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SPACE TELESCOPE SCIENCE INSTITUTE

Newsletter

Highlights of this Issue:

STScI named as Operations Center for NGST

The Space Telescope Science Institute was designated as the NGST Science Operations Center based on its very successful and well-regarded operation of HST, which included service to the international scientific community. Choice of the Institute for the NGST SOC means that the experience derived from nearly a decade of HST operations can be incorporated into the planning for NGST at a very early stage. This should permit greater participation in NGST by the scientific community, including such areas as major collaborative programs involving the two observatories and techniques for efficient scheduling of complex scientific programs. Location of the NGST SOC at the STScI will also mean a significant financial savings, as the NGST project will not have to support a significant new infrastructure or staff.

The option for STScI to also take on responsibility for NGST science operations was evaluated earlier this year and unanimously supported by the Origins Subcommittee of the Space Science Advisory Committee, which specifically cited the benefits to the scientific community.

— Harley Thronson
NASA Headquarters

Maryland Senator Barbara Mikulski and NASA Administrator Dan Goldin display their pleasure while unveiling a special HST image, following an announcement by Mr. Goldin that the Space Telescope Science Institute will be the operations center for the Next Generation Space Telescope mission.

Director's Perspective

Bob Williams

Some very interesting results have come out of collaborations involving *HST* and other ground and space observatories in the past few months. Near-IR images obtained with NICMOS of a number of gravitational lens systems have revealed very nicely a variety of lensing galaxy morphologies. The images of the optical transients associated with several gamma-ray-burst sources observed by Keck to have high redshifts have been shown to be coincident on the sky with extended emission. Two groups have found distant Type Ia supernovae with z~1 from the ground, and have used *HST* to obtain light curves which place them on the Hubble diagram at positions favoring low matter density and, for a flat universe, a non-zero cosmological constant.

At an operational level, current scheduling projections for *HST* show that we should come very close to being able to complete implementation of all TAC-recommended NICMOS programs before the cryogen depletes late this year. We are certainly doing our best to achieve this goal. The Institute has recently concluded conducting the peer review of the supplemental round of Cycle 7 Archival Research proposals which resulted in the allocation of an additional $2.5 million for analyses of *HST* archival data. At the same time, we are readying ourselves for Cycle 8 for which observations should commence in mid-1999. The Cycle 8 Call for Proposals was just issued in June, and the deadline for receipt of observing and archival proposals is mid-September. The *HST* Project at Goddard has informed us of a 4 to 5-month delay in the third servicing mission, to spring 2000, and therefore Cycle 8 will not include use of the Advanced Camera nor a cryocooled NICMOS.

Important ongoing efforts directed toward the future remain on track and include the NASA-ESA discussions on extending the current Memorandum of Understanding relating to ESA participation in *HST*, the Second Decade study for *HST*, and the new *HST* instruments. As a participant in the NASA-ESA discussions, I am confident that ESA's strong interest in both *HST* and NGST and their willingness to consider funding for NGST at a level that would provide for their continued partnership in *HST* beyond the April 2001 expiration of the current MOU will be successful in extending their agreement with NASA. It is already providing additional impetus for the study phase of NGST, which is going well. The Second Decade study is now underway, headed by Bob Brown of STScI, and meetings of the steering group and open forums will soon commence that will develop the issues to be addressed in operating *HST* after its final servicing mission in the 2001/2 timeframe. Progress on the new instruments ACS and COS has been satisfactory, and planning for the development of a WFPC2 replacement, called WFC3, on the final servicing mission is underway.

Finally, on 1 August my five-year term as Director comes to a close and I stand down to assume a position on the scientific staff of the Institute. I will be taking a one-year sabbatical leave during which time we will execute the Southern Deep Field, in October, and I will begin work on several research projects. Deputy Director Mike Hauser will assume the Directorship following the expiration of my term until Steve Beckwith officially begins his tenure as Institute Director on 1 September 1998. I look forward to working with Mike and with Steve in continuing to get the best possible science out of *HST*. My deepest thanks to AURA for their role in what for me have been 13 very fulfilling years as a center director.

A Kinematic Model for NGC 3516

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Active Galactic Nuclei are galaxies whose nuclei are highly luminous, and their nuclear spectra show broad emission lines covering a wide range of ionization. AGN activity spans a broad range of luminosity: quasi-stellar objects (QSOs) are the most luminous type of AGN, while Seyfert galaxies are the more common but less luminous of this class of objects.

Two significant facts about AGN make them very interesting to study. The first is their ability to generate extraordinary luminosities (10^{38} to 10^{47} ergs/s) in tiny volumes (<< 10^{18} cm), and the second is the similarity in spectral features over 7 dex in luminosity, across most of the electromagnetic spectrum. Very few phenomena have these unusual properties. The simplest process that can produce such energy and scale with luminosity is accretion of matter onto a massive black hole. In the commonly-accepted picture, the supermassive black hole at the center is surrounded by an accretion disk.

The disk is thought to be the source of the x-ray, ultraviolet and optical continuum emission, which ionizes circumnuclear gas, and may also be the launch site for winds and jets. Although this scenario postulates the ultimate power source of AGN, there are many complications in understanding how gravitational energy is transformed into radiation and kinetic power (see Urry and Padovani 1995 for a review of the AGN unified schemes).

The circumnuclear gas which lies within a region a few light weeks from the central engine is called the Broad-Line Region (BLR). The proximity of the BLR to the central engine dictates that the structure and dynamics of the BLR are strongly determined by the central engine, thus the BLR is a unique probe of the AGN phenomenon. The study of broad emission line variability has long been recognized as a powerful tool in understanding the nature of the BLR in AGN (Peterson 1993) since the region is too small to resolve even at the distances of the nearest AGN.

One of the intriguing properties of AGN is the observation of intrinsic, blue-shifted, broad absorption lines (BALs) arising from a wide range of ionic species. These BALs provide information concerning the location, density, column density and velocity structure of gas along a well defined line-of-sight. About 10% of radio-quiet QSOs have BALs (Weymann et al. 1991). Although BALs have not been seen in their low-luminosity counterparts, approximately 50% of nearby, low-luminosity AGN display narrow intrinsic UV absorption lines in their spectra (Crenshaw and Kraemer 1998). The precise relationship between the emission and absorption line gas is unclear.

NGC 3516 displays the strongest intrinsic, blue-shifted ultraviolet (UV) absorption lines of any Seyfert 1 galaxy. In an ongoing effort to determine the nature of the broad emission/absorption-line regions and their long-term evolution, we conducted an HST/FOS campaign to monitor (for five epochs) NGC 3516, to study both the emission (Goad et al.

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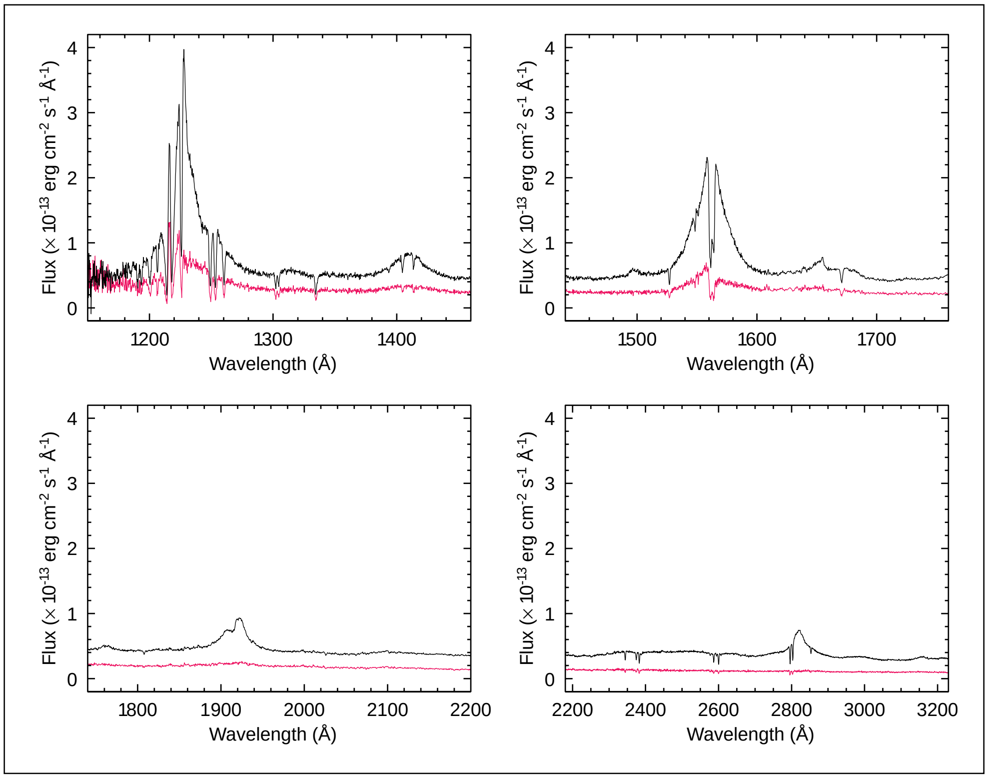

Figure 1: The mean spectrum formed by the co-addition of individual spectra from all epochs, weighting by their respective Poissonian errors. The grey line is the root mean square rms spectrum. The rms spectrum indicates that all the emission-line variability seen in Lyman alpha and C IV λ 1550 is in the line cores. Further, this spectrum also shows that the Mg II λ 2800 emission-line variation is <8%. The mean spectrum shows many galactic absorption lines. These are not only the common low-ionization lines of C, O, N, Mg, Al, Si, Mn, Fe and Zn, but also the highly ionized lines of N V λ 1240, Si IV λ 1400, and C IV λ 1550.

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1998) and absorption (Koratkar et al. 1998) line variability. The signal-to-noise in our data allows us for the first time to constrain the broad emission/absorption-line gas characteristics.

The co-added spectrum shown in Figure 1, covering the wavelength range 1150-3300 Å, is one of the highest signal-to-noise AGN spectrum obtained by HST/FOS. One can easily see the richness of the sight line. Similar to the Galactic absorption line results of Savage et al. (1993), this sight line shows not only the common low-ionization lines of C, O, N, Mg, Al, Si, Mn, Fe and Zn, but also the highly ionized lines of Si IV, and C IV. The Galactic absorption line data are consistent with a single absorbing cloud located along our line of sight to NGC 3516, with Doppler parameter b ~ 30 km s^{-1}.

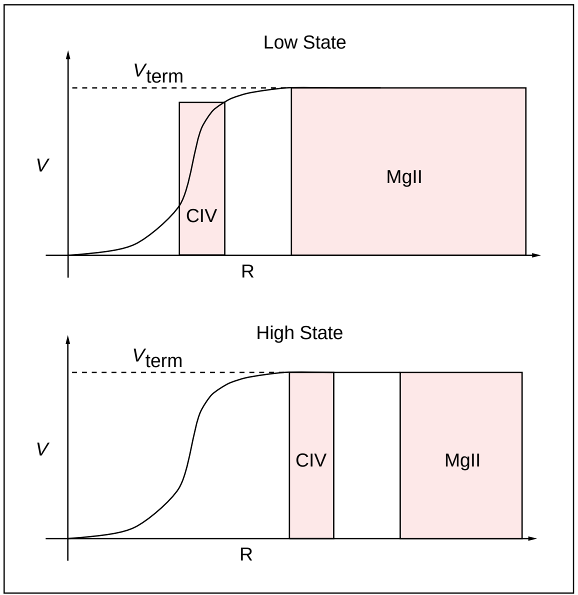

Figure 2: Although the C IV and Mg II emission lines are formed in very different regions, they are remarkably similar indicating that the the physical structure of the BLR must be such that it displays a similar range in projected velocity on both small and large scales. The model proposed for the BLR in NGC 3516 is the terminal wind model. Because of the lack of response in the Mg II emission line, we further suggest that this line is formed in a region which extends over several light-years. The observed HIL profile variations are a result of changes in their formation radius which is closer to the central source than the LIL region. Specifically, we propose that in the low state, conditions within the BLR gas are such that a large fraction of the C IV emission arises at the base of the wind, in the region where the BLR gas begins to accelerate. In the high state, the C IV emission region moves out, and both the C IV and Mg II emission come from the region where the wind has reached its terminal velocity.

Kinematic constraints from the Emission Line Variability

From 1995 December to 1996 November the UV continuum showed a factor of 5.4 variation at 1365 Å, spanning almost the entire range in continuum flux variability seen in over 15 years of IUE data. Similar to other variability campaigns, the high-ionization lines (HILs), such as Ly-α λ 1216 and C IV λ 1550, showed both emission-line flux and profile changes on relatively short timescales, which are correlated with changes in the continuum level. In contrast, the low-ionization lines (LILs) of Mg II λ 2800 and Fe II remained unchanged! Further, the shapes of the broad Ly α, C IV and Mg II emission lines as observed on 1996, February 21, when NGC 3516 was in its highest state, are indistinguishable from one another. Moreover, IUE observations indicate that while historically the strength of the Mg II emission line has varied, increasing by a factor of 2 between 1989 and 1993, its shape has remained unchanged for over a decade.

The remarkable similarity between the line shapes of the HILs and LILs, at high continuum levels, when clearly these lines form under very different physical conditions, suggests that in the high state both C IV and Mg II arise in kinematically similar regions. The absence of both short-timescale (~ months) and long-timescale (~ a few years) variations in the Mg II emission-line flux and shape, despite significant changes in the strength of the ionizing continuum indicates that either (i) the continuum band driving this line is invariant, or (ii) the Mg II line-emitting region is physically extended. If, as seems likely, the latter applies, then these observations necessarily impose severe constraints upon the spatial distribution and kinematics of the BLR in NGC 3516. For example, radial flow models in which the HILs and LILs arise in azimuthally separated regions can clearly be ruled out, as each line would show a different projected range in velocity.

The one physical structure which does indeed display a similar range in projected velocity on both small and large scales, is a terminal wind. If, as in the reverberation model of the BLR, the line variations are driven by continuum variations, the lack of response in the Mg II emission line suggests that this line is formed in a region which extends over several light-years, and thus its response to short-term continuum variations is simply washed out. While the emission-line flux variations of the HILs, which are formed closer in, are assumed to be driven by continuum variations, this fact alone cannot account for the observed changes in profile shape. We propose that the observed HIL profile variations are a result of changes in their formation radius. Specifically, we propose that in the low state, conditions within the BLR gas are such that a large fraction of the C IV emission arises at the base of the wind, in the region where the BLR gas begins to accelerate (see Figure 2). A prediction of this model is that the HIL and LIL profiles should be similar at high continuum levels. Monitoring of emission-line profile variations will help distinguish and constrain the kinematic models further and provide a detailed physical description of the BLR in NGC 3516.

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Constraints on the Absorption Line Gas:

Although the intrinsic UV absorbers in NGC 3516 are somewhat narrower than those observed in QSOs, the IUE data seemed to indicate that they are closely related to the BAL phenomenon (Shull & Sachs 1993). The HST/GHRS data showed four distinct narrow components indicating that the absorption was produced in dense condensations and not in a smooth flow as expected in the BAL QSOs (Crenshaw, Maran & Mushotsky 1997). A comparison of the HST/FOS, HST/GHRS and IUE C IV absorption-line profile shows that the differences in the appearance of the absorption-line is not simply a consequence of differences in the spectral resolution of the data (see figure 3). There are clear changes in the properties of the absorbing gas between the various epochs indicating that absorption line variations occur on timescales of approximately a few years. Further, a comparison of the *HST* and IUE data indicate that the highest velocity absorption component has moved out of our line-of-sight. The narrowness of the absorption-line widths and the very small variation in the absorption-line strengths indicates that the absorbing gas lies outside of the BLR.

The HST/GHRS spectra do not simultaneously cover a wide enough range in absorption-line ionization, hence the origin and physical properties of the UV absorber could not be well determined. The HST/FOS spectrum of NGC 3516 (Figure 1) shows strong, narrow, intrinsic absorption lines of highly ionized species (e.g., Lyman α, N V λ 1240 Si IV λ 1400 and C IV). Similar to the BAL QSOs, we do not see any absorption for any of the low ionization absorption species such as Al III λ 1854, 1862, C III] λ 1909 and Mg II. From the absorption-line equivalent widths, we can place broad limits on the absorption-line, gas-covering fraction. It is quite likely that the absorption-line gas is marginally optically thick and covers only the continuum source.

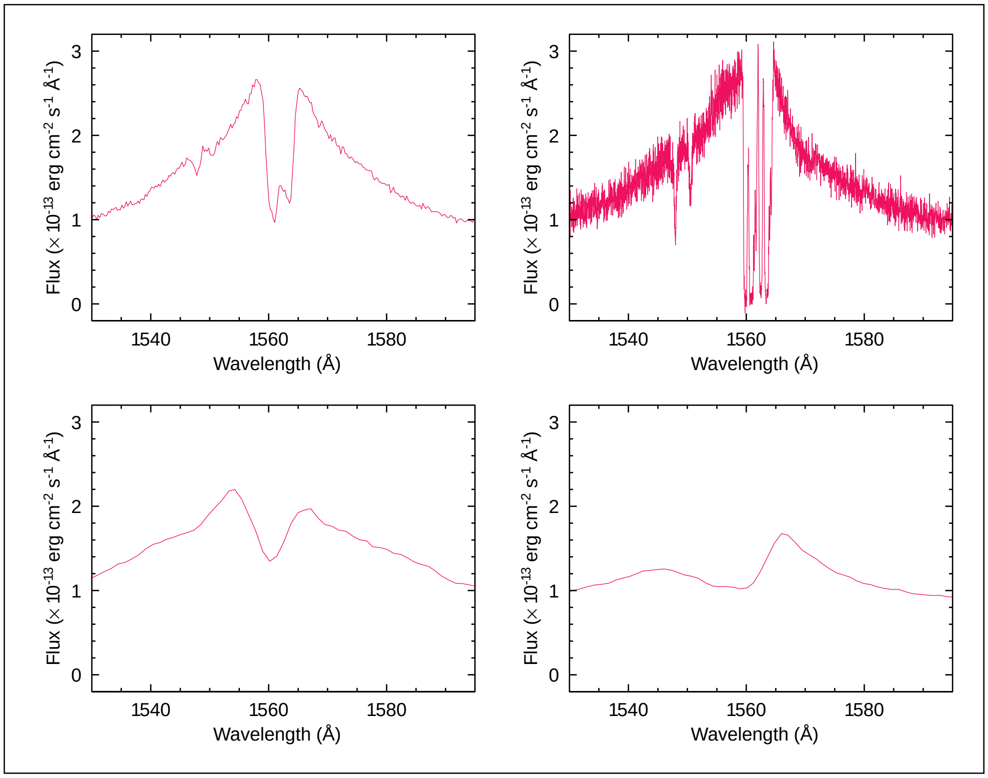

Figure 3: A comparison of the HST/FOS, HST/GHRS and IUE C IV absorption-line profiles. The differences in the appearance of the absorption line is not simply a consequence of differences in the spectral resolution of the data. There are clear changes in the properties of the absorbing gas between the various epochs indicating that absorption-line variations occur on timescales of approximately a few years.

Variability monitoring at high spectral resolution is the key to understanding the nature of the absorbing gas. These observations will provide information on both the location and density of the absorbers, as well as the evolution in ionization, column density, velocity structure, and coverage of the inner active nucleus.

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The Hubble Deep Field — South

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In December, 1995, *HST* pointed at an undistinguished, high-Galactic-latitude patch of sky and observed for 10 straight days. The result was the deepest optical image of the sky yet obtained, allowing detection of sources as faint as $V = 30$ in four bandpasses spanning the near-UV to the near-IR. The data were released to the community within one month of the observations and have been used in a wide variety of projects and publications, ranging from studies of the star-formation rate as a function of redshift, to studies of faint M dwarfs in the Galactic halo.

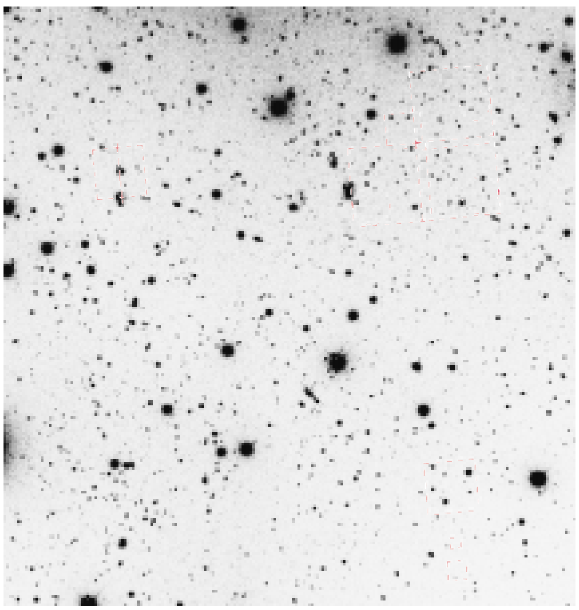

Fig. 1 Ground-based view of the HDF-S area. The image is a 3000s R-band exposure from the CTIO 4m telescope (courtesy of Alistair Walker). The WFPC-2 region is to the West, the STIS region is to the East and NICMOS region is to the South. North is up and East is left. The WFPC2 field is centered at J2000 coordinates $22^h\ 32^m\ 56.2^s$ -60° 33' 02.7". The positions of the fields are subject to change at the level of a few arcsec. The NICMOS positions in particular may ultimately move relative to each other and relative to the WFPC-2 field.

A second Hubble Deep Field campaign will be carried out with *HST* in October, 1998. The observations will be much the same as the original HDF, but with several important differences:

- The field is located in the southern Continuous Viewing Zone at J2000 coordinates $22^h\ 32^m\ 56.2^s$ -60° 33' 02.7".
- A moderate redshift quasar of $z = 2.24$, identified by Boyle, Hewett, Weymann (private communication) and colleagues, will be placed in the STIS field for both imaging and spectroscopy so that correlations between quasar absorption redshifts and the redshifts of galaxies in the fields may be determined.
- Simultaneous, parallel observations will be made with the three *HST* instruments (WFPC2, NICMOS, and STIS) of separate, neighboring fields. The STIS and NICMOS data will be a significant enhancement over what was possible for HDF-N.

The rationale for undertaking a second deep field follows from the wealth of information that has come out of HDF-N and from the desire to provide a point of focus for similar studies of the distant universe from southern-hemisphere facilities. Choosing a field in the CVZ maximizes the efficiency of *HST* for such projects. The wide public access to the HDF-N data stimulated extensive followup observations across the electromagnetic spectrum, both from major ground-based observatories and from other satellites. A similar level of effort is anticipated for HDF-S. We will maintain a clearinghouse for supporting observations on the HDF-S web page.

Figure 1 shows the position of the HDF-S overlaid on a deep ground-based image. As was the case for HDF-N, approximately 150 consecutive orbits will be devoted to a single telescope pointing, with additional flanking-field images to be obtained surrounding the deep WFPC2, STIS, and NICMOS fields. Both raw and reduced data will be made publicly available in the *HST* Data Archive approximately 6 weeks after the end of the observing campaign. The data reduction team includes members of the STScI and ST-ECF staff, and members of the STIS, and possibly the NICMOS instrument development teams.

The details of the observing strategy for WFPC2, NICMOS, and STIS are now mostly finalized. As for HDF-N, this observing strategy represents a compromise of suggestions presented both from within STScI and from the general community. The observing plans are discussed below; we welcome comments and suggestions on any aspect of the observations. Further details can be found on the web at *http://www.stsci.edu/ftp/science/hdf/hdfsouth/hdfs.html*

The observing strategy is driven partly by the practicalities of *HST* observing. In CVZ observations, scattered earth light increases the sky background in certain bandpasses on the day side of the orbit. Observations for all the instruments have been tailored to make optimal use of 'bright' and 'dark' time.

WFPC-2 Strategy

The WFPC2 observing strategy will be similar to that for HDF-N, with slightly more time devoted to observations in the F300W filter. The tentative orbit allocation and approximate limiting magnitudes are given in Table 1.

NICMOS Strategy

NICMOS will observe in parallel with WFPC2 and STIS, with the Pupil Alignment Mechanism (PAM) set to optimize focus for Camera 3, providing the widest available field of view. At present and in the foreseeable future, Camera 3 remains somewhat

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out of focus even with the PAM set to the end of its travel range. Nevertheless, the image quality is sharp enough to be nearly undersampled by the 0.2 arcsec NIC3 pixels, and there is little doubt that interesting faint galaxy images can be obtained. The images will be dithered using the NICMOS Field Offset Mirror (FOM) in order to improve flat fielding, sky subtraction, and detector artifact removal.

Nearly all of the dark-time orbits will be used for broad-band imaging with the F110W and F160W filters (*J* and *H*-bands, approximately), giving approximately 48 hours of observing in each band. Limiting magnitudes are given in Table 2. Scattered earth light during the 'bright' portions of CVZ orbits affects NICMOS imaging. The bright time will be divided between obtaining darks and obtaining images with the F220M filter.

STIS Strategy

The STIS field will be centered on the QSO for most of the observing time. Observations with the MAMA (UV) detectors on STIS are limited to about 60 orbits due to the restriction that they only operate during during SAA-free orbits.

The flowchart (Fig. 2) shows the current tentative plan for STIS. This plan puts most of the MAMA observing time into high-resolution spectroscopy. This will provide superb QSO absorption-line data in the region from 2650-3200 Angstroms and from 1600 to 1200 Angstroms. Test observations carried out in October 1997 show that the region from 1600-2650 is attenuated by a Lyman continuum absorption-line system at $z \approx 1.9$.

MAMA imaging will provide UV morphologies of galaxies near the QSO and a measurement of the Lyman break for galaxies as faint as $B_{AB} = 27$ at redshifts $z \approx 1.7$ and 0.5.

The STIS CCD will images will provide a deep view of galaxies immediately surrounding the QSO. The images will be significantly deeper than those with the WFPC-2 and will have a higher spatial resolution. Color information will be a bit cruder than for the WFPC-2 images, but in the portion of the field with MAMA UV imaging and long-pass filter imaging, there will be four bandpasses available for photometric redshifts, and the inclusion of the UV will provide greater accuracy for galaxies in the redshift range 0.5-2.5.

Bright time for the CCD will be used to extend the spectrum of the QSO from 3000 to 3500 Å at moderate resolution.

Other options were considered for STIS: e.g. slitless spectroscopy, deep UV imaging, obtaining a higher S/N QSO spectrum in the far-UV. These were considered valuable additions to the HDF science but ones that could be reasonably left to the GO community to propose.

Flanking Fields

As with the HDF-N, there will also be some time devoted to obtaining WFPC2 single-band images of a larger, contiguous area around the primary imaging field (the "flanking fields"), to a typical depth of $I_{AB} \sim 25.5$. The current tentative plan is to observe a region about 7 arcmin in diameter, defined so as to include both the STIS

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Table 1: WFPC-2 Filters, exposure times and limiting AB magnitudes

Filter	Number of Orbits	AB mag. limit (0.2 arcsec sq. S/N=10)
F300W	45	27.0
F450W	35	27.8
F606W	35	28.2
F814W	35	27.6

Table 2: Estimated NIC3 flux limits

Filter	Limiting surface brightness (1σ over 1 arcsec^2)	Approx. mag. limit (0.8 arcsec sq. S/N=10)
F110W	6.4×10^{8} Jy/arcsec^{-2}	$J_{AB} = 27.0$
F160W	7.6×10^{8} Jy/arcsec^{-2}	$H_{AB} = 26.8$
F220M	1.0×10^{6} Jy/arcsec^{-2}	$K_{AB} = 24.0$

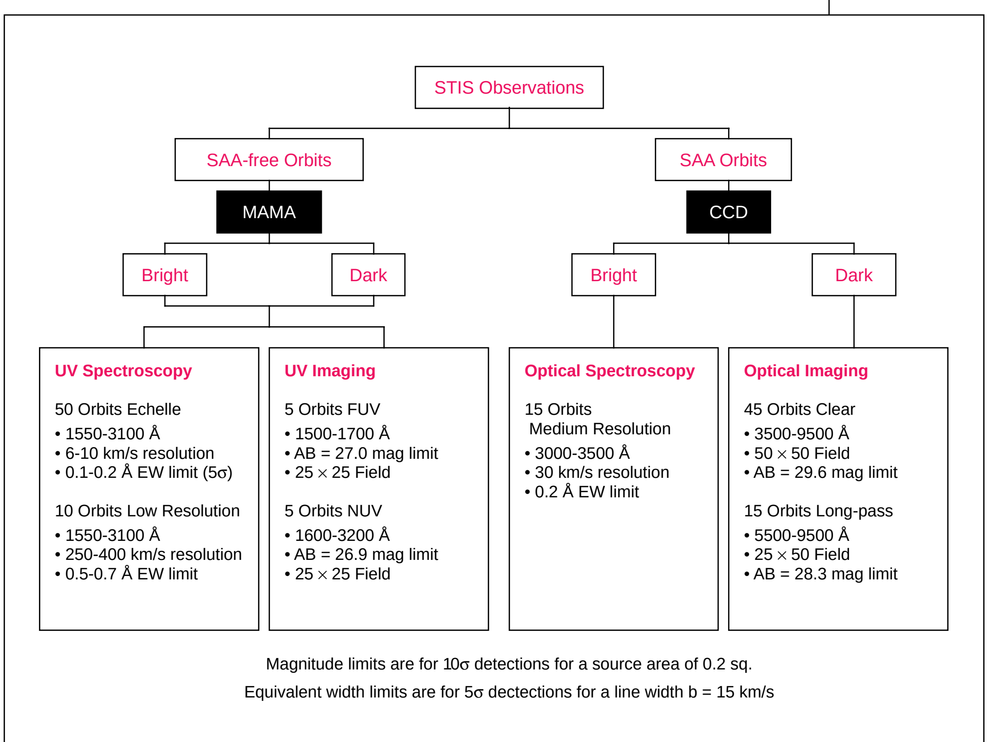

Fig. 2 HDF-S observing strategy for STIS.

Hubble Space Telescope Cycle 8 Call for Proposals

Release Date: 6/17/98
Proposal Deadline: 9/11/98, 8:00 pm, EDT

NASA and The Space Telescope Science Institute are pleased to announce the Eighth Call for Proposals for astronomical observations and archival research utilizing the Hubble Space Telescope (*HST*). Participation in this program is open to all categories of organizations, both domestic and foreign, including educational institutions, profit and nonprofit organizations, NASA Centers, and other Government agencies. This solicitation will be open from June 17, 1998 through September 11, 1998 8:00pm EDT, and proposals may be submitted throughout this period. Starting June 17, 1998, specific guidelines for proposal preparation will be available electronically from the Space Telescope Science Institute's World-Wide Web site at:

http://www.stsci.edu/observing/proposing.html

Look at the Cycle 8 menu item or obtain a printed copy from:

Science Programs Selection Office
Space Telescope Science Institute
3700 San Martin Drive
Baltimore MD 21218

A hard copy of this Call for Proposals will be mailed to our current list of libraries. Programmatic or technical information will also be available at the web site or you can contact the STScI Help Desk, email *help@stsci.edu*, phone 410-338-1082.

Multimission Archive at the Space Telescope Science Institute

The STScI archive has recently expanded by providing access to non-HST datasets which has led to the creation of the Multimission Archive at the Space Telescope Science Institute (MAST).

This message is to remind you that the archive publishes a newsletter, which is distributed electronically via a mailing list, to provide information about our activities. If you would like to subscribe to the archive newsletter, please send e-mail to *archive_news-request@stsci.edu* and put the single word SUBSCRIBE in the body of the message. You can also read the newsletter on the Web at *http://archive.stsci.edu/archive_news.html*.

MAST can be accessed at *http://archive.stsci.edu/mast.html*. E-mail inquiries and comments about the STScI data archives can be directed to *archive@stsci.edu*. MAST is supported by NASA through a cooperative agreement with STScI.

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and the NICMOS primary target regions. The goals of the wide-area imaging are to provide a large contiguous area for angular correlation studies, especially interesting near the QSO; to yield better statistics for less numerous, brighter galaxies; and to provide optical morphologies for galaxies in the larger fields typical of ground-based multi-object spectrographs. The exact location of the flanking fields is not yet finalized.

Supporting Observations

The HDF-S has already been observed by the Infrared Space Observatory; a preliminary reduced image can be viewed on the web at *http://athena.ph.ic.ac.uk/hdfs/*. Spectra of the QSO have been obtained with the ANU 2.3-m telescope and with the NTT (Savaglio, 1998; Sealey, et al. 1998). Additional observations will be carried out with the AAT (to conduct a galaxy redshift survey and obtain a high-resolution spectrum of the QSO). Infrared imaging from the NTT and from CTIO are planned. Some radio observations with the ATNF, with more planned for the future, ultimately aiming to achieve a sensitivity of 3 microJy/beam (rms) at 3, 6, 13, and 20 cm. As the followup plans evolve, details will be posted on the HDF-S clearinghouse web page.

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The NICMOS Cryocooler

Editor's note: The following has been adapted from the HST Newsletter issued by the HST Project Office at Goddard Space Flight Center, with permission.

A high-tech cooler for *HST* will join John Glenn and the rest of the STS-95 crew during their nine-day mission this October. The cooler is an experiment as part of HOST, the *HST* Orbital Systems Test. If this test is successful, the cooler will be installed on *HST* during the third servicing mission as a means of extending the life of NICMOS. The solid nitrogen cryogen now in NICMOS is expected to run out by mid-November of this year.

The device is a reverse turbo-Brayton cycle cooler. It is powered by a compressor with a tiny turbine running at up to 300,000 RPM. Robotic electron discharge milling (EDM) machines are used to micro-machine the aerodynamic portions of the cooler in order to produce well-balanced components that produce no detectable vibration. The system also uses a miniature cryogenic circulator to remove heat from the NICMOS dewar.

This device is capable of high cooling capacity (>10 W at 60 K), extremely low vibration, and high reliability (>15 years with proven gas bearings). It provides first-stage cooling for advanced cryogenic systems, and it serves as a direct replacement for liquid or solid nitrogen-based systems. The cooler is also rated as safe for Shuttle and Space Station operations. The producer is Creare, Inc., of Hanover NH.

STS-95 will be the first flight of such a cooler. During the nine-day mission, engineers will evaluate the cooler's performance, and, if it is successful, will install it on *HST*.

The NICMOS Cooling System (NCS) has three cooling loops. The first is the circulator loop which interfaces directly to the NICMOS dewar. During the HOST mission, the circulator loop will connect to a controllable thermal load to simulate the NICMOS dewar. This NICMOS Cooling Loop Simulator (NCLS) consists of a simulated NICMOS dewar aft dome and has exactly the same parts, materials, design, and interface representation as the cooling loop in NICMOS.

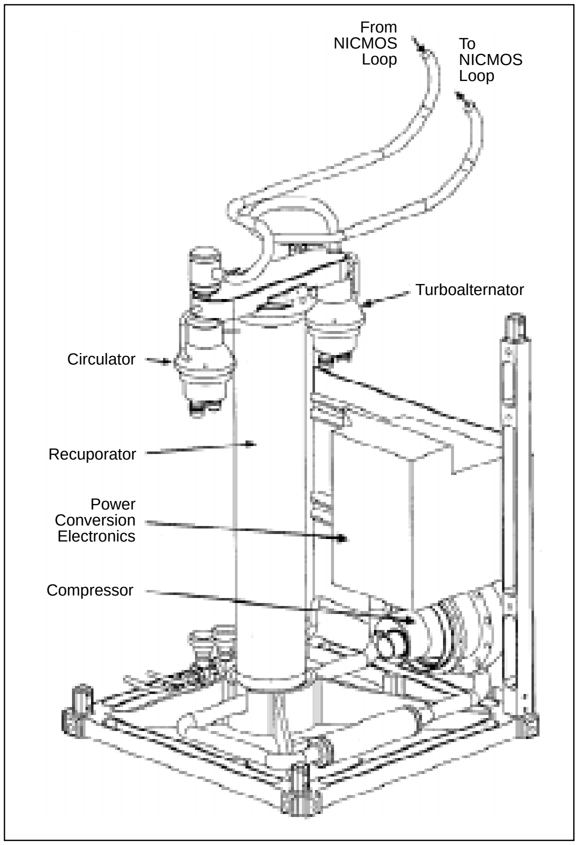
The second loop is the Primary Cooling Loop which contains a turbo compressor, a turbo-alternator, and heat exchangers to the circulator loop and capillary pumped loop. The third loop is this Capillary Pumped Loop which contains a heat exchanger at the primary cooling loop interface to transport the heat to an external radiator.

Two electronics units are needed as well. The NICMOS Cryocooler and Electronics Support Module runs the compressor/alternator loop and the circulator loop. The Aft Shroud Cooler Controller provides temperature, pressure, and power monitoring, as well as control of the capillary pumped loop.

During the HOST mission, the design of the NICMOS Cryocooler will be validated by cooling the NCLS to 70 K with short-term stability at the cooling loop interface of 0.1 K.

The NICMOS Cryocooler is now undergoing intensive laboratory testing. An initial test verified that the device can, in fact, produce 11 W of cooling at 60 K. Further tests will mate the cooler to the simulator, and verify that the cooler works as expected with a NICMOS surrogate.

If the NICMOS Cryocooler is successful, it can at least double the useful lifetime of this powerful infrared instrument.



Cryocooler & Circulator Loop

Cycle 7 Archival Research Proposal Review Panel Members

Extragalactic Panel	Stellar Astrophysics Panel	Solar System Panel
John S. Gallagher (Chair) University of Wisconsin	Catherine A. Pilachowski (Chair) KPNO/NOAO	Wendy Calvin (Chair) U.S. Geological Survey
Panel Members	Panel Members	Panel Members
Matthew A. Bershady University of Wisconsin-Madison	Barbara J. Anthony-Twarog University of Kansas	Amanda S. Bosh Hofstra University
Martin Elvis Smithsonian Astrophysical Observatory	Robin Ciardullo Pennsylvania State University	Beth Clark Cornell University
Peter M. Garnavich Harvard-Smithsonian Center for Astrophysics	Hugh C. Harris U.S. Naval Observatory	Jane X. Luu Harvard University
Tod R. Lauer KPNO/NOAO	Scott Kenyon Harvard-Smithsonian Center for Astrophysics	Yuk Yung California Institute of Technology
Crystal Martin Space Telescope Science Institute	Joan Najita Space Telescope Science Institute	
Hans-Walter Rix Steward Observatory	Saul A. Rappaport Massachusetts Institute of Technology	
Joseph C. Shields Ohio University	Regina E. Schulte-Ladbeck University of Pittsburgh	
Isaac Shlosman University of Kentucky	Kenneth Sembach The Johns Hopkins University	
Ann I. Zabludoff Lick Observatory		
Stephen E. Zepf Yale University		

The Space Telescope Science Institute will host a Workshop on:

When and How do Bulges Form and Evolve?

October 5-7, 1998

The aim of the workshop is to create, in a very timely moment, the context for a focused debate on the structure, formation and evolution of bulges in the early and present-day universe. The entire Hubble sequence is very much defined by the properties of bulges and by the physical connection between bulges and surrounding disks. Understanding how bulges form and evolve is an integral part of understanding galaxy formation and evolution. The meeting will have a real “workshop” format, with plenty of time for discussion, and will bring together world-recognized experts who explore this fundamental issue of modern cosmology from different perspectives. It will therefore provide a firm basis for future research into the origins of galaxies, a cornerstone scientific goal of the Next Generation Space Telescope.

Selected Archival Programs

PI LNAME	INSTITUTION	COUNTRY	SCI CAT	TITLE
Anderson	Univ. of Washington	USA	EA	A Morphological and Multicolor Survey for Ultrafaint QSOs/AGNs
Ashman	Univ. of Kansas	USA	EA	Globular Cluster Systems Of Spiral Galaxies
Balachandran	Univ. of MD	USA	SA	Implications of the ""Missing UV Opacity"" on Beryllium and Boron Abundance Determinations
Bianchi	JHU, Center for Astrophysical Sciences	USA	SA	Investigations of Star Clusters in M33
Brown	Caltech	USA	SS	A Reanalysis of the HST Kuiper Belt Object Search
Carollo	JHU	USA	EA	Formation of Bulges: The Role of Nuclear Activity
Churchill	PA State Univ.	USA	EA	The Neutral and High Ionization Gas in 51 Mg II Absorption Systems
Clayton	Louisiana State Univ.	USA	SA	Spatially Resolved Modeling of the Dust Attenuation and Intrinsic Stellar SEDs in Starburst Galaxies
Cohn	Indiana Univ.	USA	SA	Global dynamics of the collapsed-core globular clusters M15 and NGC 6397
Connolly	JHU	USA	EA	Evolution of the Small Scale Correlation Function
Crotts	Columbia Univ.	USA	EA	Halo Microlensing in M31 and the Luminosity Function of the Disk and Halo
Evans	OAO Corporation	USA	SS	Asteroid Trails in HST Archive Images
Filippenko	Univ. of CA at Berkeley	USA	SA	Environments of Supernovae from the HST Archive
Garmany	Univ. of CO	USA	SA	Wavelength Dependent Luminosity Functions for Super Star Clusters
Gilliland	STSCI	USA	EA	HDF Limiting Magnitude/Resolution Extension and Object Variability Search
Graham	Univ. of CA at Berkeley	USA	SA	Untangling a Cloud—Blast-Wave Collision in the Cygnus Loop
Gunn	Princeton Univ.	USA	EA	Fluctuations in the Extragalactic Background Light
Hamann	Univ. of CA, San Diego	USA	EA	Chemical Evolution of QSOs and Their Host Galaxies
Heap	Goddard Space Flight Center	USA	EA	Star-Formation History of the Universe: A Bottom-up Approach
Hodge	Univ. of WA	USA	EA	Reddening and Absorption Through Local Group Galaxies
Impey	Univ. of AZ	USA	EA	Lyman-Alpha Absorbers and Large Scale Structure
King	Univ. of CA	USA	SA	Accurate Internal Proper Motions in the Globular Cluster 47 Tucanae
King	Univ. of CA	USA	SA	Internal Dispersions of Proper Motions in Globular Clusters
Kraemer	Catholic Univ. of America	USA	EA	The Nature of Intrinsic Absorption in Seyfert 1 Galaxies
Lanzetta	SUNY at Stony Brook	USA	EA	Extremely Faint Galaxies in STIS Slitless Grism Spectra
Leitherer	STSCI	USA	SA	Dissecting the Local Starburst Clone NGC 3603
O'Dea	STSCI	USA	EA	A Systematic Study of Quasar Host Galaxies
Plait	Advanced Computer Concepts, Inc.	USA	SA	Searching for Brown Dwarfs and Extreme M Dwarfs in STIS Parallel Observations
Schneider	Lab for Atmos. & Space Physics	USA	SS	The structure of the Io plasma torus: implications for energy supply
Schulte-Ladbeck	Univ. of Pittsburgh	USA	SA	Observational constraints on massive-star evolution
Shara	STSCI	USA	SA	The Nova Rate in Galaxies of Different Types from Archival WFPC2 Images
Shlosman	Univ. OF Kentucky	USA	EA	Circumnuclear Morphology in Disk Galaxies:, HST Observations vs Theoretical Modeling
Sion	Villanova Univ.	USA	SA	A HST Archival Study of Cataclysmic Variable White Dwarfs
Smith	Univ. of TX at El Paso	USA	SA	Calibrating the Boron Abundances in Solar-Type Stars
Snow	Univ. of CO	USA	SA	Extending the Interstellar CO/H_2 Correlation Using HST and FUSE Spectra
Sparke	Univ. of Wisconsin-Madison	USA	EA	Feeding the Nucleus: a Study of Double-Barred Galaxies
Stanford	IGPP	USA	EA	Early-Type Galaxies in Clusters at z ~ 1
Wade	PA State Univ.	USA	SA	The Photospheric Spectrum of Dwarf Nova Accretion Disks During Eclipse
Yan	Carnegie Obs.	USA	EA	Studying the Evolution of Galaxies Using the NICMOS Parallel Imaging Data
Yelle	Boston Univ.	USA	SS	Analysis of FOS Spectra of Jupiter with a Raman Scattering Model
Zepf	Yale Univ.	USA	EA	The Concentrations and Tidal Radii of Globular Clusters in Virgo Ellipticals
Zheng	JHU	USA	EA	Evolution of the EUV Continuum of Quasars

EA is Extragalactic Astrophysics   SA is Stellar Astrophysics   SS is Solar System

Instrument News

FGS1R

Ed Nelan, STScI nelan@stsci.edu

The refurbished Fine Guidance Sensor #1 (FGS1R) was recently tested in Transfer Mode to determine its (and hence *HST*'s) angular resolution limit.

The angular resolution of an interferometer is determined by the instrument's ability to measure the separation of two point sources or the size of an extended disk. The FGS's interferometric fringe pattern, or S-curve, can be thought of as the instrument's PSF which can be sampled with a resolution of about 1 milli-arcsecond (as compared to the 42-mas pixels of the PC). An FGS observation of a binary star system produces a "Transfer function", which can be thought of as an image with 1-mas pixel sampling. Any difference between the Transfer function (image) and the S-curve (PSF) implies that the source is "resolved", and the degree to which they differ can be used to determine the relative brightness and angular separation of the two stars.

FGS1R is equipped with the articulating mirror assembly (AMA) which allows in-flight alignment of critical optical elements to guarantee optimal S-curves (sharpest PSF). The AMA was adjusted in May 1998, and with near ideal S-curves on both the x- and y-axis, the angular resolution limit of FGS1R was tested. By rolling the orientation of *HST* on the sky, two stars in a binary system (9th magnitude) were projected along the interferometer's x-axis with angular separations of 7, 9, 12, 14, 17, and 23 mas. At each orientation, the binary was observed in Transfer Mode.

Figure 1a shows the instrument's response to the change in the angular separation of the two stars along its x-axis while Figure 2 shows the change in the amplitude of the Transfer functions for these observations. The noise in these data is at the level of 0.001, so the "error bars" in Figure 2 are smaller than the symbols in the plot. Clearly, this instrument is capable of detecting duplicity in stellar systems when the components are separated by as little as 7 mas (provided the magnitude difference is less than about 1.5). Figure 1b shows the point source S-curve and Transfer functions of these observations along the y-axis where the components are separated by about 90 mas.

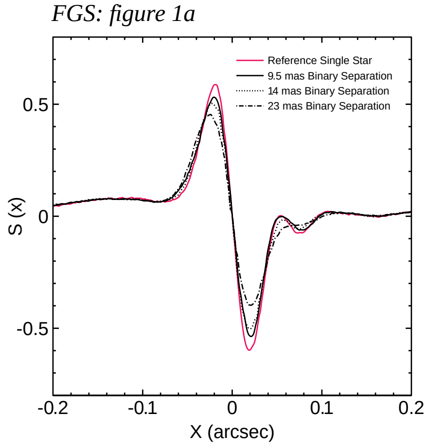
By deconvolving the observed Transfer function with reference S-curves, the angular separation and relative brightness of the two stars can be determined. An algorithm developed by John Hershey (STScI) which constrains the magnitude difference and the parity of the components (faint star to the "right" or "left" of the bright star) has been used to analyze these observations. In each case, the "measured" separation agrees with the known separation to within 1 mas with formal errors of about 0.4 mas. Unconstrained models failed to produce accurate results for separations less than 14 mas, but this may be due to limitations of the software rather than the instrument. We will try to upgrade the analysis algorithms so that this instrument's full potential can be realized. Interested readers are encouraged to check the STScI/FGS web site at *http://www.stsci.edu/ftp/instrument_news/fgs/html/TOPfgs.html* for updates to these analyses or to consult the FGS Instrument Handbook version 7 for a more detailed discussion.

FGS1R, with its near ideal interferometric response, is a significant improvement over FGS3, *HST*'s astrometer since 1991. With this new instrument, binary stars unresolvable by FGS3 can now be successfully observed.

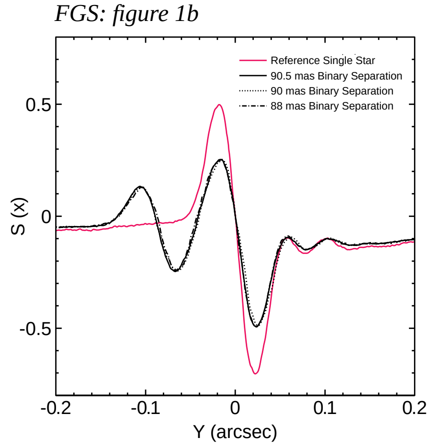
STScI would like to thank Otto Franz and Larry Wasserman (Lowell Observatory) for suggesting the binary used in this test and for providing its orbital elements. We also thank Kevin Chisholm, Linda A-Reed, and Tony Gruszczak of Raytheon for the

continued page 13

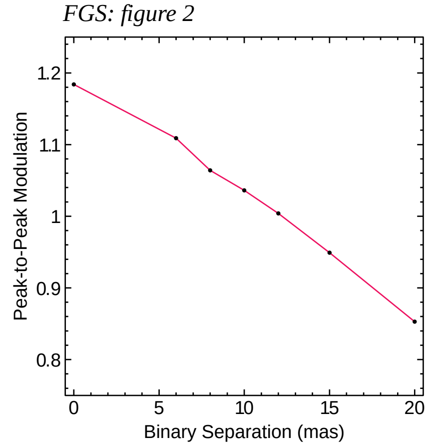
FGS: figure 1a



FGS: figure 1b



FGS: figure 2



Instrument News

FGS1R *from page 12*

invaluable support they provided in the adjustment of the AMA. And not least, we would like to acknowledge Christ Ftaclas (Mich Tech Univ) for originating the concept and design of the AMA.

Spectrographs

Stefi Baum, STScI sbaum@stsci.edu

STIS continues to operate well, and we continue to make steady and substantial progress on the on-orbit characterization and calibration of STIS, as well as on refinement of the calstis calibration pipeline. To better provide this information to GOs, we recently revamped our WWW pages, including the provision of a dedicated STIS-specific search engine, and an internal database format which allows us to more easily and regularly update information to you while flagging what is new.

Particularly noteworthy are recent advances in our understanding of STIS: the initial on-orbit sensitivity calibration of STIS's complete suite of spectroscopic modes; the refinement of techniques for fringe removal in near-IR spectroscopic observations; an initial assessment of the on-orbit imaging photometric response; and the initiation of the on-orbit MAMA flat fielding program. On the pipeline/software front, scripts for hot pixel removal using the daily darks as well as scripts for optimized removal of fringing in the near-IR were released. At the same time, the pipeline now regularly delivers extracted, one-dimensional spectra for all modes and has become considerably more robust and accurate in a number of ways (see the Pipeline button of our WWW page for details).

All of the on-orbit results for STIS have been studiously incorporated into the Version 2.0 STIS Instrument Handbook, released June 15, 1998. We urge all observers to throw out their Version 1.0 Handbook (and associated updates to it); the first version of the Handbook was written over two years ago, roughly a year before the launch of STIS and prior even to ground calibration!

Many updates to the on-orbit calibration and the pipeline are planned for the next 6 months, including updated spectral traces and geometric distortion corrections for the spectral and imaging modes, improved understanding and correction of the MAMA darks, the first on-orbit MAMA flat fields, updates to the CCD spectral flat fields to improve their integrity and their signal-to-noise, and on-orbit determined aperture throughputs. During the same period we will be working to improve the algorithms for extracting 1-d spectra, with a view to optimizing the signal-to-noise for different types of data and in order to make inroads into problems associated with scattered light, particularly in the E140M echelle modes. As always, you can see that there is no shortage of work to be done on the calibration and understanding front, and we welcome your input (send to help@stsci.edu) on priorities or problems you encounter with your data (or what you think is good!).

On the FOS and GHRS front, there has been steady progress calibrating these archival instruments as well, and we are proud to report two substantial steps forward: (1) all FOS spectropolarimetry data has been recalibrated using on-orbit-derived reference files and was rearchived in early May, (2) the ECF undertook an investigation of and resolved a long-standing issue with the accuracy of the FOS wavelength scale; an ISR describing the result has been issued and scripts made available to GOs to allow them to correct their data. The correction will be incorporated into calfos in the near future.

For the GHRS, a few database errors and software errors affecting the recalibration of GHRS data were corrected, and we have begun an investigation into the post-COSTAR GHRS LSF (one of our frequently asked GHRS questions). As noted above, send your queries and suggestions for FOS and GHRS to *help@stsci.edu*. The questions will be addressed by the Spectrographs Group which covers STIS, FOS, and GHRS. FOS and GHRS archival users will want to read the Spectrographs STAN which covers all three instruments.

STIS observing has been steady if slow through the spring and summer, and the list of publications using STIS data is growing at a good and rapid pace. There is a good body of public STIS data in the archive associated with the ERO program, the archival pure parallels, the calibration program, and GO+GTO data,and we continue to point you to that data (see the Special Projects button on the STIS WWW page for a listing of public data of particular interest). With the anticipated pickup of STIS observing come December, we are holding on to our hats, anticipating the plethora of new results to come.

WFPC2

Brad Whitmore, STScI whitmore@stsci.edu

The WFPC2 continues to work flawlessly, receiving roughly 20 of the available 90 orbits per week during the past several months. Since the WFPC2 is now a mature and largely well-characterized instrument, it was decided that a new version of the instrument handbook to support the Cycle 8 Call for Proposal would not be required. However, a short update has been prepared to highlight some of the recent studies and to inform WFPC2 users of our present and future calibration plans. The update includes recent results on charge transfer efficiency

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Instrument News

WFPC2 *from page 13*

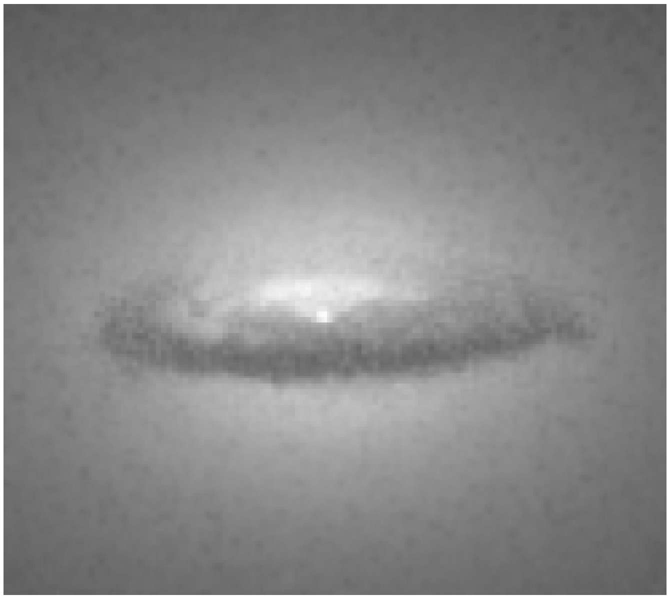
(CTE), the WFPC2 point spread function, dithering with WFPC2, a pointer to the WFPC2 clearinghouse, new information on system efficiencies and zero points, and the WFPC2 Cycle 7 calibration plan and tentative plans for Cycle 8.

Another document that may be of interest is the Instrument Science Report WFPC2 98-01 - “WFPC2 Cycle 6 Calibration Closure Report”. This report describes the status of the Cycle 6 WFPC2 calibration plan as of February 1998. Also included are summaries for three Cycle 5 proposals (Flat Field Check, UV Throughput, and Polarization and Ramps) which have been completed since the writing of the Cycle 5 Closure Report. We remind people that calibration data are non-proprietary and are available from the STScI archives. Some data sets that might be of particular interest for observers are a set of observations to characterize the long-vs-short exposure time problem (prop ID = 7630), a set to measure photometric transformations (prop ID = 6935), and extensive observations of a photometric monitoring star and of the globular cluster Omega Cen. The WFPC2 group is conducting ongoing analysis of these data, but other WFPC2 users may also find these observations useful for a variety of different purposes.

Yet another document of interest is “WFPC2 Data Analysis — A Tutorial”, which provides a step-by-step introduction to reducing WFPC2 data. All these documents are available via the WFPC2 WWW homepage or by requesting a copy from the STScI help desk.

During the NICMOS campaign in June, the WFPC2 was used in parallel mode to observed some flanking fields of the Hubble Deep Field (north), using the original HDF filter set F300W, F450W, F606W, and F814W. The data were taken with large offsets, hence an area roughly 3 times larger than the original HDF was imaged. This data, along with other WFPC2 data that was taken as part of the standard pure parallel program (see the April 1998 STScI *Newsletter*) is non-proprietary.

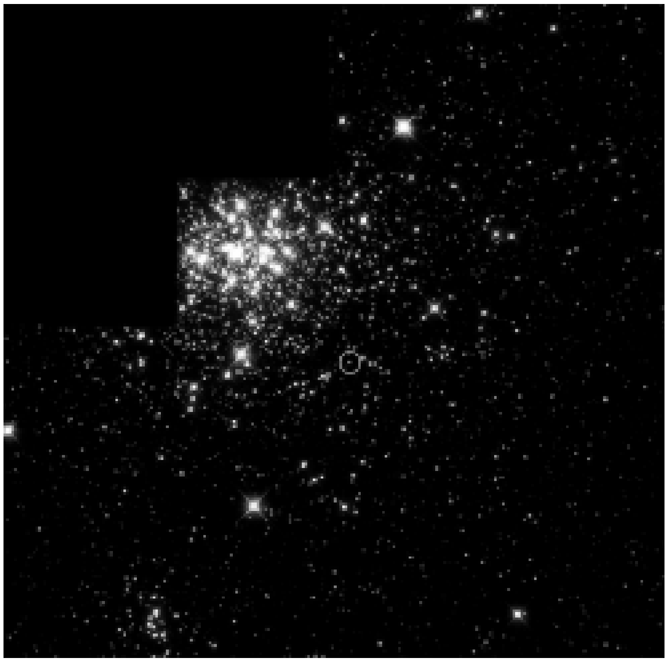
A new STSDAS package, called “dither”, has been released as part of STSDAS 2.0.1. Dither contains the drizzle task, which was used for imaging the Hubble Deep Field, as well as a number of other tasks useful for aligning and combining dithered and rotated images. A description of the dither package, as well as an explanation of many of the concepts involved in imaging dithered data can be found in an article by Fruchter, Hook, Busko and Mutchler in the 1997 *HST* Calibration Workshop. Information on STSDAS and how to retrieve the software can be found at: *ra.stsci.edu/STSDAS.html*. The article by Fruchter et al. is available online at: *icarus.stsci.edu/~stefano/CAL97_PAPERS/fruchtera.pdf.*



HST Recent Release: Hubble uncovers dust disk around a massive black hole

Resembling a gigantic hubcap in space, a 3,700 light-year-diameter dust disk encircles a 300 million solar-mass black hole in the center of the elliptical galaxy NGC 7052.

Credit: Roeland P. van der Marel (STScI), Frank C. van den Bosch (Univ. of Washington), and NASA.



HST Recent Release: Hot White Dwarf Shines in Young Star Cluster

A dazzling "jewel-box" collection of over 20,000 stars can be seen in crystal clarity in this NASA Hubble Space Telescope image, taken with the Wide Field and Planetary Camera 2. The young (40 million year old) cluster, called NGC 1818, is 164,000 light-years away in the Large Magellanic Cloud (LMC), a satellite galaxy of our Milky Way. The LMC, a site of vigorous current star formation, is an ideal nearby laboratory for studying stellar evolution.

Archive GO/GTO User Survey 1998

Megan Donahue, STScI donahue@stsci.edu

We would like to thank everyone who participated in our GO/GTO and Authorized User survey in February, 1998. One hundred fourteen people responded to our invitation to 460 GOs, GTOs, and users authorized to retrieve proprietary data to take part in a 12-question survey. We wished to hear the answers to 12 questions regarding GO services including media preferences, perceived problems with data distribution, paper products, and re-calibration patterns and preferences. We use the results of such surveys to prioritize the development of services and to plan strategically for the future of the archive.

Tape and Electronic Retrievals

Eighty-seven percent of the people responding had received *HST* data in the last 6 months. Over half of those retrieved it electronically. About one-third received it on Exabyte tape, while only 12% received it by DAT. We asked about tape problems. About 13% reported a failure to read at least one Exabyte tape. In contrast, from operational records, we have received 21 user complaints out of a total of 1604 tapes shipped between June 1997 and Feb 1998. One-third of these complaints were resolved by giving the observer electronic access. Only 2 of the tapes had genuinely bad files. Other problems turned out to be software or hardware related.

For electronic retrievals, 25% reported the experience of having an electronic retrieval fail. We are concerned by this high percentage, so we investigated our own records. From our hotseat records, we found that nobody to our knowledge had failed to retrieve data electronically eventually, except for a couple users in extremely remote countries. Between 1-Sept and 19-March there have been 11,516 DADS requests for over 500,000 files. 95% of these transferred successfully. Of those that failed to transfer, most (93%) failed because of ftp or other Internet errors, host errors, or directory errors. The remaining 7% failed because of unauthorized attempts to access proprietary data.

However, we are not counting here all the failures that a user may perceive: inability to access StarView or the Web, the times they made requests and found the database or DADS down. In our next general survey of archive services, we will ask more pointed questions about retrieval failures. We may find that including additional checks in our distribution system may avoid some of the ftp errors.

Media Preference

We found a majority of observers would like to have their data on CDROM. This is not altogether surprising, since CDROMs are inexpensive, compact, random-access, and reliable. The medium is now relatively mature. One disadvantage of CDROMs is that they are rather small compared to the size of, say, an Advanced Camera dataset or a STIS time-tagged dataset. We are not currently able to produce CDROMs for GOs, although we are gaining experience in creating CDROMs by making bulk copies of archival data on CDROMs for our sister sites at CADC and ECF.

Paper Products

Paper products can be a significant overhead on making data available to observers. Some paper collections take hours to print. We wanted to get users' opinions on these products and alternatives to placing them on actual paper. The mean grade of paper products was 2.7 on a scale of 1 to 5 where 1 is extremely useful and 5 is useless - essentially a C+/B-. Many respondents said that the paper products had their usefulness, and were essential to the 'new' user. Many respondents also said the paper products had too much white space. Based on the answers, we concluded that users in general appreciate the hardcopies, particularly when data distribution was problematic, but that they do not see the need for such voluminous amounts of paper. Summaries, or even excluding the reports for the coordinated parallels, would be appropriate particularly in the cases where the number of pages of the nominal report exceeds 50-100 pages.

On-the-Fly Calibration Service

We also asked several questions relevant to our planning for the future 'on-the-fly' recalibration service. We were interested in what sorts of intermediate products users might like and what their re-calibration habits were. We found that about half of WFPC2 observers re-calibrate their data, while 34% never do. 75% of STIS observers re-calibrate. 33% of NICMOS observers recalibrate 3 or more times during the proprietary period, reflecting the calibration challenges of that data. Most users wanted any intermediate data products such as those that might be generated during the calibration and assembly of a NICMOS association product and its member exposures.

Response

We have not yet constructed a full response to the results of this survey, but we are preparing an OTFC service to premier next fall. We are investigating the use of CDROMs for data distribution. If we have a CDROM service, we may also package paper products on them since CDROMs may be more reliable to read than tapes. We are also planning to investigate and monitor the reliability of electronic distribution of all archival data to make sure that we are not introducing more problems. Internet delivery will never be problem-free since disks will always fill up and ftp connections will never be perfect. We note that in most cases, simply trying again will result in a successful delivery.

Surveys like this are essential for us to keep track of our users' preferences and ideas. We hope to hear from you when we conduct a more general user survey in the near future.

Europeans at STScI: Carla Cacciari

Carla Cacciari is a familiar face at STScI, having been here in early days and again recently during a sabbatical. Carla first came to the Institute in 1984 to join Neta Bahcall's General Observer Support Branch, left in 1988 to return to Bologna, and just finished an eighteen-month visit.

Carla Cacciari

Carla has been associated with Bologna almost all her life. She was born there and grew up there too. She attended the Liceo Classico in Bologna, the high school for classical studies, but took physics and other science courses. She obtained her degree from the University of Bologna in 1971, having done a thesis under the supervision of Alvio Renzini on evolutionary models of globular cluster stars. This led to a fellowship from the CNR (the Italian equivalent of the NSF) in Bologna, again working with Renzini, and then a permanent position at the Osservatorio. Bologna's involvement in the construction of a 152 cm telescope in the Apennines shifted her interest more toward observations, and she began collaborations with Fusi-Pecci and Dickens to study RR Lyrae stars in globulars photometrically, especially in M15.

In the late 1970s and 1980s Carla pursued these studies worldwide. In 1978, she started an 18-month visit at Mount Stromlo to work with Ken Freeman on RR Lyrae and other stars in globulars. She returned to Europe in 1979 to spend three months at the Royal Greenwich Observatory. Mike Penston encouraged her to apply for an IUE support position at Villafranca Spain ("VILSPA"), where she worked from 1980 to 1983. That led her to apply to come to STScI in an ESA position which she did in 1984. Between 1988 and her recent return to STScI, Carla was again in Bologna, this time as an Associate Astronomer.

When she's not an astronomer, you'll find Carla hiking, traveling, cross-country skiing, or perhaps reading or at the opera. And, like all true Bolognese, she appreciates good friendship and good food.

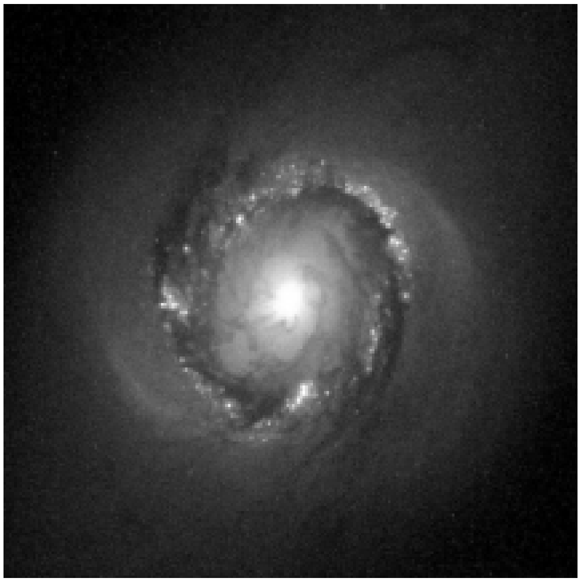
As examples of her recent work, you may wish to look at these papers:

Fusi Pecci, F., Buonanno, R., Cacciari, C., Corsi, C. E., Djorgovski, S. G., Federici, L., Ferraro, F. R., Parmeggiani, G., and Rich, R. M. "The M_V (HB) vs. [Fe/H] Calibration. I. *HST* Color-Magnitude Diagrams of 8 Globular Clusters in M31," 1996, A.J. 112, 1461.

Sandage, A., and Cacciari, C. "The Absolute Magnitude of RR Lyrae Stars and the Age of the Galactic Globular Cluster System," 1990, Astrophys. J., 350, 645.

Bingham, E., Cacciari, C., Dickens, R.J., and Fusi Pecci, F. "Photographic Photometry of RR Lyrae Variables in the Globular Cluster M15," 1984, Mon. Not. R.A.S. 209, 765.

Cacciari, C., and Freeman, K. C. "Survey of H-α Emission in Globular Cluster Red Giants," 1983, Astrophys. J., 268, 185.



HST Recent Release: A bright ring of star birth around a galaxy's core

An image from NASA's Hubble Space Telescope reveals clusters of infant stars that formed in a ring around the core of the barred-spiral galaxy NGC 4314. This stellar nursery, whose inhabitants were created within the past 5 million years, is the only place in the entire galaxy where new stars are being born.

This close-up view by Hubble also shows other interesting details in the galaxy's core: dust lanes, a smaller bar of stars, dust and gas embedded in the stellar ring, and an extra pair of spiral arms packed with young stars. These details make the center resemble a miniature lanes and rings of gas in the centers of galaxies, it is uncommon to have spiral arms full of young stars in the cores. NGC 4314 is one of the nearest (only 40 million light-years away in the constellation Coma Berenices) examples of a galaxy with a ring of infant stars close to the core. This stellar ring - whose radius is 1,000 light-years - is a great laboratory to study star formation in galaxies.

Credits: G. Fritz Benedict, Andrew Howell, Inger Jorgensen, David Chapell (University of Texas), Jeffery Kenney (Yale University), and Beverly J. Smith (CASA, University of Colorado), and NASA.

A Talk with Pierre Bely

Pierre-Yves Bely may not be familiar to most readers, yet his work has helped virtually every user of *HST*. Pierre is an engineer, and, following in his father's footsteps, has always wanted to be one. The training that Europeans go through for an engineering career is rigorous. In Pierre's case this meant three years of undergraduate training in physics, math, and chemistry, then four years at the Ecole Central de Paris, an engineering academy that has produced, among others, Gustave Eiffel.

The result of this training is roughly the equivalent of an advanced Masters degree. Pierre deliberately chose not to specialize so that he could learn something about all aspects of the profession. His "specialty" is the systemic view of projects, from conception to completion. Because he finished near the top of his class, Pierre won a French government scholarship to spend two years anywhere.

That French scholarship, together with the Fulbright program, got him to Berkeley in 1962 and 63, where he met and married his wife, Sally; she was teaching French there. He was obliged to go back and fulfill compulsory military service, but when that was finished he came back to San Francisco to work with the International Engineering Company on civil engineering projects. He realized that a love and appreciation of physics was behind his enjoyment of engineering, and he started to take some classes in astronomy at Berkeley with the view of working toward a Ph.D.

But an opportunity arose to go to the Observatoire de Paris-Meudon, where an engineer was needed. He designed two 1.5-m telescopes, one a Schmidt that was built near Nice, and then he became Chief Engineer for what would be the Canada-France-Hawaii Telescope (CFHT). French astronomers realized that their existing telescopes were inadequate when 4-m telescopes were being built elsewhere, and started efforts on a new, large facility. Pierre's experience and interests were ideal for the many jobs this required, from site testing to structural analyses. European and other sites were considered, but John Jefferies, during a visit to Meudon, convinced them that Mauna Kea was the perfect place for their telescope. A thorough evaluation supported that, but France couldn't afford the full cost of a remote telescope, and so the alliance with Canada was forged.

Pierre spent 15 years working on CFHT, from concept and design through early operations. In addition to the engineering challenges this offered, there were the practical issues of dealing with people from other countries under sometimes-difficult circumstances, all of which were new dimensions to his profession. Once operations were fairly routine, Pierre was looking for new opportunities, and so became part of the European Space Agency group at STScI. He came in 1984, joining Peter Stockman's Research Support Branch. When we reorganized in 1988, Pierre went to the Science and Engineering Systems Division (SESD), under Rodger Doxsey, where he became Chief of the Engineering Support Branch, responsible for the instrument and telescope engineers at STScI. This responsibility gave him an intimate view of *HST*, as well as a chance to work with other engineers from NASA, Lockheed, Hughes-Danbury Optical Systems, and the many others who supplied *HST* components. After launch (and the realization of *HST*'s optical problems), Pierre worked with Chris Burrows to use the Fine Guidance Sensors to study the spherical aberration.

Perhaps Pierre's specialty is really looking ahead to the future, for even before launch he worked with Garth Illingworth (who was then Deputy Director) on a symposium on successors to *HST*. He has consulted with Marshall Space Flight Center on lunar telescopes, worked with Holland Ford on POST (the Polar Stratospheric Telescope, a large-aperture telescope suspended beneath a tethered balloon), and many other concepts. More recently, he chaired an ESA study called "Kilometric Baseline Space Interferometry," comparing lunar-based and free-flying versions.

Pierre Bely

ESA requires their employees to retire at age 60, which then created the opportunity for Pierre to join STScI's AURA staff as mission architect for NGST, a job he is relishing. He has realized his dream of being an astronomer by being able to participate in many of the most important projects of our time.

For personal challenges, Pierre gets into the outdoors, and especially loves climbing and sailing. Four years ago he scaled Mont Blanc, and while in Hawaii he sailed to Tahiti and back. His musical tastes tend to bluegrass, baroque, and jazz. He and Sally have had three children, all now grown.

1998 Hubble Fellows Selection

Howard Bond, STScI bond@stsci.edu

The selection of the 1998 Hubble Fellows has been completed. The following 14 Fellows were chosen by the review committee from among 140 excellent applicants, and will take up their Fellowships at their respective Host Institutions in the fall.

The 1999 selection cycle will begin in the fall of 1998. Persons wishing to apply must have received their Ph.D. degrees on or after January 1, 1996. The following two institutions will be ineligible to host 1999 Fellows because they have accepted two 1998 Fellows: University of Arizona and Massachusetts Institute of Technology (MIT). Further information is available at *http://www.stsci.edu/stsci/Hubble_fellow.html*.

The 1998 Hubble Fellows are:

JOANNE C. BAKER received her PhD from the University of Sydney in 1995. Host institution: University of California at Berkeley. Project: Formation of Massive Structures at High Redshifts

GREG L. BRYAN received his PhD from Princeton in 1996. Host institution: Massachusetts Institute of Technology. Project: The Nature of Faint Galaxies at Early Times: An Ab Initio Approach.

MARCIO CATELAN received his PhD from the University of Sao Paulo in 1996. Host institution: NASA/ Goddard Space Flight Center. Project: The Helium Abundances and Ages of Globular Clusters.

ROELOF S. DE JONG received his PhD from the University of Groningen in 1995. Host institution: University of Arizona. Project: The Evolution of Stellar Content and Structure in Galaxies.

BRYAN M. GAENSLER will receive his PhD from the University of Sydney in 1998. Host institution: MIT. Project: Neutron Stars and Their Origins.

EVA GREBEL received her PhD from the University of Bonn in 1995. Host institution: University of Washington. Project: A Comprehensive Picture of Dwarf Galaxy Evolution.

CHRISTIAN KNIGGE received his PhD from the University of Oxford in 1995. Host institution: Columbia University. Project: Resolving Controversies in the Astrophysical Accretion Laboratory: 'Demystifying the SW Sex Stars' and 'Do Cataclysmic Variables Drive Jets?'

HUAN LIN received his PhD from Harvard University in 1995. Host institution: University of Arizona, Steward Observatory. Project: Two New Redshift Surveys: Luminosity and Clustering Evolution in the Not Too Distant Universe.

SANGETTA MALHOTRA received her PhD from Princeton University in 1995. Host institution: Kitt Peak National Observatory. Project: High-Redshift Dust in Absorption.

SIMON PORTEGIES ZWART received his PhD from Utrecht University in 1997. Host institution: Boston University. Project: The Interplay Between Stellar Evolution and Stellar Dynamics.

CHRISTOPHER S. REYNOLDS received his PhD from Cambridge University in 1996. Host institution: University of Colorado. Project: The Central Engines and Immediate Environments of AGN.

GORDON SQUIRES received his PhD from the University of Toronto in 1995. Host institution: California Institution of Technology. Project: The Nature of Dark Matter.

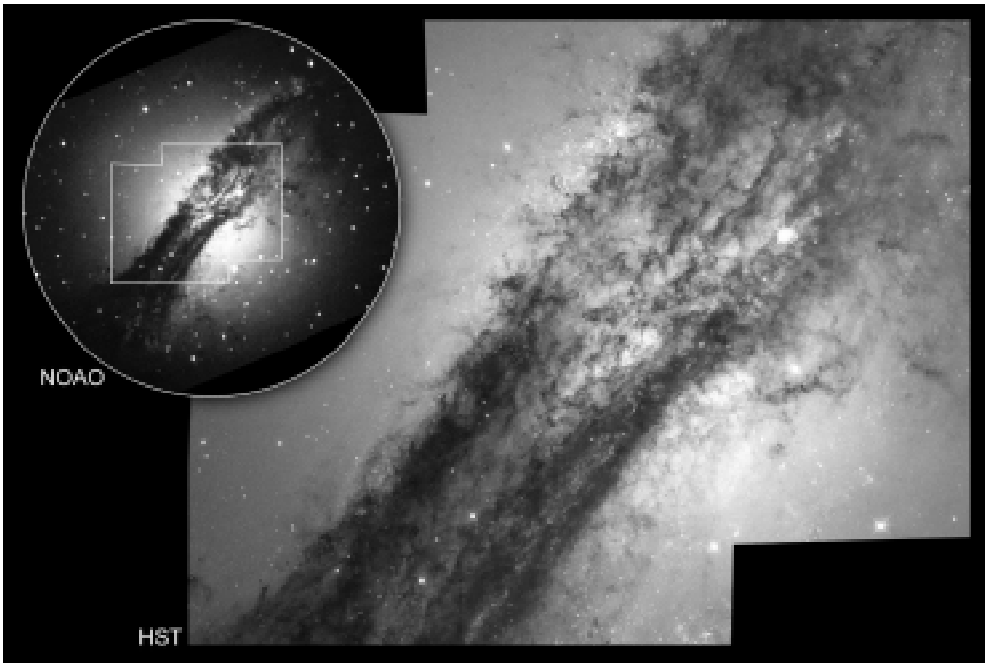
JENNIFER J. WISEMAN received her PhD from Harvard University in 1995. Host institution: Johns Hopkins University. Project: The Environmental Effects of Protostellar Outflows.

MATIAS ZALDARRIAGA will receive his PhD from the Massachusetts Institute of Technology in 1998. Host institution: Institute for Advanced Study. Project: Cosmology, CMB, and Galaxy Surveys.

HST Recent Release:
Turbulent Cauldron of Starbirth in Nearby Active Galaxy

NASA's Hubble Space Telescope offers a stunning unprecedented close-up view of a turbulent firestorm of starbirth along a nearly edge-on dust disk girdling Centaurus A, the nearest active galaxy to Earth.

Picture Credits: Ground-based image (upper left): NOAO HST image (lower right): E.J. Schreier, (STScI) and NASA



Calandar

Cycle 8

Phase I proposals due	Sep. 11, 1998 (firm)
Proposers notified	Dec. 15, 1998 (tentative)

Cycle 9

Call for Proposals issued	May 1, 1999 (tentative)
Phase I proposals due	July 30, 1999 (tentative)
Proposers notified	Oct. 31, 1999 (tentative)

Meetings and Symposia

Space Telescope Users Committee	Nov. 9-10, 1998
Bulges Workshop (see p. 10)	Oct. 4-7, 1999
Hubble Fellowship Symposium	Oct. 8-9, 1998

ST-ECF Newsletter

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

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Contents

How to contact us:

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

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

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

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

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

Fred Walter (chair), SUNY Stony Brook,
fwalter@sbast1.ess.sunysb.edu
John Bally, U. Colorado
John Clarke, U. Michigan
Bob Fosbury, ESO
Marijn Franx, Kapteyn Astron. Inst.
Laura Kay, Barnard College
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Regina Schulte-Ladbeck, U. Pittsburgh
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Bruce Woodgate, GSFC

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