



SPACE TELESCOPE SCIENCE INSTITUTE

# Newsletter

## Highlights of this issue:

- Dr Michael Hauser arrives as STScI Deputy Director.
- Dr Carol Christian arrives as head, Office of Public Outreach.
- Director's Perspective on page 2.

## Atomic Physics with the Goddard High Resolution Spectrograph

by Steven Federman,  
University of Toledo  
and Jason Cardelli,  
Villanova University

Most interstellar species have a large fraction of their electronic transitions at far ultraviolet wavelengths. Many of these transitions are accessible in the wavelength range covered by gratings

atomic and molecular species. As a consequence of the high signal-to-noise ratios attained (typically 200 to 1000), many lines of interstellar species were detected for the first time. First detections include weak intercombination lines where the excited electron changes spin.

Our high quality spectra showed many lines of neutral sulfur (S I) and singly-ionized iron (Fe II). These data are of very high precision and are

basic premise is to use precisely determined experimental  $f$ -values for multiplets containing a weak interstellar line to ensure the linearity between amount of absorption and abundance. This abundance then is used to derive a suite of self-consistent oscillator strengths for the other lines. In other words, the relative  $f$ -values derived astronomically are placed on an absolute scale with the experimental results. The final step involves comparing the astronomically-derived oscillator strengths with other laboratory measurements and with results from large-scale computations like the Opacity Project.

Two methods of analysis were applied to the GHRS data: for S I a curve-of-growth analysis was performed (Federman & Cardelli 1995, ApJ, in press), while for Fe II the observed variation of apparent optical depth with velocity (the  $\tau$  -  $v$  method) was studied (Cardelli & Savage 1995, ApJ, in press). Neutral sulfur is a minor constituent because its ionization potential is less than hydrogen's, and as a result S I absorption mainly arises from denser, cold gas along the sight line to a star. Therefore, in a direction with a single principal component of dense gas, a curve of growth can be used to extract the abundance of S I from a weak line of a multiplet and the Doppler width (or  $b$ -value) for the absorbing material from a strong line of the multiplet. Fe II, on the other hand, is the predominant form of iron in interstellar space and absorption is seen in many components. Curves of growth are usually not reliable under such circumstances and

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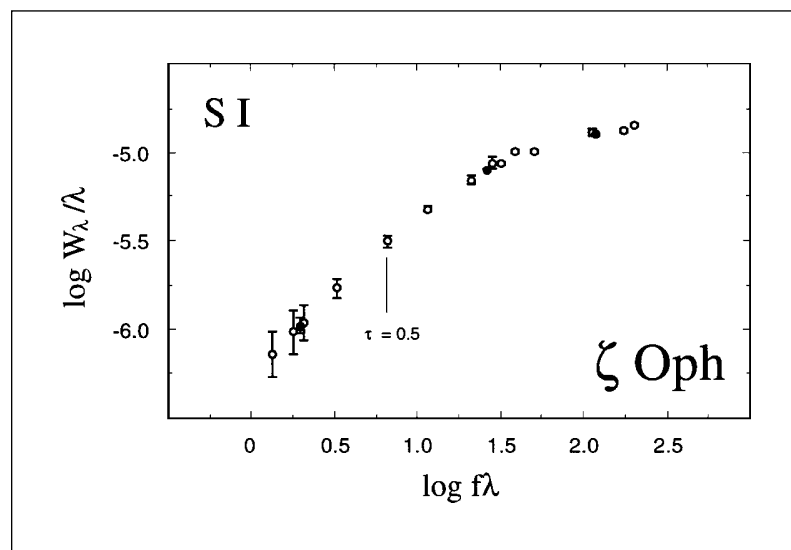


Fig. 1 — Curve of growth for S I. The position where the optical depth at line center equals 0.5 is indicated. For larger optical depths, saturation affects the analysis.

of the Goddard High Resolution Spectrograph (GHRS). We are involved in a variety of programs that probe the interstellar medium through absorption lines seen against the continuum of an early-type background star. Our observations reveal spectra rich in absorption lines from

indicating the limitations in the available atomic data used for interpretation. Of particular interest to our research are comparisons of astronomical results with available laboratory and theoretical data on atomic transition probabilities and oscillator strengths ( $f$ -values). Our

## Director's Perspective

by Bob Williams  
and F.D. Macchetto

Life at Space Telescope Science Institute and with HST is now reaching a steady state, but like the Universe it is an evolving equilibrium. It is not an exaggeration to say that HST is an outstanding scientific success and is making fundamental contributions to all areas of astronomy, both by confirming and expanding our understanding of a variety of physical phenomena and by providing observations and data that challenge current wisdom. The Institute is working very hard to schedule the HST with the highest possible observing efficiency, and efficiencies higher than 50% are now being attained. HST users are working equally hard to analyze their data and produce a steady stream of scientific results at the forefront of astrophysics, which appear in the scientific journals and in the popular press.

This spring HST users joined together with ST ScI staff in a workshop entitled "Calibrating HST: Post-Servicing Mission." Roughly 75 HST investigators and a comparable number of Institute staff attended this forum for detailed presentations and discussions concerning the calibration and analysis of post-servicing mission data. The meeting was useful both for the HST users, who were able to ask questions to Institute staff about their data, and for the Institute, which benefited from some novel approaches to data analysis being made by the HST community. The proceedings of the workshop were mailed to Cycles 4 and 5 GOs.

We have recently completed Cycle 4 observations and are well into Cycle 5 at the time of this writing. The Institute has just received over 1000 proposals for the Cycle 6 Phase 1 submission, for consideration by the TAC, surpassing the record of 863 proposals received last year. This overwhelming interest far exceeds any previous response for a NASA project and is a measure of the value with which the community holds HST. Cycle 6, of course, represents the last opportunity for observations with

the Goddard High Resolution and Faint Object Spectrographs. The Time Allocation Committee and its component panels will review all the proposals during the next month, and meet in November 1995 to carry out the peer review process.

In addition to supporting the work associated with the different observing cycles, ST ScI is preparing to operate and use the two new instruments, NICMOS and STIS, which will be deployed in the 1997 Servicing Mission. The development of these instruments is proceeding extremely well, thanks to the commitment of the many individuals involved in these projects and to the excellent communications established with the Investigation Definition Teams.

The long term future of the HST is currently projected to be in very good shape, with the Advanced Camera for Surveys (ACS) being built for the 1999 Servicing Mission and the current activities within ESA to define an instrument for the 2002 mission. These activities are concurrent with negotiations between NASA and ESA to extend the Memorandum of Understanding between the two agencies beyond the current expiration date of 2001. An important element in this extension would be ESA's provision of a new instrument. (See the September ECF Newsletter for details on the instruments under study) We are very optimistic that the continued success of HST will be assured by the combination of excellent scientific output and a solid program to deploy state-of-the-art instruments in each of the forthcoming maintenance missions.

A number of key personnel changes have taken place at ST ScI. Following the resignation of Peter Stockman as Deputy Director a search committee was established by the Space Telescope Institute Council to work with the Director in finding a replacement. The search culminated in the appointment of Dr. Michael Hauser as the next Deputy Director. Mike, who begins his new duties as Deputy on October 2, has been on the staff of Goddard Space Flight Center for more than 20 years. As Chief of the Laboratory of

Astronomy and Solar Physics, and previously the Infrared Astrophysics Branch, Mike has considerable experience in the management of large projects. He has been a part of several important scientific investigations, including IRAS and COBE, and serves on a number of prominent national committees as well. He has specialized in infrared astronomy and instrumentation, and therefore has a good technical knowledge of space hardware which will be valuable to the HST community. It is a pleasure to welcome Mike to ST ScI as the new Deputy Director.

Dr. Carol Christian, formerly with the Center for Extreme Ultraviolet Astronomy at Berkeley, joined the Institute on September 18th as Head of the Office of Public Outreach. Carol is familiar to the Institute, having served on our Visiting Committee and as chair of the STSDAS Users' Committee. In addition to her experience in both ground-based and space astronomy, Carol is very interested in the applications of technology to data transfer and outreach. She created and successfully secured funding for a national education program, the Science Information Infrastructure, and she has good familiarity with current efforts in astronomy education and computer technology. Carol will be a valuable asset to the Institute not just in leading our development of the outreach program but also in advocating HST programs.

On the negative side of the scale, we regret to announce the departures from STScI of two stalwarts of the Institute, Bob Milkey and Mark Johnston, two people who have made important contributions to the Institute and the HST program over the years. For more than ten years Bob was the Associate Director for Program Management and he performed an outstanding role in the organizational life of the Institute. He has left ST ScI for the American Astronomical Society where he has become the Executive Officer. We wish him well and we look forward to the many opportunities that we will have to continue to interact with Bob in the future. Mark Johnston has held a number of positions during his 13

years at the Institute. His most recent assignment has been as the Head of PRESTO, and thanks in large part to his efforts the efficiency of HST observations has risen steadily to the current high values. Mark has made many other significant contributions to HST operations, e.g., the RPS proposal entry system and the SPIKE scheduling system. His great creativity will be missed after his departure on

October 1, when he will join a private company in California involved in scientific software.

Finally, we continue to be concerned about the overall poor funding situation for science and its effect on the HST budget. Congressional budget decisions have resulted in significant reductions in the HST budget recently, which have affected the funds available to GOs and GTOs. This effect has been

compounded by further cuts to the GO funding that resulted directly from the Congressional rescission of funds previously appropriated late last year. We are working hard with NASA and the community to protect this area as much as possible in the future because the scientific productivity of HST would be seriously impacted.

### Atomic Physics *from page 1*

another method is needed to analyze the data. The  $\tau - v$  method allows one to express the apparent column density at each data point in velocity. Comparison between weak (small  $f$ -value) and strong (large  $f$ -value) lines can be used to check for unresolved saturated structure in the cores of the stronger lines. In the limit where no unresolved saturation is present, the apparent column density profiles for weak and strong lines match each other.

Toward  $\zeta$  Oph, we detected 27 lines of S I arising from 14 multiplets. The absorption comes from the velocity component associated with dense gas ( $v_{\text{helio}} = -15 \text{ km s}^{-1}$ ). Although ultra-high-resolution ( $\sim 0.3 - 0.5 \text{ km s}^{-1}$ ) observations indicate the presence of 2 subcomponents, the data for K I suggest the subcomponents have nearly equal strength, and therefore, the  $b$ -value derived from the curve of growth may represent the separation in velocity of the subcomponents ( $\sim 1.1 \text{ km s}^{-1}$ ).

The curve of growth for S I based on precise experimental  $f$ -values appears in Figure 1. The filled circles indicate the multiplet with the precise oscillator strengths, while the data with open circles have refined oscillator strengths that provide a consistent curve of growth. The position where the optical depth at line center equals 0.5 is indicated because previous analyses of interstellar spectra rarely included weaker lines, but these are essential for an accurate curve of growth. It is also worth noting that the dispersion in the

flat portion of the curve of growth represents an uncertainty in the  $b$ -value of only  $0.1 - 0.2 \text{ km s}^{-1}$ .

The astronomically derived S I  $f$ -values can be compared with other determinations. Of particular interest to spectroscopists is a comparison with the results from the Opacity Project. Our results for transitions involving the ground state of S I ( $3p^4 \ ^3P$ ) and excited  $^3S^o$  states agree with the theoretical results from the Opacity Project at the 5 - 10% level! The results for the  $^3D^o$  states are not always as consistent, but where significant disagreement arises ( $\sim 50\%$  level), the differences can be traced to additional mixing among levels beyond what was considered in the calculations.

As noted above, Fe II probes many kinds of interstellar environments and, therefore, is a guide to metal enrichment/depletion. The determination of  $f$ -values utilized two relatively weak transitions of Fe II for which new accurate laboratory  $f$ -values are available to place the analysis on an absolute basis. Through use of the apparent column density method, comparisons between these transitions and others (both weaker and stronger ones) allowed us to determine corrections to the existing  $f$ -values since by definition, all transitions should yield the same apparent column density in the limit of no unresolved saturated structure.

In all,  $f$ -values for 9 transitions of Fe II, spanning a range in absorption strength of over a factor 4000, were

analyzed. Figure 2 shows a composite apparent column density profile for Fe II toward  $\beta^1$  Sco, constructed by combining portions of different profiles where there is no unresolved saturated structure. The apparent column density profile is remarkable in that it shows Fe II column densities spanning a range of 10,000. The amount of Fe II in a variety of interstellar environments is more clearly defined than was possible in the past.

These astronomical results for Fe II are timely. They provide a benchmark for comparison with the ongoing work of the Iron Project. For transitions that do not involve a spin change, the available results from the Iron Project for strong lines agree nicely with our results, but the correspondence is not very good for the weakest lines. The differences for the weak lines may be attributed to the fact that the theoretical calculations could be providing a poorer representation for some of the highly excited states. Furthermore, our results are useful in placing analyses of QSO absorption systems, including those at high redshift studied with the Keck Telescope, on a firmer foundation.

With these two examples, we showed that GHRS spectra are an essential component in improving atomic oscillator strengths. Laboratory results for a select number of transitions place the astronomical data on an absolute scale for comparison with large-scale computations. These

comparisons show that the theoretical work is quite accurate in most instances and the astronomical data

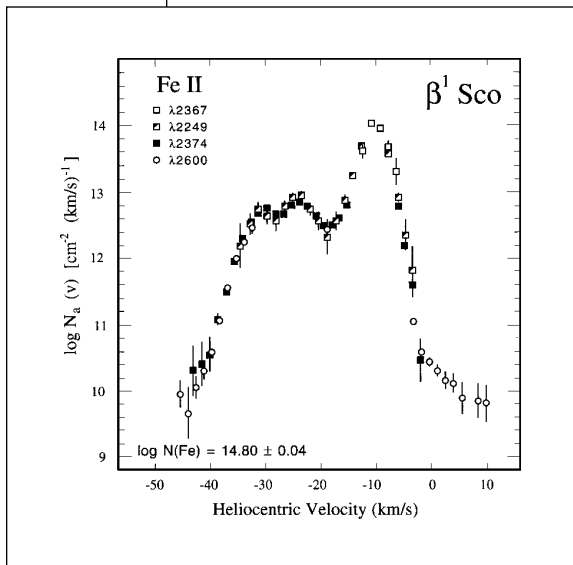


Fig. 2 — Composite apparent column density profile for Fe II toward  $\beta^1$  Sco.

suggest where further improvements can be made. In closing we note that this approach was also used to improve our understanding of ultraviolet transitions in the molecules CO (Lambert et al. 1994; Federman et al. 1994) and  $C_2$  (Lambert et al. 1995)

References

Lambert, D.L., Sheffer, Y., Gilliland, R.L. and Federman, S.R. 1994, ApJ, 420, 756  
 Federman, S.R., Cardelli, J.A., Sheffer, Y.; Lambert, D.L. and Morton, D.C. . 1994, ApJ, 432, L139  
 Lambert, D.L., Sheffer, Y. and Federman, S.R. 1995, ApJ, 438, 740

**GHRs Archival Spectra of Interstellar Zinc and Chromium**

by Katherine Roth

The HST Archive contains a wealth of images and spectra that are made available to the astronomical community within one year from the date the observations are executed. Chris Blades and I are engaged in an effort, using the spectral database, to model the disk and halo distribution, dynamics, and physical state of various

gaseous components of the Galactic interstellar medium (ISM).

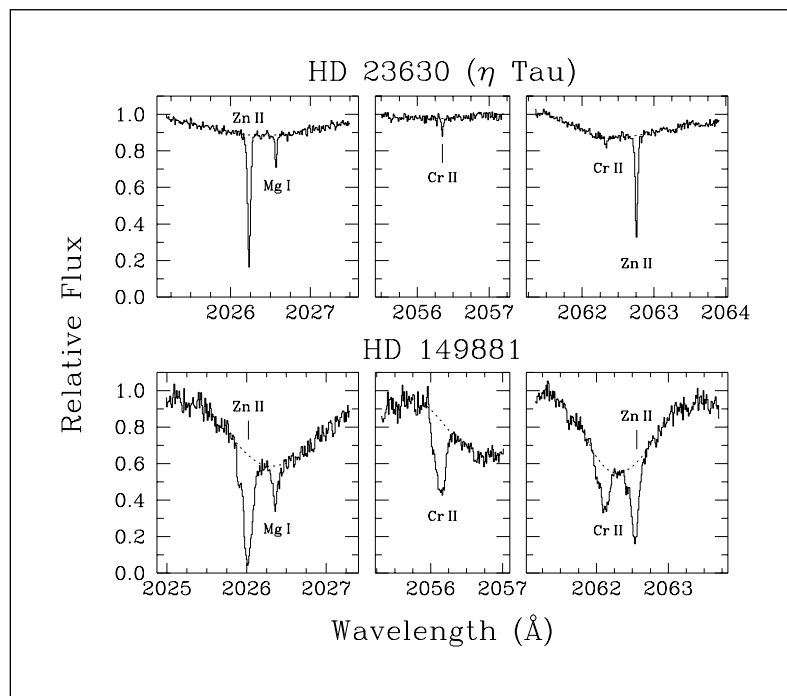
Our first results (Roth & Blades 1995) focus on the heavy metal absorption lines of singly ionized zinc and chromium. These ions reside in regions of mostly neutral material, and the typically weak line strengths are easily interpreted in terms of physical column densities without the need to invoke large saturation corrections. However, the primary motivation behind our emphasis on the abundances of these two trace metals in the ISM is the crucial role they have played in characterizing the physical state of neutral gas in damped Lyman- $\alpha$  absorption systems toward high-redshift QSOs (e.g. Pettini et al. 1994).

Our sample consists of Zn II and Cr II GHRs ECH-B spectra obtained prior to September 1993 toward 20 bright ( $m_v < 9$ ) Milky Way disk and halo stars. The observations were not affected by the failure of Side 1, and the spectral quality of these data, all obtained through the 0.25" small

science aperture, was not degraded by the spherical aberration of HST's primary mirror. In the figure we present spectra for two of these stars with the Zn II, Cr II, and Mg I line positions indicated. The pipeline-reduced spectra and calibration wavelength files were retrieved from the archive through DADS, and final data reductions made use of the IRAF and STSDAS software packages.

We derived column densities by fitting simultaneous multi-component Voigt profiles to the detected absorption features. We find, not surprisingly, that the observed large variations in Cr/Zn line-strength ratios apparent in the figure are reflected in the corresponding Cr/Zn column density ratios. We interpret this phenomenon as evidence for changing depletion levels due to dust in different lines of sight through the Galactic disk and halo.

Zn II and Cr II represent the dominant ionization stages of Zn and Cr in neutral gas, and when combined with H I and  $H_2$  measurements toward



Two representative Zn II and Cr II spectra extracted from the GHRs archive. The dotted lines represent our adopted stellar continuum levels across the interstellar absorption features. HD 23630 ( $\eta$  Tau;  $l = 167^\circ$ ,  $b = -23^\circ.5$ ) is one of the nearest stars in our sample at a distance of only 125 pc, while HD 149881 ( $l = 31^\circ$ ,  $b = -36^\circ.2$ ) is over 2 kpc away. These lines of sight illustrate the wide range of profile complexity and relative absorption strengths present in the Zn II and Cr II archival database.

these same stars (Diplas & Savage 1994; Savage et al. 1977), our measured column densities lead directly to Zn and Cr gas-phase abundances. Since Zn is generally believed to not deplete onto dust grains, Zn abundances are taken as metallicity indicators in the ISM as well as in QSO absorption systems. In contrast, Cr is highly refractory, and previous studies have shown that toward nearby disk stars nearly all ( $\geq 99\%$ ) of the Cr is missing from the gas phase and presumably has been depleted onto grains.

We find a large range of values for the gas metallicities and Cr/Zn abundance ratios in the archival data. Our Zn abundances are not consistent with the solar value, with between 25 and 75% of the Zn II apparently missing from the gas phase. The correlation between this amount of “missing” Zn and the fractional abundance of molecular hydrogen ( $f(\text{H}_2)$ ) argues that dust depletion processes are indeed affecting the measured Zn abundances, and therefore Zn is not always a reliable metallicity indicator. If we consider only the low  $f(\text{H}_2)$  lines of sight where fewer than 0.1% of the total hydrogen is in molecular form, we find  $35 \pm 6\%$  of the Zn has been processed onto grains, assuming the intrinsic metallicity of the ISM is solar. Since there are no known high  $f(\text{H}_2)$  QSO absorption systems, this suggests that existing metallicity estimates in high-redshift absorbers based on Zn/H abundance ratios are low by about 0.2 dex.

The Cr/Zn abundance ratio in the archive sample ranges from 2 — 17% solar. This approaches the observed high-redshift values of 20 — 80% solar, and perhaps it is not necessary to invoke different dust formation and destruction mechanisms in these presumably evolving galaxy precursors. Future observations with HST of more distant stars and extragalactic objects which probe the full extent of the Milky Way disk and halo will provide for a better understanding of abundance and depletion processes within the Galactic ISM. Once an

accurate fiducial has been established, more meaningful interpretations of damped Lyman- $\alpha$  QSO absorption systems will be possible.

#### References

- Diplas, A. & Savage, B. D. 1994, *ApJS*, 93, 211  
 Pettini, M., Smith, L. J., Hunstead, R. W., & King, D. L. 1994, *ApJ*, 426, 79  
 Roth, K. C. & Blades, J. C. 1995, *ApJ*, 445, L95  
 Savage, B. D., Bohlin, R. C., Drake, J. F., & Budich, W. 1977, *ApJ*, 216, 291

### The Hubble Deep Field project

by H.C. Ferguson

Among the most striking images obtained with the refurbished HST are those of high-redshift galaxies.

Impressed by the cycle-4 images, STScI director Bob Williams decided to devote a significant fraction of his HST Cycle-5 discretionary time to the study of the formation and evolution of galaxies. This project is being carried out as a community service. The data are non-proprietary and will be made available soon after they are obtained.

On March 31, a special Advisory Committee met to discuss how to best use this time to make an impact on studies of the formation and evolution of galaxies. It's recommended that the time be devoted to deep images of one field, making use of the Continuous Viewing Zone (CVZ) to increase the total exposure time. The project has become known as the “Hubble Deep Field” (HDF).

The companion article by Hans Martin Adorf in the September issue of the ST ECF Newsletter describes the issues such as field selection, filter choice, observing strategy, and options for parallel observations.

Up to date information can be found on the HDF web page under the Observer heading.

#### Field Selection

The HDF field is at 12h 36m 49.42s +62 13' 46.3" (J2000). The northern hemisphere was chosen to allow for follow-up observations from the VLA,

Keck, and KPNO observatories, although the desirability of selecting a second field in the southern CVZ is acknowledged should this be possible in the future. The field is more than two degrees away from any bright star ( $< 2$  mag), and devoid of nearby bright sources, known nearby clusters, and

**Table 1**

Limit of magnitude for 75 2100 second exposures

| Filter Name | Effective Wavelength | AB mag limit |
|-------------|----------------------|--------------|
| F300W       | 2963                 | 27.65        |
| F450W       | 4527                 | 28.11        |
| F606W       | 5940                 | 28.73        |
| F814W       | 7878                 | 28.08        |

**Table 2**

Ground-based 10 sigma Limits

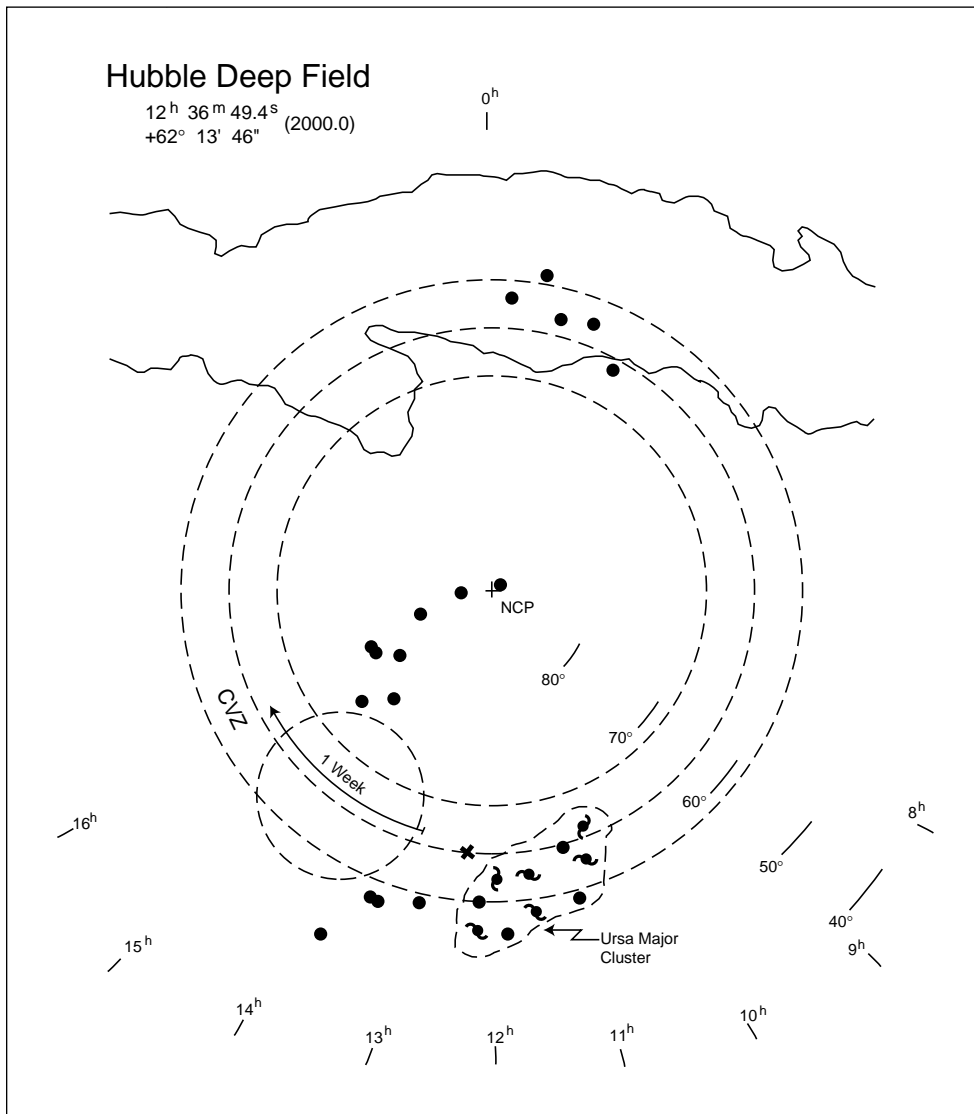
| Band             | Limit | Reference                          |
|------------------|-------|------------------------------------|
| Un <sub>AB</sub> | 26.2  | (Steidel, Pettini & Hamilton 1995) |
| B <sub>AB</sub>  | 26.2  | (Metcalf et al. 1995)              |
| V <sub>AB</sub>  | 25.8  | (Smail et al. 1995)                |
| R <sub>AB</sub>  | 25.8  | (Smail et al. 1995)                |
| I <sub>AB</sub>  | 25.1  | (Smail et al. 1995)                |

bright radio sources. The extinction is  $A_V = 0$  to within the accuracy of current measurements; 21cm observations give  $N_H = 1.72 \times 10^{20} \text{ cm}^{-2}$  along the line of sight.

#### Filter Selection

The selection is governed by balancing the desire for depth and color information as well as by practical considerations involving scattered Earth light. The current plan involves roughly equal observing times in the F300W, F450W, F606W, and F814W filters.

This filter combination provides a reasonable compromise between depth and spectral coverage, while at the same time making nearly optimal use of the “bright time” in the continuous viewing zone. Because the CVZ observations graze the limb of the Earth, there are significant periods of time when the WFPC2 background is dominated by scattered light from the Earth. The F300W observations, which



The position of the Hubble Deep Field on the sky. The wavy lines at the top of the image represent the galactic plane. The large circles show the region of the sky swept out every 55 by HST Continuous viewing zone, and the smaller circle shows the portion swept out in one week. The X marks the position of the deep field.

are always dominated by read noise, make efficient use of this time.

Table 1 shows the observing time and estimated  $10\sigma$  limiting magnitudes of our preliminary 150 orbit schedule. These numbers may change slightly for the final version. They are calculated using nominal handbook values for the bandpass throughputs, readout noise and dark current, but using predictions of a detailed zodiacal+scattered light model (SEAM) for the sky background. The object aperture size used is 20pix (approximately 0.5" diameter).

Existing HST observations indicate that most galaxies fainter than  $I \sim 23$  have half-light radii smaller than 0.2", with sizes decreasing to fainter magnitudes, so the aperture size is reasonably conservative for objects at the HDF limits.

For comparison, Table 2 shows the limits reached by the deepest ground based observations. These are 10 sigma limits on the AB (Oke 1974) system, converted from the author's 3 sigma limits, where provided. Where 3 sigma limits are not provided, we have

assumed that the 50 % incompleteness limit corresponds to 3 sigma.

With the four-filter strategy the HDF will thus reach depths at least three magnitudes fainter than the deepest ground based images in the red bands, 2 magnitudes deeper in the B band, and 1 magnitude deeper in the U band. The 80% completeness limit of current deep spectroscopic surveys is  $B_{AB} \sim 24$ , and  $I_{AB} \sim 22.5$ . For at least the next few years, information on the redshift distribution of such very faint galaxies will have to come from statistical analysis of the color distribution, or from gravitational lensing studies (e.g. Smail et al 1994).

### Data Distribution

It is our goal at STScI to provide the data as quickly and to as many researchers as possible, while at the same time making sure that the quality of the finished product is not compromised by taking too many shortcuts in the data reduction.

We anticipate that different people will want different products of the observations, ranging from all the raw data and calibration files, to final catalogues of detected objects and their photometric parameters. The current plan is to release the data on January 15, 1996, roughly two weeks after the observations are complete. This brief delay in the release will provide time for STScI to construct cosmic-ray cleaned, summed images and a preliminary source catalog, and will avoid placing an impossible load on the archive from too many people trying to access the individual data frames.

The data will be summarized in an AAS poster and a paper detailing the observational strategy and data reduction, with a minimum of interpretation.

After January 15, it will be "open season" on the HDF data and publications therefrom. At that time we hope to have the calibrated, summed images available in the HST archive, along with all the individual frames, and possibly some intermediate cosmic-ray cleaned images at different offset positions. The summed images are

small enough that they may be reasonably extracted over the network. However, the full set of individual images is large enough that it is best sent on tape. If you are sure now that you would like all the individual data frames, you may request a tape in advance from [archive@stsci.edu](mailto:archive@stsci.edu).

### **HDF Clearinghouse**

While there is likely to be lively competition in interpreting the HDF images and carrying out follow up observations, it is our hope that there will not be much needless duplication of effort. To this end, we invite anyone contemplating follow-up observations or detailed analysis to share information through the HDF web page. We will provide pointers to other web locations that describe research on the HDF. The aim is to establish a forum for publicizing the status of follow-up work in order to avoid too much duplication, and to provide points of contact for cooperation or collaboration between various investigators. If you are interested in participating, please contact [ferguson@stsci.edu](mailto:ferguson@stsci.edu).

### References

Smail, I., et al. 1995, *ApJ*, 449, L105  
 Smail I., Ellis, R. S., & Fitchett, M. J., 1994, *MNRAS*, 270, 245  
 Steidel, C. C., Pettini, M. & Hamilton, D., 1995, preprint  
 Metcalfe, N., Shanks, T., Fong, R., & Roche, N., 1995, *MNRAS*, 273, 257

### **WFPC2 UV Parallel Survey**

by John Mackenty

In July, we have initiated a new parallel program known as the "WFPC2 Ultraviolet Parallel Survey" (DD 6253). The primary goal of this survey is to discover sources with excess ultraviolet flux. The secondary goal is to determine the UV morphology for a randomly selected sample of field galaxies. This program is designed to utilize those WFPC2 parallel observing opportunities which would otherwise not be used by the Cycle 5 parallel programs and would

therefore be lost. Many of these pointings are relatively short (less than 2 orbits) and may not be CR-SPLIT. As this program is conducted as a public service, the data are placed immediately in the public archive.

At the request of the STSci Director, we have formed an internal team to define an observing program and to collect these data. Its members are John MacKenty, Sylvia Baggett, John Biretta, Daniela Calzetti, Stefano Casertano, Harry Ferguson, Andrew Fruchter, Marc Postman, Alex Storrs, and David Taylor. After consideration of the existing programs and the contents of the HST archive, we have chosen to explore a less visited region of phase space with the intention of re-visiting this decision after a few months of data are obtained.

The observing strategy is to use the WFPC2 filter which provides wavelengths slightly shorter than those available from the ground but still has the maximum available sensitivity. Ground based observations (initially the digitized sky survey plates) at longer wavelengths will be used to estimate the colors of objects and (for the single exposure instances) to discriminate between sources and cosmic rays. Please contact us if you have questions or comments.

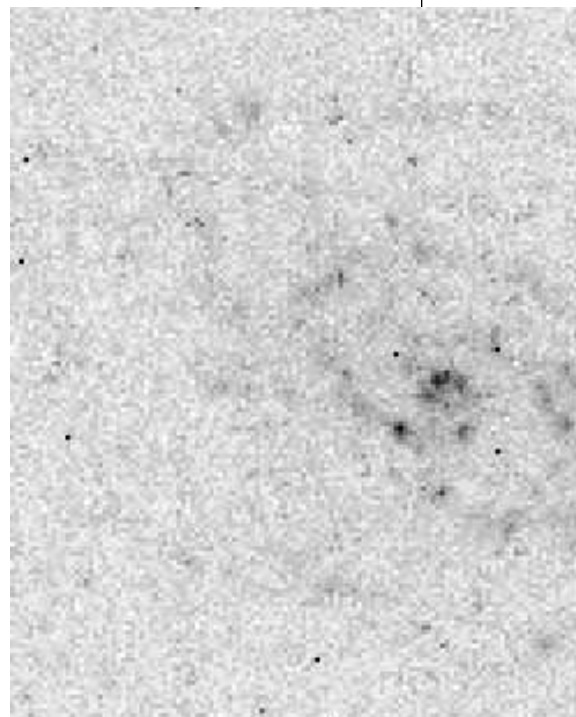
### **New Methods of Observing for the 21st Century**

by Glenn Miller, Mark Johnston and Ethan Schreier

An international workshop to consider innovative observing and scheduling strategies for the 21st century was held at the University of Hawaii in Hilo in July 1995. The workshop considered a variety of topics including queue scheduling, service and remote observing, scheduling in response to changing observing conditions, and data reduction and archiving. Speakers from a variety of observatories gave talks on their experience with new and classical modes of observing. The abstracts can be found at <http://www.jach.hawaii.edu/>

[nmo95.html](#). The proceedings will be published by the ASP.

The workshop was designed to allow staff from Gemini, Subaru, Keck, HET and ESO's VLT to learn



*Anonymous spiral galaxy serendipitously observed with WFPC2 in the F300W filter on the WF4 detector. The galaxy spans approximately 12 arcseconds and has at least 5 bright knots in its inner regions.*

from each other and from existing facilities in terms of planning for new and optimal observing strategies and operating modes. Given the cost of these new telescopes, and their ability to exploit superb seeing conditions, the large question examined at the workshop was whether traditional ground-based scheduling methods were effective in realizing the scientific potential of these new facilities. The consensus was that new scheduling techniques such as queue (or interleaved) and flexible scheduling, were not only required but have already been successfully used at several observatories. The experience of space observatories such as HST was particularly relevant, since we already do many of these things.

The need for quantitative understanding of observatory operations and observing efficiency was emphasized and several speakers presented such quantitative analyses. Tod Boroson of the U.S. Gemini Program Office/NOAO presented a simulation of operations for a traditional model and for interleaved/flexible operations. In the case of ground-based telescopes, weather is unpredictable. In addition, times of excellent seeing are not only rare (10-25%) but not very predictable. This means that with traditional scheduling, top-rated programs are not completed at a high rate and that programs don't often get the seeing they require. The analysis showed the potential gain in both quality and quantity of science if interleaved and flexible scheduling are used.

Mark Johnston's talk "Scheduling Tools for Astronomical Observations" discussed the need for automated planning and scheduling tools, outlined different approaches for solving the problems and presented examples of systems in use today. He also pointed

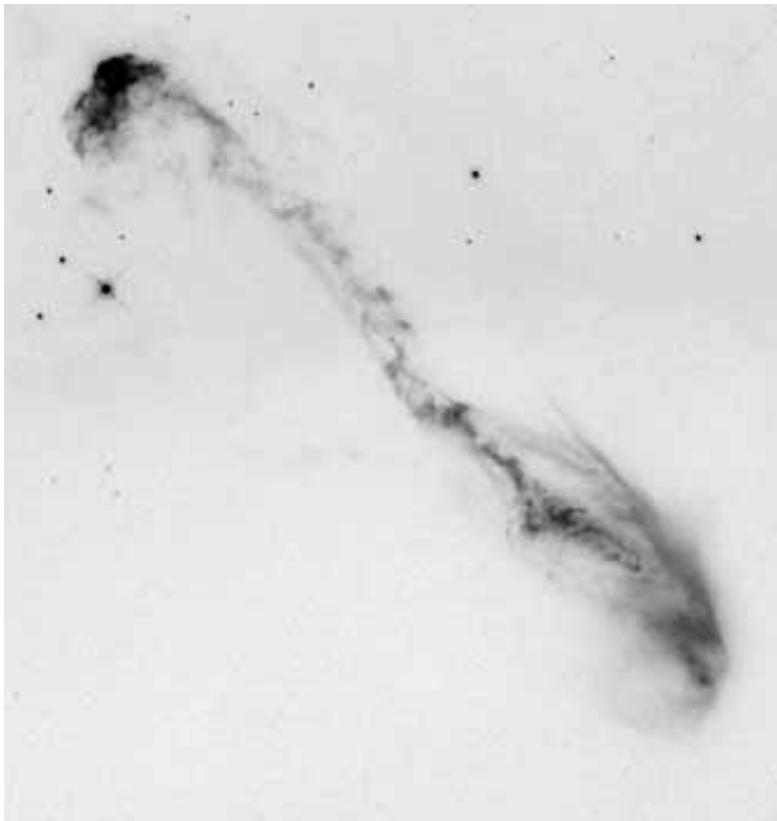
out that many projects are already using versions of the HST planning tool. The viewgraphs from this talk are available from <http://presto.stsci.edu/spike/>

In order to foster better communications between observatory schedulers, software developers and users, Johnston proposed three recommendations for the future:

- **Data Interchange:** Develop a multi-Observatory interchange format for scheduling data. This will facilitate coordinated campaigns and allow comparison of scheduling methods between facilities.
- **Benchmark Problems:** Publish benchmark problem sets and solutions for realistic observing scenarios
- **Better dissemination of information:** Provide more information to other sites about methodology, approaches, tools, results, and problems. Suggested venues include: WWW pages, listserv mailing lists and future conferences.

It became quite clear at the workshop that the experience of STScI with HST will be of increasing relevance to the next generation of ground-based facilities. HST has been operated in a "service observing" mode since the telescope first went into operations in 1990.

We plan to help with this process by participating in future workshops of this type, and we encourage the establishment of new dialogs between the STScI and other facilities. In particular, the Institute and Gemini are planning to discuss possible coordination in planning and scheduling work, within the context of a more general effort by AURA to foster technical coordination efforts among its centers.



#### **WFPC2 image of HH 47**

*An example of the images obtained with HST that are available for downloading. You can find all the press releases' photographs and texts, plus animations at <http://www.stsci.edu/public.html>.*

*To download the image directly, click the "Load to local disk" button in the Options menu at the top of the Mosaic window. If you use Netscape, you can save the image selecting "Save As" from the "File" menu. (Photo courtesy of J. Morse)*

## Scientific Instruments Status

by Ron Gilliland

Since the last Newsletter, all of the instruments on HST have continued to perform quite well and stably. In addition, results of ongoing tests to calibrate and characterize the f/48 side of the Faint Object Camera have been encouraging and we are optimistic that it will be made available for spectroscopy in Cycle 6.

The mid-point of observations between the first and (planned) second servicing missions has now been passed. The proceedings of the Second HST Calibration Workshop held at ST ScI 15-17 May 1995, (edited by A. Koratkar) were distributed. A full revision of the HST Data Handbook will be available next month.

If you would like more information, please be reminded that the World Wide Web is a repository for late breaking instrument news, frequently asked questions, details of calibrations, etc. Instrument pages may be easily accessed under the ST ScI homepage: <http://www.stsci.edu>.

### Faint Object Camera

Science and calibration observations with the f/96 relay have continued to provide excellent results.

The FOC f/48 relay has not been used for routine science observations since the initial high-voltage turn-on failure in September 1992. Subsequent engineering observations showed that the detector background was higher than nominal, time-varying and with spatial structure present. The cause of these problems is not thoroughly understood, but may be related to breakdown in insulation or potting around high-voltage components. Modifications to the turn-on procedure have enabled more robust operations, and more recent testing has shown improvements in the background noise level and greater stability. Testing of the f/48 relay, which currently provides the only long-slit spectrographic capability on HST, passed a major milestone on July 10th with a successful calibration of the slit position to an accuracy of  $\sim 0.1-0.2''$ . The troublesome excess background

dark current has continued to show improved behavior, although a format dependence was recognized in the last test — this will be further characterized before the f/48 is released for routine science observations.

### Faint Object Spectrograph

The FOS Red and Blue sides have both continued to perform well with no substantial anomalies arising. Further characterization of polarimetric capabilities has suggested substantial problems (perhaps as a result of small y-base instabilities) with gratings G190 and G270 on the Red side. Existing GO/GTOs using these have been contacted and advised to move their observations to the Blue side.

### Goddard High Resolution Spectrograph

Both Sides 1 and 2 of the GHRS have continued to return excellent observations with no substantial anomalies to report. The first use of FLYLIM for a science program was in June 1995 and resulted in a substantial reduction of background noise for this observation. This is a procedure that limits background level by throwing away 0.2 second time slices with excess counts likely to have arisen from noise bursts.

### Wide Field and Planetary Camera 2

Stable operations for the WFPC2 have also continued with no substantial problems arising. Characterization of the instrument performance has turned up an infrequent, but important type of anomaly that observers will want to guard against. A bright star just off the corner of the PC can result in multiple diffuse arcs imaged onto it. A bright star near the outer corner of the PC pyramid facet (region where outer corner of WF chip would be) can result in sharp arcs on the PC. Both types of ghosts are probably the result of incomplete/inadequate baffling of the PC relay optics. Further details may be found by browsing the WFPC2 WWW page.

The linear ramp filters are now fully operational, with the first science images being taken on 23 June. These filters provide a bandpass  $\lambda/\Delta\lambda \sim 80$

which is continuously variable from 371 to 976.2 nm. Several programs have now utilized the ramp filters and everything appears to be working well.



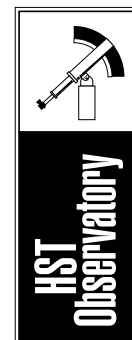
### Hubble Data Archive News

by Marc Postman

As post-COSTAR HST data accumulates in the Hubble Data Archive (HDA), usage has increased. Over the last 4 months, the average retrieval rate has been 15 Gbytes per week, comparable to the present data ingest rate. The total data volume of the HDA is now approximately 1.7 Tbytes. The Data Archive and Distribution Service (DADS) has managed this load well. Between June and August DADS was up and running 91 percent of the time. Improving the performance and reliability of DADS, none the less, remain top priorities (indeed, we would like to see the duty cycle approach 100 percent!).

One of the more significant reliability improvements will be the replacement of the Aptec array processor which handles the FITS conversion of HST datasets prior to optical disk archiving. The Aptec also controls a large staging disk which is used for both data archiving and retrieval. Aptec problems accounted for 25 percent of DADS downtime during the last quarter.

Testing of a major new tool that automates the generation of tapes for external distribution has begun. Other near term service improvements will include mass tape production and/or continuous on-line access to large, popular datasets such as the upcoming WFPC2 observations of the Hubble Deep Field (see related article in this issue) and direct electronic access to proprietary data by PIs. The latter augmentation will be coupled with direct delivery of data to your host computer and will eliminate the need to FTP data from staging areas at STScI. In the meantime, it should be noted that the STDATU staging areas do occasionally become full. Users are requested to FTP their archive



retrievals shortly after they are downloaded. The staging disk is purged of data more than 2 days old. We will significantly increase the staging disk space capacity early this fall. As a reminder, DADS status information can be obtained by typing: finger archhot@nemesiis.stsci.edu.

StarView, the primary user interface to the HDA, continues to be improved. The latest added features include: direct access to the STSci Digitized Sky Survey (DSS), display of world coordinates when previewing HST and DSS images, improved cross correlation features, and ports to Sun Solaris, DEC OSF/1 (on Alpha machines) and VMS 6.1.

Access to the DSS (which can also be accomplished through the WWW; has proved particularly popular — since the installation of remote DSS access in mid-May, we have received over 16,000 DSS retrieval requests. A new StarView modification, which should be available by this fall, is a utility to overlay HST instrument apertures on DSS images. The overlay location and orientation can be specified either by the user directly or by using the parameters from any existing HST dataset that can be displayed with the preview utility. We anticipate this utility will be very helpful in phase II planning of cycle 6 HST observations and in determining which archival data are best suited for a given research program. Other StarView improvements which should be available this fall include column reordering on the table format screen, export of query results with proper column size and order based upon parameters set in the table format screen, and a port to OpenVMS Alpha (now in beta test).

Requests for modifications of the proprietary period for HST data can now be done through STEIS. Select the "Requesting Proprietary Rights Modifications" option on the Archive home page. All requests should be received at least 2 weeks before the current proprietary period expires and must be approved by the Director's office before being enacted.

Now that the HDA is operating on a routine basis, the STSci has begun to consider options and strategies for the long-term enhancement of the archive. We can anticipate the availability of faster and higher density archival media, especially important after the 1997 servicing mission when data ingest rates will more than triple. We are now able to incorporate non-HST data (e.g., new data from the VLA FIRST survey) into the HDA on a cost-recovery basis. Database searches based upon more extensive astrophysical criteria such as color, redshift, and classification will be added to the growing capabilities of StarView. By these actions we hope to keep the HDA a vital and dynamic astronomical resource. As always, user comments and suggestions are welcome.

## STIS Hardware Status

*by George Hartig*

STIS optical alignment and testing is proceeding satisfactorily at Ball Aerospace. An alignment problem, discovered during the band 2 echelle alignments, was traced to distortion of the Mode Selection Mechanism (MSM) optics ring caused primarily by an overly long screw. This has been corrected, the ring mounting pads on the MSM were dressed to be more coplanar, and the ring has been reinstalled on the mechanism. Testing is now in progress to assure proper alignment of the ring optics. Meanwhile, alignment of the mode 1.4 echelle is proceeding. The original mode 1.3 echelle will not be installed; we will wait for the replacement echelle, which is on order.

A problem was also discovered with the order sorter mounts — a shiny ring was left unmasked at the edge of clear aperture. The filters are being dismantled and the mounts reworked to remove this potential straylight problem. The filters will likely be installed on the MSM after its reinstallation in the truss.

The NUV (Band 2) MAMA flight detector developed glow discharge on the tube exterior so the STF2 (chevron

configuration) tube is now being built up as flight prime detector and should soon undergo environmental tests. The hope is that the STF6 tube, now in electron scrub, will meet specification and supplant the less desirable chevron tube in a few months. The FUV (Band 1) MAMA flight detector is being tested.

The flight CCD noise problems were largely surmounted in the past few weeks and three of the four channels now show about 3.5 e<sup>-</sup> RMS read noise. The fourth channel is still a bit noisy (6 e<sup>-</sup>). The metal vacuum seal of the flight spare detector has been problematic, most likely due to marginal finish quality of the seal surfaces.

Optical verification testing is proceeding apace: slit-to-detector images show that the optical system is working as expected, with specifications easily being met. Verification of the aberrated OTA simulator are well underway. Images obtained with BIA CCD camera system compare well with the optical models and the Goddard Independent Verification Team is now at Ball using their wavefront sensor (ABA) to determine the image and pupil locations and aberration content of the RAS. The corrector system breadboard is scheduled to be assembled and aligned during the last week of August and will be placed in the RAS to verify the capability of the corrector mirrors to cancel the OTA aberration in early September.

## NICMOS Status

*by John MacKenty, David Axon, and Chris Skinner*

The construction of the NICMOS science instrument proceeds on schedule at Ball Aerospace. A major milestone was successfully passed with the testing of the flight detectors installed in the cooled dewar. All three detectors performed as expected and are not expected to be removed from NICMOS until after its flight in HST. NICMOS will undergo thermal vacuum testing next spring at Ball and

is expected to arrive at Goddard Space Flight Center in August 1996.

The NICMOS IDT (Rodger Thompson, PI) and the STScI are working together to prepare for NICMOS operations. The Proposal Instructions are essentially complete and the commanding software is on schedule and approaching the half way mark. The data reduction pipeline has proceeded through the Preliminary Design phase and several elements (including enhancements to IRAF/STSDAS and the basic image calibration parts) passed their Final Design reviews and are being coded. The SMOV requirements have been defined and an initial draft of the activities to be performed has been written. A NICMOS mini-Handbook was distributed with the Cycle 6 Call for Proposals and a complete NICMOS Instrument Handbook and Proposal Instructions are being prepared for Cycle 7.

## Manifest for the Servicing Mission 1997

by Manfred Miebach

During the Critical Design Review (CDR) of the Second Servicing Mission the "1997 Manifest" was presented specifying the priorities in hardware to be exchanged and activities including its priorities for the upcoming Servicing Mission presently scheduled for February 1997.

### Primary Priority Items

The primary priorities has been assigned to the replacement of the GHRS with the second-generation Space Telescope Imaging Spectrograph (STIS), the replacement of the FOS with the Near-Infrared Camera and Multi-Object Spectrometer (NICMOS), and the replacement of FGS-2.

A special aspect of the Instrument change-out is the fact that STIS is extremely sensitive to particulate contamination. This results in stringent requirement for the sun-avoidance volume in the cargo bay of the orbiter and STIS aperture pointing during the

change-out. One unique aspect of the NICMOS change-out is the addition of another kind of interface: the cryogenic venting system. Beside the mechanical, electrical, and software interface the cryogenic interface provides an exhaust path for the gaseous nitrogen from the solid cryogen dewar. Next in the list is assigned to the Spare Data Interface Unit (DIU) that will replace DIU #2 whose A-side electronic has failed due to a short circuit in the Power Control Unit (PCU) during the First Servicing Mission. This spare will restore critical redundancy for commands and telemetry. A reboost test will be performed next. A reboost of HST to a higher altitude is mandatory for the Third Servicing Mission in November 1999 especially in the light of the expected maximum of the solar cycle during that time. The objectives of the Reboost Test is to demonstrate the ability to reboost HST *without* retracting the solar arrays. To improve mechanical stiffness a support post will be installed on the Flight Support System. Finally, the Spare Engineering Science Tape Recorder (ESTR) will replace the faulty Tape Recorder #2.

### Secondary Priority Items

Priority #1 within the Secondary Priority category is assigned to the replacement of ESTR #1 with new Solid State Recorder (SSR). The new SSR provides 10 times the capacity (12 GBIT versus 1.2 GBIT) of the existing mechanical recorders. Furthermore, the new unit will allow simultaneous recording and dumping of science data. Priority #2 within the secondary category is assigned to the Hemispherical Resonator Gyros (HRG) to replace Remote Sensing Unit # 3 (RSU-3) and Electronic Control Unit #3 (ECU-3). All of the Gyros onboard are of concern because of the generic corrosion of the flex leads and in the long term because mechanical gyros are a technological dead end. The new HRG has no wear-out mechanism and is based on a solid state gyroscope with a silica hemispherical shell as the inertially sensitive element. Its expected lifetime is more than 15 years

compared to 5 years of the existing onboard Gyros. Priority #3 has been reserved for the Spare Rate Sensing Unit (RSU) to replace RSU #2. Finally, Priority #4 has been assigned to the Spare Solar Array Drive Electronics (SADE) to replace SADE 2. Prior to the First Servicing Mission SADE #1 failed due to thermally over stressed transistors. The SADE 1 unit has been refurbished including the addition of transistor heat sinks.

The Critical Design Review did not reveal any serious "show stopper" for the upcoming Servicing Mission, which as of now is scheduled for February 13, 1997, which - by the way - is NOT a Friday.

## Filter choice for the Advanced Camera for Surveys

by Mark Clampin

The Advanced Camera for Surveys (ACS) is a 3rd generation instrument for HST. It is scheduled for installation during the 1999 Servicing Mission. ACS consists of three cameras, a Wide Field Channel (WFC), a High Resolution Channel (HRC), and a Solar Blind Channel (SBC). The WFC features a 204" x 211" field of view, with a plate scale of 0.05"/pixel, and is optimized for sky-limited V and I-band imaging. The HRC provides spectral coverage from 200-1000 nm with a 26" x 27" field of view and an effective plate scale of 0.026"/pixel. The SBC covers the spectral range 115-170 nm with a 30" x 33" field of view and a plate scale of 0.03"/pixel.

The Camera has two filter wheels shared by the WFC and HRC, and a third filter wheel for the SBC. A total of 29 filters will be mounted in the WFC+HRC filter wheels. The filter wheel closest to the detector will contain a clear slot allowing the WFC+HRC cameras to be used in parallel with the broadband filters.

The preliminary filter complement for the WFC+HRC channels is shown in Table 1. The science team has chosen to adopt the Sloane Digital Sky Survey (SDSS, AJ submitted) filter set (Fukugita et al 1995) as one of the

| Slot | Wheel #1                                     | Camera |
|------|----------------------------------------------|--------|
| 1    | Clear                                        | WFC    |
| 2    | i (SDSS)                                     | WFC    |
| 3    | z (SDSS)                                     | WFC    |
| 4    | r (SDSS)                                     | WFC    |
| 5    | g (SDSS)                                     | WFC    |
| 6    | Johnson B                                    | WFC    |
| 7    | Johnson V                                    | WFC    |
| 8    | Broad V (F606W)                              | WFC    |
| 9    | Broad I (F814W)                              | WFC    |
| 10   | F658N - H $\alpha$ ( $\Delta\lambda = 1\%$ ) | WFC    |
| 11   | F502N - [OIII] ( $\Delta\lambda = 1\%$ )     | WFC    |
| 12   | UV Polarizer (0°)                            | HRC    |
| 13   | UV Polarizer (60°)                           | HRC    |
| 14   | UV Polarizer (120°)                          | HRC    |

| Slot | Wheel #2                                   | Camera |
|------|--------------------------------------------|--------|
| 1    | Clear                                      | WFC    |
| 2    | 220 nm (180 - 250 nm)                      | HRC    |
| 3    | 220 nm (200 - 300 nm)                      | HRC    |
| 4    | u (SDSS) (300 - 400 nm)                    | WFC    |
| 5    | F550M - 547 nm cont                        | WFC    |
| 6    | Grism                                      | WFC    |
| 7    | [OII] Ramp                                 | WFC    |
| 8    | [OIII] Ramp                                | WFC    |
| 9    | Ha Ramp                                    | WFC    |
| 10   | IR Ramp                                    | WFC    |
| 11   | Redshift quad                              | WFC    |
| 12   | Uis Polarizer (0°)                         | HRC    |
| 13   | Uis Polarizer (60°)                        | HRC    |
| 14   | Uis Polarizer (120°)                       | HRC    |
| 15   | clear                                      | HRC    |
| 16   | UV prism                                   | HRC    |
| 17   | u' (300-380 nm)                            | HRC    |
| 18   | F344N - Ne V ( $\Delta\lambda = 2\%$ )     | HRC    |
| 19   | CH4 ( $\lambda_c=892, \Delta\lambda=2\%$ ) | HRC    |

| Slot | Wheel #1                            | SBC |
|------|-------------------------------------|-----|
| 1    | Blank                               |     |
| 2    | Longpass MgF <sub>2</sub> (>1150 Å) |     |
| 3    | Longpass CaF <sub>2</sub> (>1250 Å) |     |
| 4    | Blank                               |     |
| 5    | Longpass BaF <sub>2</sub> (>1400 Å) |     |
| 6    | Crystalline quartz (>1500 Å)        |     |
| 7    | Blank                               |     |
| 8    | CaF <sub>2</sub> Prism (R~100)      |     |
| 9    | LiF Prism (R~100)                   |     |
| 10   | Blank                               |     |
| 11   | CIV 1450-1650 Å                     |     |
| 12   | L $\alpha$                          |     |

primary broadband filter systems, along with the standard U, B, and V filters for WFC programs. For deep imaging with WFC, two broad bandpass filters are provided, a V filter similar to the WFPC2's F606W (employed for the Medium Deep Survey), and an I band filter similar to the WFPC2 filter F814W. For high efficiency near-UV imaging in the HRC channel, two broadband filters are provided, one centered at 220 nm and one at 250 nm.

For wide-field, narrow-band imaging there are H $\alpha$  and [OIII] filters, each with a bandpass of 1%. To complement them there is a medium-band continuum centered at 547 nm with a bandpass of ~11%. The majority of narrow-band imaging will be undertaken using ramp filters similar to those in WFPC2, but with a significantly larger monochromatic field of view (70" x 30") at any given wavelength. Four ramp filters will cover the wavelength region 365-985 nm, with a bandpass of 2% at any given wavelength. Each ramp filter will have three strips which are arranged parallel to the rotation direction of the filter wheel. This will permit the central strip in each filter wheel to image onto the HRC as well as the WFC. Two additional 2% bandpass narrow-band filters are included to provide HRC imaging in the NeV line, for imaging of AGN nuclei, and the methane band (892 nm) for imaging of solar system objects. Finally, a quadrant filter is included to provide four 100" x 100" field of view medium bandpass filters.

The ACS filter complement has two sets of polarizers optimized for UV and visible band polarimetry with the HRC. The UV polarizers will be optimized for the 200-400 nm region and are located in filter Wheel 1 to permit them to be crossed with the UV filters in Wheel 2. The visible band polarizers are located in filter Wheel 2 and are designed to be crossed with broad and narrow band filters in Wheel 1. Each set of polarizers comprises three separate elements which give relative polarizer angles of 0°, 60° and 120°, respectively.

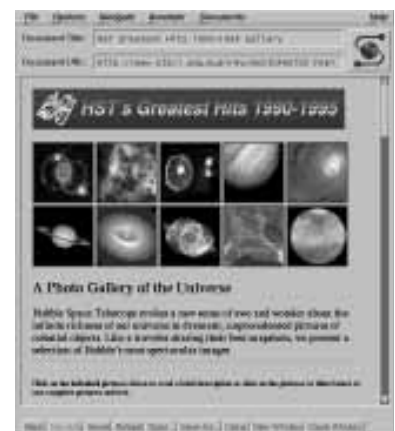
High efficient, low dispersion spectroscopy is provided by a grism for the WFC and a UV prism in the HRC channel.

The SBC filters are selected for imaging programs in the FUV and are shown in Table 2. A narrow-band Lyman- $\alpha$  filter will isolate this line for observations such as auroral emission on Jupiter. A narrow band CIV filter is provided for imaging of the nuclei of AGN. Longpass filters, designed for use in pairs are provided to isolate a specific bandpass, and will provide coverage of the spectral region from 120-160 nm where the SBC has good sensitivity. A LiF prism provides a high transmission, high efficiently and relatively constant dispersion from 120 nm to 180 nm. A CaF prism performs a similar function, but with a cutoff wavelength which blocks Lyman- $\alpha$  emission.

### Space Telescope Analysis News

The Space Telescope Analysis News are 3 monthly electronic publications with news and information on the FOS, GHRS and WFPC2.

If you are not in our mailing lists and would like to receive them, please send a message to [help@stsci.edu](mailto:help@stsci.edu)



Explore HST's greatest hits at <http://www.stsci.edu/public.html>.

## Cycle 6 Proposal Selection Schedule

by Ron Downes and Mike Shara

As mentioned in the previous Newsletter, the deadline for Cycle 6 proposals was September 15, 1995. Upon careful review of the proposal selection process, we have made two major changes which will allow for a more thoughtful selection by the Telescope Allocation Committee (TAC), and for more rapid notification of the results to the proposers.

In the past, the TAC meeting occurred immediately after the panel meetings, which did not allow the TAC members to study the results of the panel meeting. We have now included a 1.5 week delay between the two meetings, so the TAC members can have the time to assure a properly balanced science program, both between panels and within a given panel. With this extra time, we will also be asking the TAC to look more carefully at the large (with more than 60 orbits) science programs.

The notification letters have all been mailed to the proposers on the same day. However, their arrival seem to spread over a two week period. In order to assure that all proposers receive their results at the same time, and to make it as short as possible, we will be sending electronic as well as paper notification letters.

The post-deadline schedule for Cycle 6 is as follows: Around the end of September, the referees will begin their scientific evaluation of the proposals, and the Panel Coordinators (STScI scientists) will perform a technical evaluation. These evaluations, along with preliminary grades, will be loaded into our TAC database in preparation for the scientific panel meetings. There are 10 scientific panels, which will meet in two groups from October 30 - November 1 and November 2 - 4. The TAC meeting is scheduled for November 17-19. After verification of the database, the STScI Director's review will occur the week of December 11. The electronic notification letters should be sent the

week of December 18. The paper letters will follow shortly thereafter.

## General Observer/Archival Researcher Funding

by Ray Beaser

Phase I budgets for U.S. astronomers are required only for Cycle 6 Archival Researcher Proposals. Budgets for U.S. General Observers (GO) will be requested after the selection of Cycle 6 observing Programs. The GO budgets will be submitted for the Phase II deadline early next year after the selection of the program.

Funding notification letters for Cycle 5 General Observer Programs were mailed on July 12 and August 1, 1995. The deadline for the receipt of revised Cycle 5 budgets was extended until September 30, 1995.

Due to NASA budgets constraints, it has become necessary to change the method of funding GO/AR programs. Preparatory funding will be reduced to a maximum of 10% of the approved funding for a program and should be requested only when essential to prepare for the receipt of HST data. The balance of funding will be conditionally awarded upon the receipt of observational data. Expenditures on a project will be limited to a funding profile which will initially release 50% of the available funding, with the balance available eight months later.

## HST Long-Range Observing Plan Now Available via the World Wide Web

by Glenn Miller, Peg Stanley, and Wayne Kinzel

The HST long-range observing plan is now available via the Presto Program Information page. From the STScI Homepage you should select "Observer" and then "Program Status and Visit/Scheduling Unit level information".

After entering your proposal id number, a summary of the proposal status will be displayed. Selecting

"Visit Status Information" will give the status of each visit in the program. Plan Window information for unexecuted visits is now included in this page.

Observations are assigned "Plan Windows" which are a subset of the observing opportunities dictated by the scientific and spacecraft constraints. For most observations, Plan Windows are between 2 and 8 weeks in duration, but they can be shorter or longer depending on the visit's constraints. Barring unforeseen circumstances, your visit will be executed within its Plan Window.

It is easier to implement changes received at least 6 weeks before the published Plan Window opens. Changes received beyond this time may delay execution of the visit.

For the observer, the long-range plan provides the obvious benefit of indicating when the observation will be executed, to monitor the progress of the project and plan for the data reduction and analysis. Long-range planning also has several benefits to the entire observatory. The plan allows the Program Coordinators and other observatory staff to order their proposal preparation work. The plan allows the STScI to monitor the progress in executing the Cycle's observations including the detection of inter-proposal conflicts. The long-range plan is also a tool for increasing observing efficiency by exploiting opportunities of good target visibility (e.g. continuous viewing zone or avoidance of South Atlantic Anomaly impacts). Another important use of the long-range plan is in re-planning observations which miss a scheduling opportunity.

If you have any questions about the assigned plan windows or status of the visits you can contact your Program Coordinator (who is listed on the program status page). There is also detailed help which explains the proposal and visit status values. Just click on the appropriate item to see a more detailed explanation.





**Welcome New Members**

*by Goetz Oertel, AURA President*

We are pleased to announce that the University of Minnesota and the University of North Carolina - Chapel Hill have joined AURA as its newest members. Bruce Carney from Chapel Hill and Len Kuhi from Minnesota have joined our Board. We cordially welcome them. Len had served on the Board previously, from 1978 to 1989, when he was at the University of California — we are glad to have him back! Bruce has worked closely with us in several capacities. We are glad to see him in this new role.

**Key AURA Committees**

*by Diana Whitman, AURA Corporate Office*

Annual elections at the AURA Board meetings change the membership of key committees of the Board. As a result of this year's elections, the members of the Executive Committee and the Space Telescope Institute Council (STIC) are:

**Executive Committee:**

|                            |                                             |
|----------------------------|---------------------------------------------|
| Bruce Margon, Chair        | University of Washington                    |
| Richard Zdanis, Vice Chair | Case Western Reserve University             |
| Donald Baldwin             | University of Washington                    |
| Jay Frogel                 | The Ohio State University                   |
| John Huchra                | Harvard/Smithsonian Center for Astrophysics |
| Morton Lowengrub           | Indiana University                          |
| Richard Margison           | University of Illinois                      |
| Goetz Oertel               | AURA                                        |
| Vera Rubin                 | Carnegie Institution of Washington          |
| Lee Anne Willson           | Iowa State University                       |

**Space Telescope Institute Council (STIC):**

|                            |                                  |
|----------------------------|----------------------------------|
| Malcolm Longair, Chair     | University of Cambridge          |
| Donald Baldwin, Vice Chair | University of Washington         |
| Neta Bahcall               | Princeton University             |
| Jacqueline Bergeron        | European Southern Observatory    |
| Richard Ellis              | University of Cambridge          |
| Elizabeth Hoffman          | Iowa State University            |
| Jonathan Grindlay          | Harvard College Observatory      |
| Robert Millis              | Lowell Observatory               |
| Goetz Oertel               | AURA                             |
| Douglas Richstone          | The University of Michigan       |
| Lyman Spitzer, Emeritus    | Princeton University Observatory |
| Robert Szczarba            | Yale University                  |
| Juri Toomre                | University of Colorado           |
| Edwin Turner               | Princeton University Observatory |

The detailed scheduling of HST observations is performed on a weekly basis and begins 4 weeks prior to the week of execution. Approximately 3 weeks before the week of execution the preliminary timeline of observations has been established. At this point, the scheduled start and end time of a visit will be displayed on the WWW page. This information is also e-mailed to the Principal Investigator or program Contact Co-Investigator and posted to STEIS. In most cases, the observations will be executed at this time, but it is possible that the timeline can be disrupted by instrument or spacecraft problems or target of opportunity observations.

We welcome your comments and suggestions on this new service.

**Science with the Hubble Space Telescope — II**

**A Scientific Conference co-organized by ST Sci and ST-ECF**

*December 4-8, 1995*

**UNESCO Buildings — Paris**

The aim of this Conference is to present and discuss the results of the last two years of operations with the fully restored HST. The program will also include reviews of future HST Instruments, plans for future maintenance missions, and a Special Session on "Education and HST."

The Scientific Organizing Committee consists of P. Benvenuti, J. Bergeron, R. Ellis, R. Fosbury, H. Hammel, R. Kirshner, R. Kudritzki, D. Macchetto, G. Miley, V. Rubin, and E. Schreier

**For further information contact:**

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 Cheryl Schmidt at ST Sci  
 (schmidt@stsci.edu)

## Office of Public Outreach

by *Ethan Schreier*

During the Institute's strategic planning process in 1993-1994, education was identified as one of the four "pillars" of our long range plan. Subsequently, with NASA's encouragement and support, and with the endorsement of the Space Telescope Institute Council, we set out to greatly expand our public outreach and



education activities.

Over the past year, we have set up a new Office of Public Outreach, recruited staff, solicited outside advice, started familiarizing ourselves with the world of science education, developed a preliminary science education plan, and embarked on a variety of projects.

A key element was to convene an external advisory committee — the STScI Advisory Council on Education (STACE). This group of 12 experts from the science education community — astronomers, teachers, and educators, from museums, universities, and schools, met for the first time last fall. They provided general guidance and specific advice on how to construct a balanced program spanning both formal and informal education activities. Following their strong recommendation that we build on existing programs, we also embarked on a series of visits and contacts with other science education programs, providing us with further valuable insights into the world of science education.

The STScI Office of Public Outreach consists of three groups. The News and Information group encompasses our previous Education and Public Affairs Office, headed by Ray Villard. Ray, with Cheryl Gundy and others, continues to work with HST's users and with NASA to support press releases and otherwise keep the media informed about the outstanding science

being done with HST. The Education group, led by Anne Kinney, has embarked on a variety of programs, continuing and extending the pioneering work done by Laura Danly, the original lone "Education Project Scientist" at the Institute. Finally, the Products and Services group, led by Trish Pengra, provided the infrastructure to produce graphics, photos, animations, posters, TV production, internet, and other technical and programmatic support for our education and public information projects. We have been or are engaged in a number of projects — local classroom activities, planetarium shows, museum exhibits, teacher workshops, etc. — which will be discussed in future issues of this newsletter. In separate articles of this issue, we discuss the IDEA grants program and a workshop recently held at the Institute.

Meanwhile, we want to thank everyone who has helped develop our expanded outreach program, especially mentioning: Laura Danly and Bob Brown, who as "voices in the wilderness" worked both locally and nationally to advocate STScI activities in astronomy education; Mimi Bredeson, who helped with the transition to the new organization structure; Ray Villard, who kept the news releases flowing; Anne Kinney, who moved into a new domain and started formalizing our education program; and Trish Pengra, who while new to the Institute, was key to our success in starting new programs while keeping essential existing activities and interfaces with NASA going.

Finally, during the last year, we engaged in a national recruitment for a head of OPO. By the time this newsletter is printed, Dr. Carol Christian, formerly at the Center for Extreme Ultraviolet Astrophysics at Berkeley, will have taken over to lead OPO. We enthusiastically look forward to Carol's work with us.

## Time for a Good IDEA

The call for proposals for IDEA grants (Initiative to Develop Education through Astronomy) went out on August 17th via e-mail and the following week by regular mail.

IDEA grants provide funding for professional astronomers to develop and carry out innovative educational and outreach programs with an emphasis on collaborating with teachers or education specialists. Proposals can be submitted in a wide range of topics, including teacher and student workshops, curriculum or product development, internet usage, multi-cultural programs, public outreach, student outreach, students research opportunities, and teacher resources. The IDEA proposals can be made in either of two categories: small projects, not to exceed \$6,000, and large projects, not to exceed \$20,000.

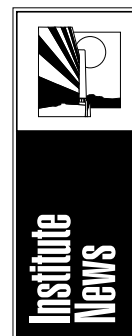
The deadline for submission of proposals is October 31, 1995. Proposals will be evaluated by a panel of astronomers, teachers, and education specialists. Inquiries about the proposal process, and requests for a call for proposals can be made to [idea@stsci.edu](mailto:idea@stsci.edu).

## Keeping the Public Tuned-in to Hubble's Discoveries

by *Ray Villard*

Every month, dozens of popular articles describe Hubble Space Telescope's contributions to modern astronomy, while students and adults around the world download the telescope's latest images across the Internet. The STScI Public Information Office helps to disseminate this newsworthy science to tens of millions of interested individuals.

Continual, positive news coverage for Hubble has several benefits. Space Telescope's discoveries consistently fire the public's imagination and have intrinsic cultural, educational and intellectual value. Furthermore, because the HST project is federally funded, taxpayers have a right to learn what they are getting for their



investment, as well as to have an opportunity to share in the wonder of exploration and discovery. Finally, the resurgence of astrology, UFO sightings and other occult “sciences” betrays an alarming lack of public understanding about science. Hubble’s accomplishments demonstrate that true scientific research is exciting, revealing, and challenging.

If you have scientific results that you believe have popular interest, we are here to help you communicate your findings to an information-hungry public. Because most people are unfamiliar with astronomical terms and concepts, science reporting requires a great deal of explanation and simplification. We provide a full range of services intended to generate clear, accurate and timely news coverage of Hubble’s latest findings.

### **What we can do for you**

#### *Science Communication*

We translate scientific findings into concise, accurate and understandable press releases and background informational material for the news media and public.

#### *Image Processing*

We format and layout HST images for reproduction as photographic prints, slides, and electronic files.

#### *Science Visualization*

We create science illustration of results and prepare simplified diagrams. We use state-of-art computer animation for showing astronomical concepts that involve temporal changes, spatial relationships or three-dimensional structure.

#### *Video Production*

We produce video news releases including animation, diagrams and interviews with the principal investigator. This product provides all the elements a TV news station needs to prepare a report for broadcast.

#### *News Coordination*

We work with your home university press office to simultaneously release news of your research. If your results

are being announced at AAS or other science conferences, we will prepare and provide all news materials needed by reporters attending the conference. We can serve as the contact point for filtering and coordinating media request for interviews, so that you are not swamped with queries.

#### *News Distribution*

Press releases reach several hundred news reporters and science journalists internationally, through direct mail, Internet, and FAX transmissions. NASA and ESA co-release much of this material to their respective mailing lists. Results are also posted on SpaceLink, NASA’s computer bulletin board.

Video news releases are mailed directly to all major networks to be edited into televised reports.

Our Internet home page allows millions of people to directly access Hubble images, spectra, animation and news information independently from traditional news sources.

A variety of outside educational products incorporate our information and images including slide sets, posters, color newsletters, educational video and CD-ROMs. This material is available to educators, planetariums and science museums.

### **Some General Guidelines**

Your research has genuine news value if your results:

1. Represent a major discovery of a new phenomena or class of object (i.e. brown dwarfs), or are so significant they decisively clarify a mystery or controversy in astronomy.
2. Present a new mystery or unexpected new complexity to a known phenomena (i.e. observations of “naked” quasars).
3. Are a significant step forward in a specific research area (i.e. refined value for the Hubble constant).
4. Are an incremental but important step forward in knowledge in a given area (i.e. new structure in the Beta Pictoris disk).
5. Set a new astronomical record or benchmark (i.e. the farthest known

galaxy, smallest identified star).

6. Deal with unpredicted, transient events (nearby comets, a nova, changing weather on a planet).
7. Provide new insights into: cosmology, extrasolar planets, black holes, dark matter, solar system objects, distant galaxies, Earth’s evolution, extraterrestrial life.
8. Are scientifically interesting but also invite curiosity or novelty (i.e. O<sub>2</sub> on the moon Europa)
9. Yield images that are visually striking and have aesthetic appeal, even though there is no new science (i.e. interior of the Orion nebula)

### **Pathway to Issuing a News Release**

If you have results that you feel might be of interest to the public:

1. Call Ray Villard (Public Information Manager) at (410) 338-4514 or send e-mail to villard@stsci.edu to discuss the results and the data.
2. Following a telephone interview, we will e-mail to you a draft news release, photo caption, and sample image for final review and approval. We will work with you to develop graphics to further clarify and explain your results.
3. We will coordinate with you and your home university public information office to set a date for release. Typically, one month is required to prepare a press kit, so it’s important that we be contacted well in advance of a publication or conference deadline. The press release date will usually coincide with acceptance of your research for publication in a science journal. You might also be asked to participate in a televised press conference broadcast from NASA Headquarters in Washington, D.C.
4. Following the release we can provide you with a bibliography of newspapers that carried the story.

### **Special Circumstances**

If your results warrant announcement in an IAU telegram, please contact us *before* issuing a telegram. Under special circumstances we can prepare and distribute a press release within 24 hours of notification. In the absence of a press release only a few reporters

will pick up on the IAU circular, and this will diminish chances for broad news coverage. Also it is more likely a reporter will get the facts wrong without a release that provides a full explanation and background.

### **News Exclusives**

Researchers sometimes are contacted by reporters from individual magazines who request data for immediate publication. In the spirit of fair play, please defer such requests by telling the reporter that they will have to wait for a formal news release. Giving such exclusives diminishes chances that your results will be picked up by the mainstream news media.

### **ST Sci Education Awareness Workshop**

The saying, "Tell me, I may listen. Show me, I may understand. Involve me, I will learn" aptly captures the changes taking place in science education. There are new curriculum standards. New teaching methods. More schools have computer labs and some are even on-line. There may not be much about a schoolroom we would recognize from our own experiences, but some things don't change. Students still need exposure to the excitement of scientific discovery and role models. It is important for astronomers to get involved in science education, so it is important to understand today's classroom and how we can best contribute.

STScI held the first in a series of one day workshops aimed at educating astronomers about the process of education. The workshop was moderated by Ramon Lopez, the Director of Education and Outreach at the American Physical Society, and Karen Worth, a Senior Associate at the Educational Development Center in Boston. Attendance was limited to classroom size to encourage dialogue, and the agenda included a demonstration hands-on activity.

Dr. Worth introduced two definitions of science — one is the way scientists perform science, and the other is the

way, inadvertently, science is taught. The scientists' version is "Science is the continuing search for underlying commonalities in apparently disparate phenomena. Science is an intense engagement with things that arouse curiosity in us." The student version is "There is something called Science, in which I am told what to see, what to know, and what to think. This Science is rather unrelated to my world, so I give up using and trusting my senses."

Dr. Worth and Dr. Lopez presented a picture of education as a dialogue, where the students learn by experiencing the concepts. In the workshop's hands-on exercise, Investigating Floating and Sinking, the underlying, complex concept that was being introduced — that of density — was not mentioned. The exercise was designed to give the students the experience necessary to understand the

concept, which was to be introduced in a future class.

The workshop was attended by STScI staff, including Director Bob Williams, and by NASA Headquarters staff as well as staff from Goddard Space Flight Center. Another one-day workshop is planned for the late fall. To request more information, contact outreach@stsci.edu.

### **Hubble Postdoctoral Fellowship Program**

*by Howard Bond*

The Space Telescope Science Institute announces the continuation of the Hubble Postdoctoral Fellowship Program, in cooperation with astronomical institutions throughout the United States. The main objective of



*Workshop attendees (seated left to right) Marie Wicks, Baltimore City Materials Manager, Ethan Schreier, Associate Director, STScI, Julian Parks, Teacher, Baltimore City College High School, FUSE Science Outreach, Karen Worth, Workshop Co-moderator, Science Associate, Educational Development Center, John Wood, Astronomer, GSFC, Anuradha Koratkar, Astronomer, STScI, (standing) Ramon Lopez, Workshop Co-moderator, Director of Outreach, American Physical Society*

the Program is to provide opportunities for postdoctoral research on problems that are broadly related to the scientific mission of the Hubble Space Telescope, and compatible with the interests of the host institutions. The program is open to applicants of any nationality, who have earned (or will have earned) their doctoral degrees on or after January 1, 1993, in astronomy, physics, or related disciplines.

The duration of the Fellowships is for a total of three years, which includes an initial appointment of two years and an extension to a third year, contingent on a positive mid-term review. Subject to availability of funding from NASA, up to 8-10 new Hubble Fellows will be appointed this year, through grants to United States institutions.

The Announcement of Opportunity, including the detailed application instructions and forms, may be obtained by writing to the Hubble Fellowship Program Office at STScI at [hfellows@stsci.edu](mailto:hfellows@stsci.edu). Information is also available at [http://www.stsci.edu/Hubble\\_fellow.html](http://www.stsci.edu/Hubble_fellow.html)

The application deadline is November 15, 1995. The new Hubble Fellow appointments are expected to begin on September 1, 1996. Women and members of minority groups are strongly encouraged to apply.

### **Sabbatical Visitors at ST Sci**

In order to promote exchange of ideas and collaborations in HST-related science, STScI expects to provide limited funds to support visiting scientists who wish to spend extended periods of time (typically three to six months) doing research at STScI. Typically the visitor is on sabbatical leave from his or her home institution. In general, these visitors will have the status of STScI employees and have access to the same facilities available to staff members, including those at NCSA facilities.

Established scientists who might be interested in such a visit during the summer of 1996 or during the academic year commencing in

September 1996 should send a letter specifying the suggested period for the visit and any other relevant details to the Visiting Scientist Program, c/o Nino Panagia ([panagia@stsci.edu](mailto:panagia@stsci.edu)) at STScI. Applicants should also include a statement of research plans and a copy of their curriculum vitae. Applications received by November 1, 1995, will receive full consideration for visits planned in the academic year 1996-97.

Confirmed sabbatical visitors for the academic year 1995-96 include Henny Lamers (University of Utrecht), Tom Wilson (Max-Planck-Institute für Radioastronomie, Bonn) and Ronald Webbink (University of Illinois).

### **Recent Staff Changes**

ROBIN AUER transferred to the Servicing Mission Office as Administrative Secretary, on June 26, 1995.

RAYMUNDO BAPTISTA, left the Institute on June 30, 1995 for a position at St. Andrews University.

KIRK BORNE, former Associate Scientist in the Archive Branch, left the Institute on July 28, 1995 for a position at NSSDC.

GARY BOWER, a former Postdoctoral Fellow, left the Institute on June 30, 1995. He is now at the Johns Hopkins University.

GUIDO DeMARCHI, left on July 31, 1995 for a postdoctoral position at ESO.

MEGAN DONAHUE joined the Archive Branch as Archive Scientist/Assistant Astronomer on October 1, 1995.

HARRY FERGUSON joined WFPC2 group as Instrument Scientist/Assistant Astronomer on September 1, 1995.

GINA JONES, former Research Assistant, left the Institute on July 28, 1995.

SEBASTIANO LIGORI joined the Institute on April 3, 1995 as a Graduate Student.

BRIAN McLEAN was promoted to Scientist on June 1995.

KEITH NOLL transferred to the WFPC2 group as Instrument Scientist/Assistant Astronomer, effective June 1, 1995.

ROCÍO PATIÑO KATSANIS joined the General Support Pool in SSD as a Data Analyst on September 5, 1995.

SAMANTHA OSMER transferred to the General Support Pool in SSD as a Data Analyst on September 11, 1995.

KAILASH SAHU joined the Institute on August 10, 1995 as STIS Instrument Scientist/Assistant Astronomer.

RITA SAMBRUNA, left the Institute on May 31, 1995 for a position in the Laboratory of High Energy Physics at GSFC.

MASSIMO STIAVELLI joined the Institute on September 5, 1995 as a WFPC2 Instrument Scientist/Assistant Astronomer.

PETER STOCKMAN assumed the role of Astronomer in SESD/Division Office as of June 1, 1995.

MEG URRY was granted tenure on July 1995.

DEBRA WALLACE transferred to the General Support Pool in SSD as a Data Analyst on September 11, 1995.

YIPING WANG, former Research Support Scientist in RPO, left the Institute on April 21, 1995.

HAL WEAVER, former Associate Astronomer in RPO, left the Institute on June 30, 1995. He is now a Senior Scientist at Applied Research Corp.

ERIC WYCKOFF joined the Institute on June 13, 1995 as a Data Analyst in the General Support Pool/SSD.

CHENG-YUE ZHANG, a former Postdoctoral Fellow, left the Institute on June 30, 1995.

## Recent ST Scl Preprints

927. "HST Imaging of the Planetary Nebula K648 in M15" L. Bianchi, H. Ford, R. Bohlin, F. Paresce, G. De Marchi.
928. "Quasar Lyman Edge Regions in Polarized Light" A. Koratkar, R.R.J. Antonucci, R.W. Goodrich, H. Bushouse, A.L. Kinney.
929. "Towards Understanding the Fanaroff-Riley Dichotomy in Radio Source Morphology and Power" S.A. Baum, E.L. Zirbel, C.P. O'Dea.
930. "A Model for the Galactic Population of Symbiotic Stars with White Dwarf Accretors" L. Yungelson, M. Livio, A. Tutukov, S.J. Kenyon.
931. "Low Mass Stars in Globular Clusters. II. The Mass Function of M15" G. De Marchi, F. Paresce.
932. "Low Mass Stars in Globular Clusters. III. The Mass Function of 47 Tucane" G. De Marchi, F. Paresce.
933. "Compton Heating and Superthermal Electrons in Gamma-Loud Agns" A.M. Beloborodov, A.F. Illarionov.
934. "High Resolution Coronagraphic Imaging and Spectropolarimetry of the HR Carinae Nebula" M. Clampin, R.E. Schulte-Ladbeck, A. Nota, M. Robberto, F. Paresce, G.C. Clayton.
935. "High Resolution Far-Infrared Mapping of the Star-Forming Region RCW 122C" C.Y. Zhang, P.M. Harvey, B.J. Smith, C. Colome, J. DiFrancesco.
936. "The Calibration of Novae as Distance Indicators" M. Della Valle, M. Livio
937. "Consequences of Dust in Damped Lyman-Alpha Systems" S.M. Fall, Y.C. Pei.
938. "Core Properties of Elliptical Galaxies: A Northern Hemisphere Sample at High Resolution" P. Møller, M. Stiavelli, W.W. Zeilinger.
939. "Scattering Properties of the Dust in the Reflection Nebula IC 435" D. Calzetti, R.C. Bohlin, K.D. Gordon, A.N. Witt, L. Bianchi.
940. "The Evolution of Lithium Abundances of Solar-Type Stars. V. K Dwarfs in the Hyades" D.R. Soderblom, B.F. Jones, J.R. Stauffer, B. Chaboyer.
941. "The Intercomparison of Star Catalogs III: Comparing the AGK3, the AGK3U, the ACRS (part 1), and the PPM to the GC" D. Daou, J.E. Morrison, L.G. Taff.
942. "Nova Outbursts on Magnetic White Dwarfs" M. Livio.
943. "White Dwarf Standard Stars: G191-B2b, GD 71, GD 153, HZ 43" R.C. Bohlin, L. Colina, D.S. Finley.
944. "Unified Schemes for Radio-Loud Active Galactic Nuclei" C.M. Urry, P. Padovani.
945. "Implications of Non-Thermal Motions for Statistics of Lyman-Alpha Forest Clouds" V.P. Kulkarni, S.M. Fall.
946. "Accreting, Isolated Neutron Stars: III. Preheating of Infalling Gas and Cometary H II Regions" O. Blaes, O. Warren, P. Madau.
947. "Radio and Emission-Line Jets in the Type 2 Seyfert Galaxy MKN 1066 (UGC 2456)" G. Bower, A. Wilson, J.A. Morse, R. Gelderman, M. Whittle, J. Mulchaey.
948. "Software for the Analysis of Emission Line Nebulae" R.A. Shaw, R.J. Dufour.
949. "On the Origin of the FIR-Radio Relation in Active Galaxies" L. Colina, D. E. Perez-Olea.
950. "Evolutionary Models of the Radio Emission in Compact Starbursts" D. E. Perez-Olea, L. Colina.
951. "Variable Stars in the Irregular Galaxy NGC 2366 (DDO 42)" E. Tolstoy, A. Saha, J. G. Hoessel, K. McQuade.
952. "Constraints on the Extragalactic Background Light from Gamma-Ray Observations of High Redshift Quasars" P. Madau, E.S. Phinney.
953. "Spectroscopy of Poorly-Studied Cataclysmic Variables" R. Downes, D.W. Hoard, P. Szkody, S. Wachter.
954. "Environmental Properties of BL LAC Objects" J.E. Pesce, R. Falomo, A. Treves.
955. "Evidence for an Obscured Quasar in the Giant Radio Galaxy PKS 0634-205" C. Simpson, M.J. Ward, A.S. Wilson.
956. "Nuclear Disks of Gas and Dust in Fanaroff-Riley Type I Radio Host Galaxies: 3C 402N and NGC 7052" L. de Juan, L. Colina, D. Golombek.
957. "Discovery of an Optical Synchrotron Jet in 3C 78" W.B. Sparks, D. Golombek, S.A. Baum, J. Biretta, S. de Koff, F. Machetto, P. McCarthy, G.K. Miley.
958. "The Lyman Continuum in Starburst Galaxies Observed with the Hopkins Ultraviolet Telescope" C. Leitherer, H.C. Ferguson, T.M. Heckman, J.D. Lowenthal.

## Recent ST Sci Preprints *Continued*

959. "O Stars in Transition. I. Optical Spectroscopy of the OFPE/WN9 and Related Stars" A. Nota, A. Pasquali, L. Drissen, C. Leitherer, C. Robert, A.F.J. Moffat, W. Scmutz.
960. "Cosmic Metal Production and the Contribution of QSO Absorption Systems to the Ionizing Background" P. Madau, J.M. Shull.
961. "Dynamo Driven Accretion Discs and Dwarf Nova Eruptions" P.J. Armitage, M. Livio, J.E. Pringle.
962. "Cataclysmic Variables in Globular Clusters" M. Livio.
963. "Dust Obscuration in Starburst Galaxies from Near-Infrared Spectroscopy" D. Calzetti, A.L. Kinney, T. Storchi-Bergmann.
964. "Detection of H<sub>2</sub> <sup>18</sup>O in Jupiter" K.S. Noll, R.R. Gerballe, R.F. Knacke.
965. "Accreting White Dwarfs and Type Ia Supernovae" M. Livio, D. Branch, L.R. Yungelson, F. Boffi, E. Baron.

## HST Related Publications

The following is a list of papers based on HST observations that have appeared in refereed journals since the last Newsletter. This list is maintained by the ST Sci Library (library@stsci.edu) to which corrections and additions should be sent. Please remember that supplying the ST Sci Librarian with preprints or reprints is a requirement for GO/AR grant recipients and strongly encouraged for everyone else as well.

Atreya, S.K.; Edgington, S.G.; Trafton, L.M.; Caldwell, J.J.; Noll, K.S.; Weaver, H.A. "Abundances of ammonia and carbon disulfide in the Jovian stratosphere following the impact of comet Shoemaker-Levy 9" *Geophys. Res. Lett.* 22: 1625-1628, 1995

Bahcall, J.N.; Kirhakos, S.; Schneider, D.P. "PKS 2349-014: a luminous quasar with thin wisps, a large off-center nebulosity, and a close companion galaxy" *ApJ* 447: L1-L4, 1995

Baptista, R.; Horne, K.; Hilditch, R.W.; Mason, K.O.; Drew, J.E. "Hubble Space Telescope and R-band eclipse maps of the UX Ursa Majoris accretion disk" *ApJ* 448: 395-415, 1995

Barcons, X.; Lanzetta, K.M.; Webb, J.K. "Extensive dark-matter haloes in low-luminosity galaxies revealed by quasar absorption lines" *Nature* 376: 321-323, 1995

Ben Jaffel, L.; Leers, V.; Sandel, B.R. "Dark auroral oval on Saturn discovered in Hubble Space Telescope images" *Science* 269: 951-953, 1995

Bernacca, P.L.; Lattanzi, M.G.; Porro, I.; Neuhauser, R.; Bucciarelli, B. "Hubble Space Telescope astrometric observations of pre-main sequence stars from the Hipparcos Program. II" *A&A* 299: 933-939, 1995

Bobrowsky, M.; Zijlstra, A.A.; Grebel, E.K.; Tinney, C.G.; Te Lintel Hekkert, P.; Van De Steene, G.C.; Likkell, L.; Bedding, T.R. "He 3-1475 and its jets" *ApJ* 446: L89-L92, 1995

Borkowski, K.J.; Harrington, J.P.; Tsvetanov, Z. "Interaction of a stellar wind with clumpy stellar ejecta in A30" *ApJ* 449: L143-L147, 1995

Bowen, D.V.; Blades, J.C.; Pettini, M. "The distribution of metal-absorbing high velocity clouds in the galaxy" *ApJ* 448: 662-666, 1995

Bowen, D.V.; Blades, J.C.; Pettini, M. "Interstellar Mg II absorption lines from low-redshift galaxies" *ApJ* 448: 634-661, 1995

Bower, G.A.; Wilson, A.S. "Hubble Space Telescope images of the nuclear star forming region in the interacting galaxy NGC 5930" *ApJS* 99: 543-549, 1995



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

**Robert Fosbury** (*Editor*)

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Federal Republic of Germany

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**HST Related Publications** *Continued*

Boyd, P.T.; Van Citters, G.W.; Dolan, J.F.; Wolinski, K.G.; Percival, J.W.; Bless, R.C.; Elliot, J.L.; Nelson, M.J.; Taylor, M.J. "High-Speed Photometer observations of the LMC pulsar B0540-69" *ApJ* 448: 365-368, 1995

Brandt, J.C.; Heap, S.R.; Beaver, E.A.; Boggess, A.; Carpenter, K.G.; Ebbets, D.C.; Hutchings, J.B.; Jura, M.; Leckrone, D.S.; Linsky, J.L.; Maran, S.P.; Savage, B.D.; Smith, A.M.; Trafton, L.M.; Walter, F.M.; Weymann, R.J.; Snow, M.; Randall, C.E.; Ake, T.B.; Robinson, R.D.; Wahlgren, G. "An atlas of Alpha Orionis obtained with the Goddard High Resolution Spectrograph on the Hubble Space Telescope" *AJ* 109: 2706-2735, 1995

Capetti, A.; Axon, D.J.; Macchetto, F.; Sparks, W.B.; Boksenberg, A. "HST imaging polarimetry of NGC 1068" *ApJ* 446: 155-166, 1995

Capetti, A.; Macchetto, F.; Axon, D.J.; Sparks, W.B.; Boksenberg, A. "The morphology of the narrow line region of Markarian 3" *ApJ* 448: 600-610, 1995

Carpenter, K.G.; Robinson, R.D.; Judge, P.G. "GHRS observations of cool, low-gravity stars. II. Flow and turbulent velocities in the outer atmosphere of gamma Crucis (M3.4 III)" *ApJ* 444: 424-437, 1995

Clarke, J.T.; Lallement, R.; Bertaux, J.-L.; Quemerais, E. "HST/GHRS observations of the interplanetary medium downwind and in the inner solar system" *ApJ* 448: 893-904, 1995

Clayton, G.C.; Wolff, M.J.; Allen, R.G.; Lupie, O.L. "Ultraviolet interstellar linear polarization. II. The wavelength dependence" *ApJ* 445: 947-957, 1995

Deharveng, J.-M.; Buat, V.; Bergeron, J. "Lyman alpha emission from galaxies: the case of absorption line selected galaxies at  $z \sim 0.3 - 0.4$ " *A&A* 298: 57-62, 1995

Disney, M.J.; Boyce, P.J.; Blades, J.C.; Boksenberg, A.; Crane, P.; Deharveng, J.M.; Macchetto, F.; Mackay, C.D.; Sparks, W.B.; Phillipps, S. "Interacting elliptical galaxies as hosts of intermediate-redshift quasars" *Nature* 376: 150-153, 1995

Driver, S.P.; Windhorst, R.A.; Ostrander, E.J.; Keel, W.C.; Griffiths, R.E.; Ratnatunga, K.U. "The morphological mix of field galaxies to  $m(I) = 24.25$  magnitudes  $b(j) \approx 26$  magnitudes from a deep Hubble Space Telescope WFPC2 image" *ApJ* 449: L23-L27, 1995

Elson, R.A.W.; Gilmore, G.F.; Santiago, B.X.; Casertano, S. "HST observations of the stellar population of the globular cluster omega Cen" *AJ* 110: 682-692, 1995

Federman, S.R.; Cardelli, J.A.; Van Dishoeck, E.F.; Lambert, D.L.; Black, J.H. "Vibrationally excited H<sub>2</sub>, HCl, and NO<sup>+</sup> in the diffuse clouds towards Zeta Ophiuchi" *ApJ* 445: 325-329, 1995

Ferlet, R.; Lecavelier Des Etangs, A.; Vidal-Madjar, A.; Bertin, P.; Deleuil, M.; Lagrange-Henri, A.-M.; Lallement, R. "HST-GHRS observations of alpha Piscis Austrini" *A&A* 297: L5-L8, 1995

Forbes, D.A.; Franx, M.; Illingworth, G.D. "Ellipticals with kinematically-distinct cores: WFPC1 imaging of nearby ellipticals" *AJ* 109: 1988-2002, 2278-2279, 1995

Fullton, L.K.; Carney, B.W.; Olszewski, E.W.; Zinn, R.; Demarque, P.; Janes, K.A.; Da Costa, F.S.; Seitzer, P. "A VI(c) color-magnitude diagram of the globular cluster NGC 6352 from Hubble Space Telescope planetary camera observations" *AJ* 110: 652-681, 946-947, 1995

Garnett, D.R.; Dufour, R.J.; Peimbert, M.; Torres-Peimbert, S.; Shields, G.A.; Skillman, E.D.; Terlevich, E.; Terlevich, R.J. "Si/O abundance ratios in extragalactic H II regions from Hubble Space Telescope UV spectroscopy" *ApJ* 449: L77-L81, 1995

Gilliland, R.L.; Edmonds, P.D.; Petro, L.; Saha, A.; Shara, M.M. "Stellar variability in the central populations of 47 Tucanae from WF/PC observations with the Hubble Space Telescope. I. Project overview, reduction techniques, and first results" *ApJ* 447: 191-203, 1995

Glazebrook, K.; Ellis, R.; Santiago, B.; Griffiths, R. "The morphological identification of the rapidly evolving population of faint galaxies" *MNRAS* 275: L19-L22, 1995

Hammel, H.B.; Lockwood, G.W.; Mills, J.R.; Barnet, C.D. "Hubble Space Telescope imaging of Neptune's cloud structure in 1994" *Science* 268: 1740-1742, 1995

Hester, J.J.; Scowen, P.A.; Sankrit, R.; Burrows, C.J.; Gallagher, J.S. III; Holtzman, J.A.; Watson, A.; Trauger, J.T.; Ballester, G.E.; Casertano, S.; Clarke, J.T.; Crisp, D.; Evans, R.W.; Griffiths, R.E.; Hoessel, J.G.; Krist, J.; Lynds, R.; Mould, J.R.; O'Neil, E.J. Jr.; Stapelveldt, K.R.; Westphal, J.A. "WFPC2 studies of the Crab Nebula. I. HST and ROSAT imaging of the synchrotron nebula" *ApJ* 448: 240-263, 1995

**HST Related Publications** *Continued*

Hunter, D.A.; Shaya, E.J.; Holtzman, J.A.; Light, R.M.; O'Neil, E.J. Jr.; Lynds, R. "The intermediate stellar mass population in R136 determined from Hubble Space Telescope Planetary Camera 2 images" *ApJ* 448: 179-194, 1995

Hunter, D.A.; Shaya, E.J.; Scowen, P.; Hester, J.J.; Groth, E.J.; Lynds, R.; O'Neil, E.J. Jr. "Gas near the center of 30 Doradus as revealed by Hubble Space Telescope images" *ApJ* 444: 758-764, 1995

Im, M.; Ratnatunga, K.U.; Griffiths, R.E.; Casertano, S. "The axis ratio distribution of faint galaxies: evidence for a population of dwarf galaxies at  $I \sim 20.5$ " *ApJ* 445: L15-L18, 1995

Jackson, N.; Sparks, W.B.; Miley, G.K.; Macchetto, F. "HST observations of 3C 305" *A&A* 296: 339-346, 1995

Johansson, S.; Brage, T.; Leckrone, D.S.; Nave, G.; Wahlgren, G.M. "Interpretation of anomalous ultraviolet transitions of Fe II observed in laboratory Fourier transform spectra and stellar HST and IUE spectra" *ApJ* 446: 361-370, 1995

Kim, Y.H.; Caldwell, J.J.; Fox, J.L. "High-resolution ultraviolet spectroscopy of Jupiter's aurora with the Hubble Space Telescope" *ApJ* 447: 906-914, 1995

Krist, J.E.; Burrows, C.J. "Phase retrieval analysis of pre- and post-repair Hubble Space Telescope images" *Appl. Opt.* 34: 4951-4964, 1995

Lagrange, A.M.; Vidal-Madjar, A.; Deleuil, M.; Emerich, C.; Beust, H.; Ferlet, R. "The Beta Pictoris circumstellar disk. XVII. Physical and chemical parameters of the disk" *A&A* 296: 499-508, 1995

Lanz, T.; Heap, S.R.; Hubeny, I. "HST/GHRS observations of the beta Pictoris system: basic parameters and the age of the system" *ApJ* 447: L41-L44, 1995

Laor, A.; Bahcall, J.N.; Jannuzi, B.T.; Schneider, D.P.; Green, R.F. "The ultraviolet emission properties of 13 quasars" *ApJS* 99: 1-26, 1995

Longair, M.S.; Best, P.N.; Rottgering, H.J.A. "HST observations of three radio galaxies at redshift  $z \sim 1$ " *MNRAS* 275: L47-L51, 1995

Lyu, C.-H.; Bruhweiler, F.C.; Smith, A.M. "Tomography/power spectrum techniques for removal of fixed pattern noise from Hubble Space Telescope spectra" *ApJ* 447: 880-888, 1995

Marsh, T.R.; Wood, J.H.; Horne, K.; Lambert, D. "The discovery of high-velocity flares in  $\nu$  and the detection of carbon in the double degenerate binary GP Com" *MNRAS* 274: 452-460, 1995

Mason, K.O.; Drew, J.E.; Cordova, F.A.; Horne, K.; Hilditch, R.; Knigge, C.; Lanz, T.; Meylan, T. "Eclipse observations of an accretion disc wind" *MNRAS* 274: 271-286, 1995

Mould, J.; Huchra, J.R.; Bresolin, F.; Ferrarese, L.; Ford, H.C.; Freedman, W.L.; Graham, J.; Harding, P.; Hill, R.; Hoessel, J.G.; Hughes, S.M.; Illingworth, G.D.; Kelson, D.; Kennicutt, R.C. Jr.; Madore, B.F.; Phelps, R.; Stetson, P.B.; Turner, A. "Limits on the Hubble constant from the HST distance of M100" *ApJ* 449: 413-421, 1995

Netzer, H.; Brotherton, M.S.; Wills, B.J.; Han, M.; Wills, D.; Baldwin, J.A.; Ferland, G.J.; Browne, I.W.A. "The Hubble Space Telescope sample of radio-loud quasars: the Ly  $\alpha$ /H  $\beta$  ratio" *ApJ* 448: 27-40, 1995

Neuschaefer, L.W.; Ratnatunga, K.U.; Griffiths, R.E.; Valdes, F. "Detection, photometry and completeness of FOCAS catalogs for the HST Medium Deep Survey" *PASP* 107: 590-599, 1995

O'Connell, R.W.; Gallagher, J.S. III; Hunter, D.A.; Colley, W.N. "Hubble Space Telescope imaging of super star clusters in M82" *ApJ* 446: L1-L4, 1995

Paresce, F. "HST observations of high density globular cluster cores" *Mem. Soc. Astron. Ital.* 65: 713-721, 1994

Paresce, F.; Livio, M.; Hack, W.; Korista, K. "The structure and evolution of the nova V1974 Cygni shell from HST observations" *A&A* 299: 823-834, 1995

Parker, J.M.; Heap, S.R.; Malumuth, E.M. "Identification of emission-line stars in 30 Doradus using HST observations" *ApJ* 448: 705-714, 1995

Percival, J.W.; Boyd, P.T.; Biggs, J.D.; Dolan, J.F.; Bless, R.C.; Elliot, J.L.; Nelson, M.J.; Robinson, E.L.; Taylor, M.J.; Van Citters, G.W.; Wolinski, K.G. "A search for a pulsar in the remnant of SN 1987A with the Hubble Space Telescope High Speed Photometer" *ApJ* 446: 832-837, 1995

Phillips, A.C.; Bershad, M.A.; Forbes, D.A.; Koo, D.C.; Illingworth, G.D.; Reitzel, D.B.; Griffiths, R.E.; Windhorst, R.A. "Structure and photometry of an  $I < 20.5$  galaxy sample from the Hubble Space Telescope medium deep survey" *ApJ* 444: 21-40, 1995

**HST Related Publications** *Continued*

Rao, S.M.; Turnshek, D.A.; Briggs, F.H. "The incidence of damped Ly alpha systems in the redshift interval  $0 < z < 4$ " *ApJ* 449: 488-496, 1995

Roth, K.C.; Blades, J.C. "An HST archival study of galactic interstellar zinc and chromium" *ApJ* 445: L95-L98, 1995

Sartoretti, P.; McGrath, M.A.; McEwen, A.S.; Spencer, J.R. "Post-Voyager brightness variations on Io" *JGR* 100: 7523-7530, 1995

Savage, B.D.; Sembach, K.R.; Lu, L. "Probing the galactic disk and halo. III. The galactic and intergalactic sight line to H1821+643" *ApJ* 449: 145-155, 1995

Shara, M.M.; Drissen, L. "Cataclysmic and close binaries in star clusters. III. Recovery of the quiescent nova 1860 A.D. (T Scorpii) in the core of the globular cluster M80" *ApJ* 448: 203-206, 1995

Sion, E.M.; Huang, M.; Szkody, P.; Cheng, F-H. "Hubble Space Telescope high-resolution spectroscopy of the exposed white dwarf in the dwarf nova VW Hydri in quiescence: a rapidly rotating white dwarf" *ApJ* 445: L31-L34, 1995

Sion, E.M.; Szkody, P.; Cheng, F-H.; Huang, M. "A Hubble Space Telescope study of the underlying white dwarf in the dwarf nova VW Hydri during quiescence" *ApJ* 444: L97-L100, 1995

Smith, P.S.; Schmidt, G.D.; Allen, R.G.; Angel, J.R.P. "The polarization and ultraviolet spectrum of Markarian 231" *ApJ* 444: 146-156, 1995

Spitzer, L. Jr.; Fitzpatrick, E.L. "Composition of interstellar clouds in the disk and halo. III. HD 149881" *ApJ* 445: 196-210, 1995

Stapelfeldt, K.R.; Burrows, C.J.; Krist, J.E.; Trauger, J.T.; Hester, J.J.; Holtzman, J.A.; Ballester, G.E.; Casertano, S.; Clarke, J.T.; Crisp, D.; Evans, R.W.; Gallagher, J.S. III; Griffiths, R.E.; Hoessel, J.G.; Mould, J.R.; Scowen, P.A.; Watson, A.M.; Westphal, J.A. "WFPC2 imaging of the circumstellar nebulosity of HL Tauri" *ApJ* 449: 888-893, 1995

Stern, S.A.; Trafton, L.M.; Flynn, B. "Rotationally resolved studies of the mid-ultraviolet spectrum of Triton. II. HST surface and atmospheric results" *AJ* 109: 2855-2868, 1995

Sulentic, J.W.; Marziani, P.; Dultzin-Hacyan, D.; Calvani, M.; Moles, M. "First direct comparison of high and low ionization line kinematics in active galactic nuclei" *ApJ* 445: L85-L89, 1995

Thomson, R.C.; Crane, P.; Mackay, C.D. "Optical structure and polarization of the western hot spot of Pictor A" *ApJ* 446: L93-L95, 1995

Wahlgren, G.M.; Leckrone, D.S.; Johansson, S.G.; Rosberg, M.; Brage, T. "The abundances of Pt, Au, and Hg in the chemically peculiar HgMn-type stars kappa Cancri and chi Lupi" *ApJ* 444: 438-451, 1995

Walter, F.M.; Matthews, L.D.; Linsky, J.L. "New insights into nonradiative heating in late A star chromospheres" *ApJ* 447: 353-363, 1995

Weiland, J.L.; Shore, S.N.; Beaver, E.A.; Lyons, R.W.; Rosenblatt, E.I. "Goddard High-Resolution Spectrograph observations of the interacting binary system W Serpentis" *ApJ* 447: 401-407, 1995

Welty, D.E.; Hobbs, L.M.; Lauroesch, J.T.; Morton, D.C.; York, D.G. "Interstellar lead" *ApJ* 449: L135-L138, 1995

Werner, K.; Dreizler, S.; Wolff, B. "Spectral analysis of the hot DO white dwarf PG 1034+001" *A&A* 298: 567-576, 1995

Wills, B.J.; Thompson, K.L.; Han, M.; Netzer, H.; Wills, D.; Baldwin, J.A.; Ferland, G.I.; Browne, I.W.A.; Brotherton, M.S. "The Hubble Space Telescope sample of radio-loud quasars: ultraviolet spectra of the first 31 quasars" *ApJ* 447: 139-158, 1995

Windhorst, R.A.; Fomalont, E.B.; Kellermann, K.I.; Partridge, R.B.; Richards, E.; Franklin, B.E.; Pascarelle, S.M.; Griffiths, R.E. "Identifications of faint radio sources with optically luminous interacting disk galaxies" *Nature* 375: 471-474, 1995

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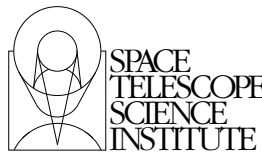
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