by Cambridge University Press.

The deadline for registration is April 1, 1993. Inquiries and applications should be sent to Tawanta Nance (410-338-4512, nance@stsci.edu) or Barbara Jedrzejewski (410-338-4836, ellen@stsci.edu).

—Michael Fall

GALAXIES MINIWORKSHOP

ST ScI will hold a Miniworkshop on Emission from Quasar Absorption Line Systems on July 7-9, 1993. Topics of discussion will include both continuum and line emission from absorption-line clouds over a wide range of redshifts. Anyone interested in attending should contact:

James Lowenthal
410-516-5101, lowenthal@stsci.edu

David Bowen
410-338-4889, bowen@stsci.edu

Mauro Giavalisco
410-338-4942, giavalisco@stsci.edu.

—Michael Fall

ESA FELLOWSHIPS AT ST ScI

Astronomers of ESA member countries are reminded of the possibility of coming to do research at ST ScI as an ESA Fellow.
Prospective fellowship candidates should aim to work with a particular member or members of the staff at ST ScI and, for this reason, applications must be accompanied by a supporting letter from ST ScI.

Details of the fellowships and applications procedures can be obtained from the EDUCATION OFFICE, ESA, 8-10 rue Mario Nikis, 75738 PARIS 15, FRANCE. A summary of the interests of the ESA staff members at ST ScI can be obtained from Dr. N. Panagia (panagia@stsci.edu or 659::PANAGIA). Their interests and activities can best be assessed by reading the annual report of the Institute, the most recent of which is in BAAS, 24, 530, 1992.

Completed application forms must be submitted through the appropriate national authority, and should reach ESA no later than 31 March for consideration in May, and no later than 30 September for consideration in November.

A copy of the completed application should be sent to the Chairman of the Postdoctoral Selection Committee (currently Michael Fall) at ST ScI.

Selected Fellows must negotiate the commencement dates of their ESA Fellowships at ST ScI with the Academic Affairs Division (c/o Nino Panagia) at least two months before their prospective starting dates.

—Nino Panagia

HUBBLE FELLOWSHIP PROGRAM

The 134 applications received for the fourth round of Hubble Fellowships were considered by the Review Panel in late January 1993. Offers to successful candidates have been made, with replies due by mid-February 1993.

The selection process should be completed by early March 1993 at which time the names of this year’s new Hubble Fellows will be announced.

An Announcement of Opportunity for the fifth round of Hubble Fellowships will be issued in early Summer 1993. The deadline for submitting applications is anticipated to be mid-November 1993.

—Nino Panagia

REORGANIZATION IN SCIENCE PROGRAMS DIVISION

Over the last few months we have restructured several of the organizational groups within the Science Programs Division. Our purpose has been to improve both our service to the astronomical community and our scheduling and planning of science observations with the telescope. The smaller groups that we have produced should make for easier management and reporting.

The Telescope & Instruments Branch has been split into two smaller groups, namely the Science Instruments Branch (SIB) and the Science Observatory Branch (SOB). The SIB Chief is Ron Gilliland and includes the instrument scientists and teams working on the WFPC2 and 2, FOC, GHRS, FOC, and HSP. The SOB Chief is Roberto Gilmozzi and includes the scientists who work on the OTA, FGS and calibration activities. The Science Planning Branch has recently been restructured into two smaller Branches, one Branch specifically responsible for all GO and GTO Phase II implementation and headed by Peggy Stanley, and a second Branch led by Melissa McGrath that will be responsible for planning the long range schedule, moving targets and Targets of Opportunity. Several staff members from the User Support Branch will transition over to these implementation areas. However, USB will remain responsible for helping users to prepare observing proposals with HST, maintaining the electronic bulletin board (STEIS), documentation and TAC support, and coordinating the visits of GOs and GTOs to ST ScI. The Branch Chief of USB is Abi Saha.

—Duccio Macchetto and Chris Blades

RECENT STAFF CHANGES

Raymundo Baptista joined the cataclysmic variables group as a Postdoctoral Fellow in January 1993 after completing his Ph.D. under Joao Steiner at the University of Sao Paulo, Brazil. Raymundo’s current research topics include multi-wavelength eclipse mapping of accretion disks, flickering, orbital period variations in short-period eclipsing cataclysmic variables, magnetic nova candidates, and maximum entropy techniques. He will be working with Keith Horne on eclipse mapping projects including applications to HST data.

Luciana Bianchi has joined the Institute in October 1992 as a Research Associate in the Science Observatory Branch of the Science Programs Division working on FOS/WFPC data of planetary nebulae and on UIT images of external galaxies. She comes from the Astronomical Observatory of Torino, Italy where she is an Associate Professor. Most of her studies in astronomy were at the University of Padova, Italy. Most of her research is based on observational activity in the optical and especially in the UV (IUE and HST), on hot massive stars (stellar wind characteristics) and evolved objects (planetary nebulae and XRB). She formerly worked for the IUE project as an ESA Resident Astronomer.

Kirk Borne has taken the position of DADS Project Scientist in the Data Systems Operations Branch.

David Bowen switched from an ESA Fellowship in October 1992 to a Postdoctoral Fellowship in the Science Programs Division. He is continuing his studies of QSO absorption lines and is collaborating with Chris Blades. In particular, they are analyzing HST GHRS data on several QSOs that are shining through the halos of foreground galaxies. First results appeared in ApJ Letters, 403, L55 for the QSO-galaxy pair Mkn 205 - NGC 4319.

Daniela Calzetti arrived at the Space Telescope Science Institute from the University of Rome (Italy) in November 1990 as an ESA Fellow. Since November 1992 she has been a Postdoctoral Fellow at the Institute. She is presently collaborating with Anne Kinney on a study of a large sample of UV and optical spectra of quiescent, starburst and Seyfert 2 galaxies. The main projects are the construction of template spectra of galaxies according to the Hubble type and the activity level (thermal and non-thermal) and a statistical study of the physical and chemical properties of the starburst galaxies in the sample. The template spectra will be useful for predictions...
of expected colors from galaxies as a function of the redshift.

**Michael Dahlem** joined ST ScI in January, as a Postdoctoral Fellow in the Academic Affairs Division. He graduated from Bonn University in 1990 and, subsequently, occupied postdoctoral positions at the Max Planck Institute for Radioastronomy in Bonn and at the Hamburg Observatory. At ST ScI he is working on multifrequency observations, including ROSAT data, of nearby galaxies, with particular emphasis on starburst galaxies, in collaboration with Tim Heckman, Claus Leitherer, and Ralf Dettmar.

**Michael Eracleous** started a Postdoctoral Fellowship with the cataclysmic variables group in the Science Observatory Branch of the Science Programs Division in October 1992 after completing his Ph.D. under Jules Halpern at Columbia University. Mike’s research interests include accreting compact objects in binary systems, particularly their oscillatory behavior, and active galactic nuclei, particularly those with double-peaked emission profiles that offer the best evidence for accretion disks. Mike is currently working with Keith Horne on HST observations of the 33s oscillations in AE Aquarii. His favorite bands of the electromagnetic spectrum are the optical (near-UV and near-IR included) and the X-ray.

**Andrea Ferrara** joined the Academic Affairs Division last July as an ESA Fellow. He earned his Ph.D. from the University of Florence (Italy) in 1992. He is mainly working on theoretical problems concerning the physics of the interstellar medium, both in nearby galaxies and in those at high redshifts.

**Paola Grandi**, who recently received her Ph.D. from the University of Padova, joined ST ScI in November, as a Postdoctoral Fellow in the Science Computing & Research Support Division. She is working on continuum processes in active galaxies in collaboration with Meg Urry.

**Knox Long** has moved from his position as the DADS Project Scientist to become the Branch Chief for the Data Systems Operations Branch.

**Piero Madau** joined the User Support Branch of the Science Programs Division as an Assistant Astronomer on October 1, 1992 after having completed a Davis Fellowship. Piero earned his Ph.D. from the International School for Advanced Studies, Trieste, in September 1987, and then held a postdoctoral position at Caltech. His main research interests include AGNs, intergalactic medium, gamma ray bursts and compact objects.

**Jon Arthur Morse** completed his Ph.D. in 1992 at the University of North Carolina at Chapel Hill. He joined the Academic Affairs Division last November, where he is carrying out active research programs in both observational and theoretical astrophysics in collaboration with Andrew Wilson. His current research includes observations of radiative stellar jets, SNRs and AGNs, modelling of both emission-line spectra in shock-excited environments and synthetic stellar spectra, kinematics of OB associations and young clusters, formation and evolution of blue stragglers.

**Kathy Roth** joined ST ScI in October 1992, as a Postdoctoral Fellow in the Science Programs Division working with Chris Blades. Kathy has just successfully completed her Ph.D. studies at Northwestern University with Professor David Meyer. At ST ScI she will continue her observational research on the interstellar medium and QSO absorption lines.

**Emanuel Vassiliadis** received his Ph.D. in 1993 from the Australian National University, working with Drs. Peter Wood and Michael Dopita at the Mount Stromlo and Siding Spring Observatories. Emanuel’s Ph.D. research was directed towards theoretical and observational aspects of Asymptotic Giant Branch and Planetary Nebular evolution. He is currently employed as a Postdoctoral Research Fellow, continuing his research into the late stages of evolution of low to intermediate mass stars. The program involves obtaining narrow band images and UV spectra of a sample of PN in the Magellanic Cloud and is in collaboration with Ralph Bohlin and Holland Ford.

**Boqi Wang** earned his Ph.D. at Harvard University, and spent two years on a postdoctoral position at the University of California at Berkeley before taking a joint appointment at ST ScI and JHU as a Davis Fellow. His main interests are theoretical astrophysics, with special emphasis on interstellar medium, galactic halos, galaxy evolution, and radiative decay of massive neutrinos.

**Brad Whitmore** has returned from his sabbatical leave and taken up a new position as Deputy Division Head in the Science Computing and Research Support Division. In addition, he will be the acting Branch Chief for the Science Software Branch while Bob Hanisch works on an image restoration project for the next 18 months. During the sabbatical, Brad continued his work on the morphology-radius relation in clusters of galaxies, and began the analysis of HST observations of merging galaxies.

**IN MEMORY OF MARCO OLIVERI**

It was with sadness that we learned of the death of Marco Oliveri, which befell this past New Year’s Eve after a protracted fight with cancer.

Marco came to the ST ScI in 1988 after receiving his Master’s degree in Astrophysics from The University of Toledo, Ohio. He was one of the first Technical Assistants assigned to the newly formed User Support Branch and quickly became our GHRS user support specialist. He developed close working relationships with the GHRS Investigation Definition Team and many General Observers. He also helped devise many of the generalized systems and procedures which are used to support proposal solicitation, program selection, and the Phase II processing. In a real and substantial sense, Marco helped us navigate through the technical newness and several HST program shifts during the past four years.

Marco was later promoted to the position of Coordinator for the USB Technical Assistants, and provided strong technical leadership for the group. He received two ST ScI service awards, one for individual achievements and another for his contributions as part of the Proposal Implementation Team.
At work, Marco combined his buoyant sense of humor with an often stoic perseverance. He approached every technical challenge with an innovative and confident attitude, and often deferred his own work to help his coworkers and the HST users. Marco was a good friend to all, and he personified user support in its finest form. He is sorely missed.

—Bruce Gillespie

RECENT STSCI PREPRINTS

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


670. “NGC 4945: A Post-Burst Infrared Galaxy,” J. Koomneef


673. “Two-Stage Starbursts in the LMC: N11 as a Once and Future 30 Doradus,” N.R. Walborn, J.W. Parker


677. “Obscuration of Quasars by Dust in Damped Lyman-Alpha Systems,” S.M. Fall, Y.C. Pei

678. “Rotation of Young Solar-Type Stars in the Orion Nebula Region,” D.K. Duncan


681. “Stellar Kinematic Groups. I. The Ursa Major Group,” D.R. Soderblom, M. Mayor


683. “V1 in the Core of 47 Tucanae: A Possible Optical Counterpart to X00218-7221,” F. Paresce, G. De Marchi, F.R. Ferraro


685. “Comptonization Effects as a Test for Hot Intercloud Medium in the BLR of AGNs,” A. Ferrara, P. Pietrini


688. “Rotation and Activity among Solar-Type Stars of the Ursa Major Group,” D.R. Soderblom, M. Mayor

689. “Peculiar Velocities and Galaxy Clustering: Do Bulk and Shell Motions Have the Same Origin?” D. Calzetti, M. Giavalisco


697. “What Determines the Morphological Fractions in Groups and Clusters?” B.C. Whitmore


701. “Can Galactic HI Be Radiatively Supported?” A. Ferrara

706. “Interstellar Mg II and C IV Absorption toward Mrk 205 by NGC 4319: an Optically-Thick QSO Absorption System,” D.V. Bowen, J.C. Blades
708. “Output of Matter and Radiation by Massive Stars in Different Chemical Environments,” C. Leitherer

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With few exceptions the userid is the staff member's surname. Many are published in the Membership Directory of the American Astronomical Society. If you do not know the userid, 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 this issue of the ST ScI Newsletter should be addressed to the Editor, J. Patricia Vader (410-338-5008, userid VADER). Mailing-list corrections should be sent to Amy Connor (userid CONNOR).

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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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