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SPACE TELESCOPE SCIENCE INSTITUTE

Newsletter

Highlights of this Issue:

Galaxy Bulges as Seen with *HST*

Rosemary Wyse, Johns Hopkins University

The relative luminosity of a galaxy's bulge is a factor in determining its Hubble type, and the properties of bulges constrain galaxy formation models. The common usage of "bulge," as in the term bulge-to-disk ratio, allocates to the bulge all the light of a galaxy that isn't disk. Thus the bulge is assigned any light that is in excess of an inward extrapolation of a constant scale-length exponential disk. New observations with *HST* have characterized for the first time the stellar populations in the inner parts of external disk galaxies. These observations have strengthened the case for two dominant modes of bulge formation, the first being dissipational collapse at high redshift, forming the classical dense bulges of early-type disk galaxies, and the second being more recent formation of a bulge through instabilities in the disk, producing the relatively low-density exponential bulges of late-type disk galaxies. Such apparently dichotomous behavior had been suggested earlier on the basis of ground-based observations. The *HST* data have provided an unprecedented look at the inner workings of bulges and their disks.

The View from the Ground

Classical bulges are centrally-concentrated, high-surface-density, three-dimensional stellar systems, with $R^{1/4}$ surface brightness profiles, as in elliptical galaxies. Large bulges are obviously easier to observe, which meant that available samples with, e.g., spectroscopic determination of kinematics, were biased towards these systems. Many similarities between the bulges of early-type disk galaxies and ellipticals of the same luminosity were found, such as the level of rotational support (Davies et al. 1983), and a correlation between the strengths of metal absorption lines and velocity dispersion (Jablonka et al. 1996; Idiart et al. 1997).

However, recent observations have revealed that the surface brightness profiles of bulges in late-type disks are better fit by an exponential decline than an $R^{1/4}$ law (e.g., Andredakis, Peletier & Balcells 1995; de Jong 1996). Further, the derived scale-lengths of bulges are apparently statistically related to those of the disks in which they are embedded. As best as they can be measured from the ground (bearing in mind that for typical galaxies in the sample the bulge scale-lengths are less than 1 arcsec), the (exponential) scale-lengths of bulges are around one-tenth that of their disk (Courteau, de Jong & Broeils 1996). The projected starlight of the bulge of the Milky Way (perhaps an intermediate Hubble type, Sbc) can be reasonably approximated by exponentials (vertically and in the plane); the Milky Way then fits within the scatter of the correlation between bulge- and disk-scalelengths of the external galaxies.

A connection between bulge and disk is also seen in the optical colors in that the color of a bulge is approximately the same as that of the inner

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Cycle 9

Who got time on HST to do what ...

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DIRECTOR'S PERSPECTIVE

Steven Beckwith

Private Profit vs. Public Good

Imagine that the *Hubble Space Telescope* takes data on two fields a few weeks apart, and the principal investigator notices asteroid streaks in both that he can connect together. The asteroid is on an Earth-crossing orbit, but the PI keeps the data to himself until he can publish his own science – unrelated to asteroid work, of course. As the asteroid comes closer to Earth, it is picked up by another observatory. To calculate the trajectory accurately, a request is made to the *HST* Archive, but the data are still protected by the proprietary period, and the PI is out of contact on a hiking trip in the jungles of the Amazon. Do we break the proprietary period in the public interest or preserve the rights of the PI?

The answer seems obvious: in this case, the pubic interest should dominate, especially since the data were taken on a public facility paid for by public taxes. But there are murky scenarios in which the balance between public interest and private profit is not so obvious. Such a case occurred last year, when a group proposed to observe the target of opportunity presented when the next supernova went off in the Galaxy. The Time Allocation Committee (TAC) balked. There was no question about the importance of the science or the advantage of preparing for the observations of a rapidly varying phenomenon for which advanced planning would minimize the risk that bad observing decisions were made. But the group had overlooked the fact that they would have sole rights to the data for 1 year, long after the supernova had faded through maximum light. The TAC felt the potential loss of publicly available data during the critical early phases of the event would vastly outweigh the benefits of pre-planning. So the TAC turned down this otherwise excellent proposal simply because of the proprietary period.[1]

Increasingly, the TAC is looking at the appropriateness of proprietary time on proposals that have broad implications for the public good. Many groups recognize this trend and specifically wave some or all of the proprietary period in their proposals. My predecessor, Bob Williams, made the boldest statement about the public interest with the Hubble Deep Field, in which he insisted on no data rights to maximize the impact on astronomy. The groups proposing to observe gamma-ray bursts have generally reduced their proprietary rights to a few months, recognizing perhaps that their scientific cases would be strengthened by such an offer. All *HST* investigators should understand that the TAC may factor proprietary rights into their decisions, especially if the proposals ask for large blocks of time to observe regions of broad interest or if the immediate availability of the data would materially improve the science, such as on rapidly varying sources.

There is a good reason to have proprietary periods for scientific research. Just as patents encourage private enterprise with the incentive for profit, exclusive rights to data for some period ensure that scientists can analyze data thoroughly and publish careful interpretations without rushing to print. The key project on the Hubble constant is probably a good example of an instance where data rights serve science on a large program. Data rights serve the public interest by setting up a market for ideas to foster the success of people who may not have the scientific clout or resources to compete with established groups unless they have some protection for their ideas.

But it does not take a genius to predict that some observations will be very important – the next local supernova, for example – and it would appear counter to the public interest to preserve data rights for all kinds of data taken on public facilities. We have no clear policies to deal with these issues except for the discretion of the Director. The Director is reluctant to intervene in any but the most obvious cases, since the protests from the investigators will be long and loud. It behooves us as a community to think about policies for data rights, if we are to continue to profit from public support. As the Hubble Deep Field shows, our biggest triumphs as a community may well come from work carried out collectively rather than by the rugged individualists we have always held in the highest regard.

Steven Beckwith Baltimore, November 15, 1999

[1] It turned out that the group had simply overlooked the implications of a proprietary period and was perfectly happy to wave their rights, once they understood the oversight. I worked out a private solution with the group in case this low probability event occurred in Cycle 8.

Galaxy Buldges *from page 1*

disk in which it is embedded, for earlier spiral Hubble types (S0 to Sbc) (Balcells & Peletier 1994) and also for later Hubble types (de Jong 1996). This correlation implies that similar stellar populations exist in bulges and their inner disks, and that there should be a variation of mean stellar age from disk to disk, as may be expected from the range of colors observed. Observations of gas fraction and the like lead one to expect a corresponding range in the mean stellar age of the different bulges. But, as ever, the decomposition of the surface brightness profiles is difficult, and that difficulty is compounded by the presence of dust in the inner regions. The uncertainties in the photometry are large.

The HST View

The spatial resolution of *HST* allows a real measurement of the scale-lengths and surface brightnesses of small bulges and disks, and hence a robust structural analysis. Carollo and co-workers have carried out a snapshot survey of bulges with WFPC2 in the F606W filter. Their survey has provided definitive measurements of scalelengths etc., and the complexity in the relationship between surface brightness and scale-length for bulges is illustrated in Figure 1, based on the WFPC2 data from Carollo (1999). Carollo has separated bulges depending on whether or not they have exponential profiles or $R^{1/4}$ profiles; the plot shows that while the large, $R^{1/4}$-law bulges follow the same scaling as ellipticals, the smaller, exponential-profile bulges are offset to lower surface brightnesses and occupy the extension to smaller scalelengths of the locus of late-type disks. This strengthens the disk-bulge connection for these small bulges. However, Carollo (1999) finds both $R^{1/4}$ and exponential bulges in apparently very similar disks, so some additional parameter is important.

These WFPC2 data also allow an investigation of the detailed structure in the inner regions, quantifying the relative frequency of nuclear bars, central star clusters, and so on. Carollo finds a high fraction of photometrically-distinct compact sources sitting at the galactic centers. These "nuclei" have surface brightnesses and radii ranging from those typical of old Milky Way globular clusters to those of the young star-clusters found in interacting galaxies (e.g. Whitmore et al. 1993; Whitmore & Schweizer 1995), with typical half-light radii of a few pc up to ~20 pc. Many of the nuclei are embedded in bulge-less disks or in bulge-like structures whose light distribution is too dusty or star-forming to be meaningfully modeled. Every exponential bulge was found to contain a nucleus, and also the luminosity of the nucleus was consistent with its being a few percent by mass of the exponential bulge in which it is embedded. We will return to this point below.

The $V-H$ color distribution of the exponential bulges is rather broad, and peaks at $V-H$ ~0.96, significantly bluer, by about 0.4 mag, than the value typical of the $R^{1/4}$ bulges (Carollo et al. 1999). If this bluer color can be ascribed to a younger age, this would indicate that exponential bulges are the preferred mode, for bulges forming more recently.

Indeed, a detailed, robust determination of the range of stellar colors in the bulges and disk really requires the high spatial resolution and stability of *HST*, combined with IR data to constrain the effects of dust. Peletier and co-workers have completed a careful analysis of the optical-IR colors of bulges from their WFPC2/NICMOS imaging survey. Their sample includes disk galaxies of a range of Hubble types in a variety of larger-scale environments. The observational uncertainty is low enough, and sufficiently well-characterized, to quantify any intrinsic scatter in colors. They find a very narrow dispersion in the two-color diagram ($B-I$ vs. $I-H$) for the true stellar colors of the bulges of early Hubble type spiral galaxies.

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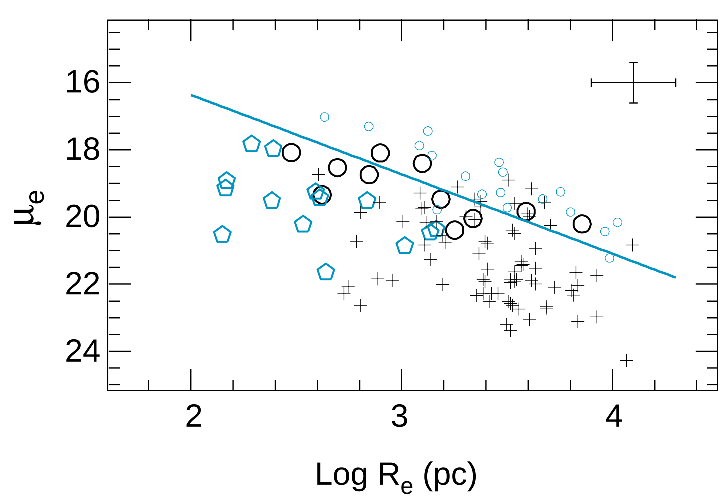

Figure 1 caption The mean V-band surface brightness μ_e within the half-light radius R_e, as a function of log R_e (in pc). The WFPC2 measurements are shown with pentagons for the exponential bulges and large circles for the "classical" $R^{1/4}$-law bulges. Comparison data from the literature are shown for the $R^{1/4}$ bulges from Bender et al. (1992; small circles) and Scd-Sm disks from Burstein et al. (1997; crosses). The solid line is the best fit to the elliptical galaxy sequence (data from Bender et al. 1992 and from Burstein et al. 1987). The typical 1-sigma error bar for the WFPC2 measurements is shown in the upper-right corner.

Galaxy Buldges *from page 3*

A reasonable interpretation is that the bulges have a narrow spread of mean stellar age. Further, at the half-light-radius, the bulge colors are similar to those of ellipticals in the Coma cluster, systems thought to be rather old, indeed forming at redshift ~3. An old age for (exponential? $R^{1/4}$?) bulges would agree with the analyses of *HST* color-magnitude diagrams for lines of sight towards the Galactic Center, which have shown a uniform old age for the Milky Way bulge field stars (Feltzing & Gilmore 1999) and bulge globular clusters (Barbuy et al. 1999, A&A, 341, 539).

What Does it Mean?

How might bulges form, producing these apparently different properties, and how might one test the model predictions further?

Correlations between the properties of disks and bulges are natural results of "secular evolution" models which form bulges from (inner) disks. The bulges result from a disk instability to form a bar, which in turn is destroyed either by a buckling instability (Combes et al. 1990; Raha et al. 1994) or through the scattering effects of a central mass concentration, itself created by the inflow of material induced by the bar potential (e.g., Norman, Hasan & Sellwood 1996). Numerical simulations have shown that a central mass concentration of only perhaps a few percent by mass of the bar can apparently destroy the bar. A strong prediction is that bulges formed this way should contain significant central star clusters.

The WFPC2 imaging survey of Carollo and co-workers found nuclei of exponential bulges that were sufficiently massive to have destroyed a bar of the same mass as the (exponential) bulge. Are these nuclei the central mass concentrations of the models? It is certainly tempting to so speculate. The relatively massive central clusters found in these exponential bulges could theoretically prevent subsequent bar formation, thus removing the possibility of successive cycles of a bar formation - gas inflow - formation of central object - bar dissolution mechanism. There is a particular need to determine how many cycles of bar formation/dissolution are expected theoretically, and how many are allowed by the observations. The fact that the Milky Way bulge is old, but has an exponential bulge (or at least more exponential than $R^{1/4}$!), limits any bulge-building in this case to one event a long time ago.

The high densities of classical bulges could arise either because significant gaseous dissipation occurred during their formation, or they could reflect formation at very high redshift when the background density was higher (or some combination of these two). The majority view, consistent with the ground-based observations, is that indeed proto-$R^{1/4}$-bulges radiated away binding energy, but also at least their stars formed at relatively high redshift. One must be careful to distinguish between the epoch at which the stars now in a bulge formed, and the epoch of formation of the bulge system itself. However, if the bulge formed with significant dissipation, and the stars are old, then the star formation and bulge formation probably occurred together.

The small length-scale of bulges, combined with their modest rotation velocity, leads to a low value of their angular momentum per unit mass. Bulges could form from the low-angular-momentum regions of the proto-galaxy, a variant on the Eggen, Lynden-Bell & Sandage (1967) "rapid monolithic collapse" scenario for the Milky Way. Models whereby bulges collapse and form stars in a short-lived phase of high star formation rate (starburst) have recently been developed (Carlberg 2000), Elmegreen (1999 ApJ, 517, 103). This scenario is entirely consistent with the data of Peletier and co-workers, although one does require a power spectrum of initial density fluctuations that has sufficient power on galactic scales at high redshift.

Simulations of hierarchical clustering galaxy formation (e.g., Cold-Dark-Matter dominated cosmologies) predict "bulges" to form stars at redshift of z~2 (peak), even if assembled later (Baugh et al. 1998). In these scenarios, bulges (and ellipticals) form from mergers between pre-existing disk galaxies, and consist of a mix of the disk stars, plus, in some versions, new star formation in the central regions resulting from the disk gas being driven there during the merger. Disks are then (re-) accreted around these bulges. Thus bulges in galaxies with small disks should be the youngest (Baugh, Cole & Frenk 1996; Kauffmann 1996). This is not obviously consistent with the observations that show a narrow age spread from bulge to bulge, and a narrow age range within any one bulge (e.g., the Milky Way) would limit the number of mergers. But one needs to quantify the allowed age spreads. The exceptional galaxies with counter-rotating disk and bulge (e.g., Rubin 1994, AJ 108, 456) are certainly candidates for mergers, but with rather specific parameters.

What Next?

The *HST* observations support the formation of (exponential) bulges in late-type spiral galaxies through a disk-bar instability, and the formation of classical $R^{1/4}$ bulges through an early rapid collapse with high star formation rate. But what determines which path a disk galaxy takes? In any case, the Milky Way bulge appears to straddle these two extremes, having an exponential surface brightness profile, but a uniformly old age.

The redshift of statistically-significant samples of galaxies is being continually pushed back (at what point will this pose a real problem for CDM?), and *HST* and the next generation of telescopes should provide robust morphological classifications. We will no doubt see

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Improvements in *HST* Planning and Scheduling

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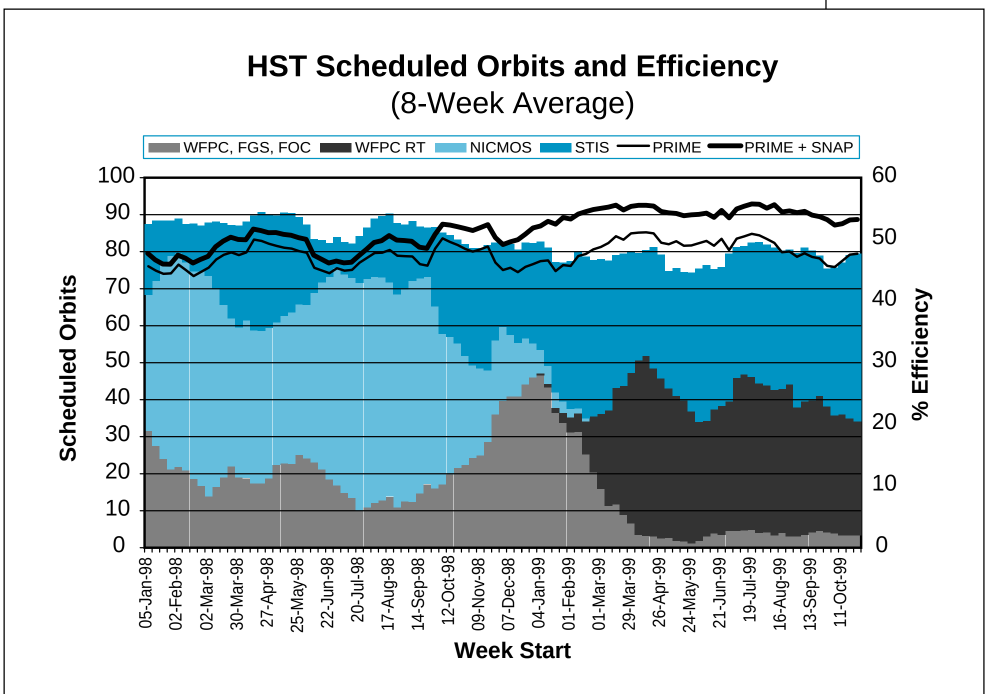
As reported in the June Newsletter, the suspension of NICMOS observations left *HST* as primarily a two-instrument observatory, and caused a decrease in the number of scheduled orbits per week. We knew this would cause problems for planning and scheduling WFPC2 and STIS observations because both instruments interact poorly with the South Atlantic Anomaly (SAA). In order to minimize these problems, several changes were made (see User Information Report 1999-01; *http://www.stsci.edu/uir/uir.html*), including shrinking of the SAA contours, and reprocessing WFPC2 visits to break them into smaller pieces (five or fewer orbits) and to modify their internal structure. This article is a brief update on how these changes have affected *HST* scheduling.

We measure *HST* planning and scheduling performance by the number of scheduled orbits in a week and by the spacecraft efficiency. As *HST* observers know, *HST* observations are allocated and scheduled in units of orbits. The efficiency is defined as the ratio of the sum of the durations of *HST* activities that occur while under guiding control to the total elapsed time. For example, major slews between targets, unused time at the end of a visibility period, and earth occultations detract from efficiency, while pointed external exposures, guide star acquisitions, and target acquisitions add to it.

The accompanying figure shows the two different scheduling measures spanning the period of 1998 January to 1999 October. The shaded sections of the plot show the number of primary orbits (non-SNAP) by instrument scheduled per week. In addition, two lines are plotted that indicate the observing efficiency with and without SNAP activities included. The data have been smoothed with an 8 week running average and show several interesting features. First, as the number of scheduled NICMOS observations dropped to zero during December 1998, the number of scheduled orbits dropped from an average of about 88 orbits per week to 79 orbits per week where it has remained. Second, as the scheduled amount of re-processed WFPC2 observations (WFPC2 RT) increased during 1999 February and March, so did the observing efficiency. In particular, comparing the 1998 and the 1999 time periods, the primary observing efficiency has stayed constant or even increased slightly, while the prime plus SNAP efficiency has increased by five percentage points.

If you are wondering how the number of scheduled prime orbits can decrease while the efficiency has stayed constant, it is caused by the shift to WFPC2 and STIS observations. To allow for flexibility in scheduling, normal NICMOS observations tended to have less activity per scheduled orbit than WFPC2 or STIS. In addition, CVZ observations were not accepted in the Cycle 7N NICMOS Call for Proposals. In 1998, when we were scheduling nearly 50% NICMOS observations, there were fewer scheduled CVZ observations than in 1999. Thus between 1998 and 1999, the increased scheduling of better packed normal orbits and an increase in CVZ usage has caused the average amount of activity per scheduled orbit to increase. This allowed the efficiency to remain constant while the number of scheduled orbits per week declined.

So while the implemented changes did not maintain the scheduled number of prime orbits per week, they did allow prime observations to more easily schedule around the SAA passages enabling the prime *HST* activity level to remain constant while nearly doubling (+70%) the number of SNAPS scheduled. Since Cycle 9 will continue to be primarily WFPC2 and STIS observations, and since any improvements to scheduling around the SAA should be applicable to later cycles, we are continuing to investigate methods of increasing the scheduling rate of the telescope.



Advanced Camera for Surveys (ACS)

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The installation of the Advanced Camera for Surveys is part of 3B Servicing Mission (SM3B), currently scheduled for launch no earlier than March 2001. ACS has three cameras:

- The Wide Field Channel (WFC) is optimized for deep, wide-field imaging in the near-IR;
- The High Resolution Channel (HRC) is designed for visible and near-UV imaging;
- The Solar Blind Channel (SBC) is designed for far-UV imaging.

Specific details of these channels are summarized below in the table. The gain in field of view offered by the WFC is illustrated in Figure 3, which shows the *HST* focal plane following SM3B. The primary design goal for the WFC is to achieve a factor of 10 improvement in "discovery efficiency" - defined as the product of field of view and throughout - compared to WFPC2 at 800 nm.

ACS Camera Specifications

Camera	WFC	HRC	SBC
Field of View	202x202 arcsec	29x26 arcsec	35x31arcsec
Plate Scale	0.05 arcsec/pixel	0.026 arcsec/pixel	0.032 arcsec/pixel
Spectral Response	380 - 1050 nm	200 - 1050 nm	115-170 nm

Earlier in 1999, ACS underwent its first thermal vacuum test at Goddard Space Flight Center (GSFC). Following that test, ACS was returned to Ball Aerospace for integration of the WFC and HRC flight detector assemblies. Both the WFC and HRC flight detectors have been selected and are in the final stages of integration with their dewar assemblies. During ambient testing at GSFC, an instability in the ACS optical bench was discovered. There was concern that the resulting image motion might result in image drift during science operations, and so a study was begun to locate its origin within the bench. It is now believed that the source of the instability lies with the bench's kinematic fittings and the front bulkhead design. Several solutions to resolve the problem are being investigated by Ball Aerospace. Figure 1 shows ACS in its test fixture during the test program at GSFC earlier this year.

The current schedule for ACS has the final delivery to GSFC occurring in late February 2000. ACS will then undergo a final thermal vacuum test to verify the thermal performance of the flight detectors, followed by science calibration of the instrument. On the basis of component level testing, it is already possible to predict the expected flight performance of each of the cameras. In Figure 2 we show the predicted throughput for the WFC and HRC cameras compared to WFPC2. Both cameras provide a significant gain in throughput compared to WFPC2. Preliminary image quality measurements indicate that the encircled energy specification of 80% within 0.25 arcsec diameter has been exceeded for both WFC and HRC.

The WFC will exceed the discovery efficiency improvement factor of 10, making it an excellent tool for conducting deep imaging programs with *HST*. The HRC provides a significant enhancement of *HST*'s imaging capability with high throughput in the near-UV, critically sampled imaging at 500 nm and a coronographic mode. In addition to the WFPC2 *B*, *V*, *R*, and *I* filters, ACS will also offer the Sloan Survey *g*, *r*, *i*, and *z* filters, which are optimized for deep imaging programs, and a narrow-band imaging capability from 370-1050 nm. ACS will be offered to the community for science observations in Cycle 10. The call for proposals for Cycle 10 will occur in June 2000.

Figure 1

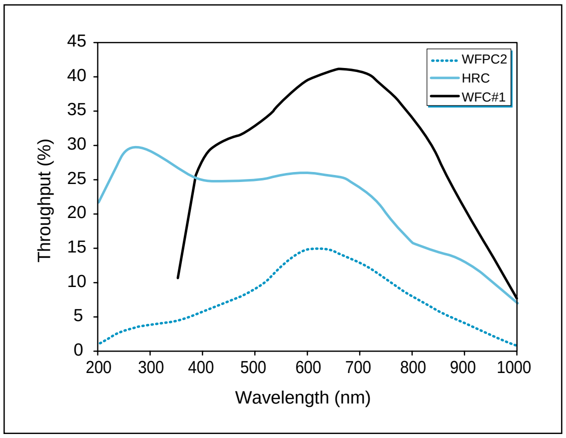

Figure 2

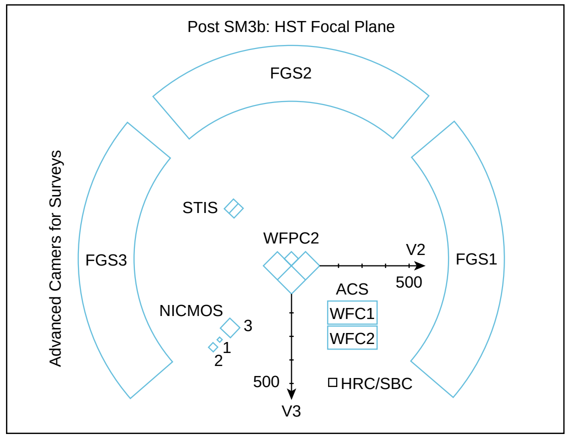

Figure 3

Spectrographs Group

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During the months of September and October, STIS experienced several anomalies. None of these, fortunately, have impaired its scientific performance. On September 21, an imaging observation was being made in the Orion Nebula near the Trapezium, and it caused an automatic high-voltage shutdown in the NUV MAMA because the global count rate exceeded the safety limit of 770,000 counts/s. The overlight condition was not due to an accidental pointing at a bright star, but rather due to diffuse UV light from the nebula. The surface brightness is low enough to have not been noticeable in previous FOC observations, but high enough to produce 1 to 3 cts/pixel/s in the NUV MAMA, or well over the software trigger of 770,000 cts/s. Analysis of archival STIS G230M spectra in a similar region of Orion shows that the total count rate was probably ~1×10^6 cts/s. HV shutdown was within 100 ms. Given the low rate per pixel and the fast shutdown, it was not believed that any permanent damage to the detector occurred. Arcing and damage tends to occur at rates exceeding 2×10^6 cts/s sustained for more than 1 sec. Nevertheless, the shutdown did result in the loss of several scheduled science observations. The recovery procedure carried out from September 27 to 30 showed that all NUV MAMA characteristics appeared nominal, and we resumed normal science observations on October 1. The subsequent initial science observations also show nominal detector performance. We note that this was the first HV shutdown on an external target for STIS in 2.5 years of operation.

On October 11, a Local Rate Check violation caused the shutter to close during an FUV MAMA imaging observation of Jupiter's northern aurora. This check is intended to prevent accidental observations of bright point sources that do not exceed the global limit but could cause local damage to the MAMA microchannel plates. High-surface-brightness extended sources can also trigger this shuttering, which occurs at local rates of 150 cts/s/pixel for the FUV MAMA, and it is believed that this is what happened during the observation of Jupiter. However, the observed surface brightness would have to have been a factor of 4 to 5 higher than that observed in any previous Jupiter observation. No damage to the FUV MAMA occurred, and there was no impact on any subsequent science observations. This was also the first instance of the loss of an exposure due to a local rate check violation in 2.5 years for STIS.

The sensitivity of STIS CCD and MAMA first-order spectral modes has been monitored for the past two years via observations of standard stars. These observations reveal small-but-significant changes in sensitivity. The largest changes are in G140L, where the sensitivity varies with both temperature and time. The sensitivity drops by 0.25% for each 1 C increase in temperature. After correcting for temperature, we see a monotonic decline in sensitivity of 0.8% to 2.8% per year, with the greatest losses at the shortest wavelengths. For G230L and the NUV MAMA, we see a rise in sensitivity of 1.3% per year for the first 1.3 years of service, followed by declines of 0.0% to 1.9% per year. Here the losses increase toward *longer* wavelengths. For the CCD modes G230LB and G750L, there is no change in sensitivity exceeding 0.4% per year. G430L shows losses of 0.5-0.7% per year, however, for wavelengths

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Spectrographs *from page 7*

longward of 3300 Å. After correction for these losses, the one-sigma, broad-band photometric repeatability of the STIS first-order spectral modes is ~0.4%. While the STIS CCD spectral modes appear fairly stable for observations of bright targets, we are becoming increasingly concerned about losses in the charge-transfer efficiency (CTE) of the CCD. Pre-launch ground tests showed excellent CTE performance with losses of only ~1% for signal levels of 100-200 e^- at the center of the chip. About 1 year into flight, the chip center charge loss at count levels of 100 e^- amounted to ~6% (see Gilliland, Goudfrooij, and Kimble 1999, PASP, 111, 1009). Our most recent calibration observations indicate that the current chip-center charge loss at a signal level of 100 e- may have increased to ~10-20% after 2.5 years on orbit; sky levels of only ~10-20 e^- appear to decrease the loss by a factor of two. As a consequence, we are examining methods to ameliorate these effects. As an example, since such losses would affect spectroscopy of faint targets most of all, we are exploring ways to make it possible to do target acquisitions onto slit locations only 100 pixels from the readout-amplifier side of the CCD, which would significantly decrease the CTE loss. Naturally, this would only be suitable for targets with a region of scientific interest of at most 4 to 5 arc seconds.

To end on a more positive note, we note that a new version of the CALSTIS calibration pipeline software, V2.3, was released in October with the recent release of STSDAS 2.1. Changes to CALSTIS in this version include several bug fixes, enhancements, and a number of new user tools and scripts. Of particular note, the discontinuities sometimes seen in the rectified STIS 2D images have been fixed. We have also updated the *daydark* task to accommodate our new method for acquiring daily darks and biases that went into effect after June 29, 1999. The fringe flat tasks have also been updated to ensure compatibility with the current IRAF FITS kernel. For full details, please see the STIS web site at *http://www.stsci.edu/instruments/stis.*

Fine Guidance Sensors

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All three of *HST*'s Fine Guidance Sensors continue to provide the observatory with superb pointing performance. The health of FGS1r and FGS3 remains excellent while FGS2's star selector servo shaft bearings continue to show mechanical wear. For this reason STScI has dramatically decreased usage of FGS2, preferring to use FGS1r and FGS3 to guide the telescope whenever possible. When FGS2 must be used to guide *HST*, special "clearing slews" (large rotation of the servo shaft) are used to smear out debris piles in the shaft lubricant. These two strategies have stabilized the mechanical condition of the bearings to assure that FGS2 can perform as needed until it is replaced in the third servicing mission.

The performance of FGS1r as a science instrument continues to meet expectations. Its point source interferograms remain stable, i.e., they show no change with time. This is important since, if the observed interferogram of a scientific target differs from that from a point source (a calibration single star), then the effect is due to resolved structure in the target rather than temporal variability of the instrument. But there have been some "teething" issues with regard to commanding the new astrometer. For the most part these have been related to identifying the optimal settings for parameters used for the acquisition of targets in finelock (Position Mode) or the centering of an object's fringe in the scan path (Transfer Mode). Fortunately, as these problems were discovered, work-arounds were employed to safeguard upcoming science observations until permanent fixes to the flight software were made. As a result, the FGS1r science program suffered little if any from these early difficulties.

Report of the *HST* Senior Project Scientist

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Uncle Sam wants you participating in HST public outreach

I suspect most of you are aware of the recent, very difficult budget prospects faced by NASA's Office of Space Science as both houses of Congress worked on the NASA appropriations for Fiscal Year 2000. I'm pleased to say that, in the end, the joint House-Senate Conference Committee restored most of the requested funding for Space Science (though legislated "earmarks" still leave Code S somewhat short). Once again, during these tough budget deliberations on Capitol Hill, we were reminded of the critical importance of our public outreach programs to the health of *HST*. In appropriating additional funding needed to cover the costs to Space Science of this December's "call-up" servicing mission to replace *HST*'s ailing gyros, the Senate Appropriations Committee included the following language in their report:

"The Committee strongly supports the *Hubble Space Telescope* as one of the most rewarding missions ever launched by NASA. Despite some serious problems with the primary mirror identified soon after the Hubble launch in 1990, the Hubble has provided almost a decade of exciting pictures and data regarding the formation and early development of the universe.... The Committee, therefore, includes an additional $26,000,000 for fiscal year 2000 for costs associated with the mission..., thereby enabling the observatory to keep operating without interruption."

There is no doubt that such favorable outcomes result from the high level of public awareness of *HST* and of the outstanding science being produced by *HST* users. For this we all are indebted to the STScI Office of Public Outreach, to the Public Affairs Offices at NASA, and to the many individual astronomers who have invested the effort to work with us to tell their stories clearly and well to the public through the news media. But there are at least ten more years of *HST* to come, and each year will bring new crises - budgetary and otherwise. It is essential that we continue to engage the public in the excitement and importance of the work *HST* does. Each user of *HST* should feel an obligation to be mindful of possible public or news interest in her or his discoveries and to work through the STScI and the *HST* Project to make certain that potentially newsworthy stories come to our attention.

I know that some astronomers disdain "PR," and others have been critical of some of the past coverage *HST* has received in the media (see Steve Beckwith's excellent "Director's Perspective" in the June, 1999, STScI Newsletter). As the *HST* Project Scientist, I have been directly involved in the production of many of the news releases with which you are familiar. And recently I have taken over the role of "executive producer" of the *HST*-related Space Science Update programs on NASA Television which is the source of much of the major national news coverage devoted to *HST*. I want to share with you my "insider's" view of our news-media process.

First, it is NASA's policy not to give "scoops" to individual reporters or news organizations. Our stories are produced and released so that all the major media will have simultaneous access. We also are determined that stories about *HST* are told as accurately, simply, clearly and succinctly as possible. Our news releases, images, animations, and on-the-air discussions assume that the reader or viewer is an 8th grader. We devote substantial effort and resources to make the science understandable to ordinary citizens. This is why it is in everyone's interest to work through the media professionals at STScI and NASA, rather than "giving away" important, potentially newsworthy results to an individual reporter. The situation is complicated by our tradition of open communication among astronomers. A number of very competent and sophisticated reporters regularly scan the preprints on Astro-Ph and scrutinize the abstracts and poster papers at AAS meetings looking for "hot" news from *HST*. That is their job and their privilege. However, you should be aware that, once your story has been told by one (and only one) magazine or newspaper, it is no longer news. It is no longer of any interest to other news organizations. For this reason, I strongly encourage you to contact Ray Villard at STScI/OPO (*villard@stsci.edu*) or me personally (*dleckrone@hst.nasa.gov*), prior to posting your preprint or giving an AAS paper, if you believe your results may be newsworthy. We'll work with you to determine the best course to follow.

The purpose of NASA's *HST* press releases is not to promulgate officially-sanctioned "final answers" to the major questions of astronomy. Their purpose is to keep the tax-paying public informed about the progress and achievements of *HST*, month-in and month-out, in response to a clear public demand for information (not to mention the National Space Act that requires us to do this). Primarily, our hope is to engage the public in the scientific process (including debate and controversy) and the excitement of discovery. Findings that appear to be provisional or controversial are treated as such in our press releases, and alternative interpretations or major sources of uncertainty are described.

The subject matter of press releases originates with you, the investigator. You play the central role in helping us draft the text and produce the images to be released to the public. You have the right of approval or disapproval of the content. In other words, NASA doesn't make this stuff up! All stories receive some form of refereeing by independent experts before they are accepted for news release. Usually this

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Galaxy Buldges *from page 4*

evolution, but need to have the model predictions to be able to distinguish the underlying physics behind the evolution.

As emphasized by Peletier, the combination of ($R^{1/4}$) bulges and ellipticals forming at redshifts of ~3 suggests a "cosmic star formation" history peaking at large redshifts. The similarity in colors between inner disks and bulges found across the spiral Hubble sequence would imply that inner disks too should be included in the "high redshift" star formation. Is there a conflict with the inferences from the HDF (e.g., Madau 1999; After the Dark Ages p299)? Can dust provide an answer? What is the age distribution of a typical inner disk?

A combination of *HST* and ground-based (to probe both small- and large-scale structure) broad-band optical and IR colors, and surface brightness profiles, are still lacking for large samples, including the whole range of spiral Hubble types. These data should allow a robust quantification of the correlations between morphologies. Basic kinematic data, including gradients, should be obtained for a representative sample of bulges and disks. While we may lack the means at present for a unique interpretation of absorption line-strength data, the straightforward test for continuity in the line strengths from bulges to their disks is meaningful. Color-magnitude diagrams for bulges and disks in which we can resolve stars would be immensely useful and feasible even now for more galaxies than presently available. The future promises much.

Senior Project Scientist *from page 9*

consists of refereeing and acceptance of the paper by a major journal. In some cases NASA requests reviews by referees of our own choosing.

Official written NASA press releases have to meet certain criteria for style, format and brevity. In general they must use simple language (no "techno-speak"). They begin with a brief and "punchy" statement of what the news is and why it's significant (in other words, why should reporters and their editors be interested in it?). And they must be brief - typically one or two pages in length. These requirements reflect the realities of the modern-day news business. I know that they sometimes make scientists uncomfortable. After all, we're accustomed to describing our work in detail and with exactitude to a scientifically critical audience. This is where the experts in the Office of Public Outreach at STScI come in. Their job is to bridge the gap between academic science and public communication. They (and the rest of us at NASA) will work with you at every step of the way to assure that your story is told both clearly and accurately to the public.

There are several alternate formats that we use to release *HST* news to the public. Stories that are clearly of major importance and which lend themselves to a visual medium like television are candidates for a Space Science Update. These have the format of informal panel talk shows. The panel consists of one or two Hubble investigators, one or two widely recognized independent authorities on the subject, and a moderator. Free discussion and exchanges about the scientific issues and implications are strongly encouraged, including the frank expression of differences of opinion or interpretation. We want it this way, because that is how science really works and because it shows the public that scientific issues are seldom "black or white".

For a variety of reasons we may elect not to produce a Space Science Update, but rather a "Videofile". This involves production of a video package of images, interviews, animations, etc., telecast by NASA in conjunction with a written press release. TV networks and stations all over the country record this material and use it to produce their individual coverage of the story. Some stories are of less visual appeal and can be well told by means of a written press release, supported perhaps with printed images and illustrations. Frequently we produce "photoreleases" of Hubble images, which are compelling or beautiful in their own right, but which may not be associated with major new research findings. And finally, we have been very successful in telling the story of Hubble science on the internet, with extensive and regular coverage given to us by the web sites of the major news organizations. Our Space Science Updates are often carried in live webcasts, which are of course accessible all around the world.

Once again, I urge you to contact us if you believe any of your *HST* data and research results would be interesting or exciting or inspiring to the public. There is a simple "screening test" that you can perform. Show your data and try explaining what you've found to your mom, your next door neighbor, or the members of your daughter's Girl Scout troop. If they get a sparkle in their eye and say something like "wow, that's way cool! ," then I want to hear from you immediately!

Multi-Mission Archive at the Space Telescope Science Institute (MAST) News

Paolo Padovani (on behalf of the MAST team), *padovani@stsci.edu*

Hubble Data Archive Status

The Hubble Data Archive (HDA) contains, as of 1999 October 1, 7.0 Tbytes of data. The number of science datasets now totals almost 200,000. Archive ingest has averaged 3.6 Gbytes/day in 1999, while the rate of data retrieval has been about 4 times as large. Work is in progress towards the migration of the entire archive to the new magneto-optical system. Cessation of ingest to the Sony platters, our current archive medium, is expected to occur in early 2000. New data will be recorded exclusively to magneto-optical disks, while older data will be transferred (by platter) to the new media whenever a request for a dataset is processed.

StarView II

All our readers should be familiar with StarView, one of the two user interfaces to the HDA (the other being our World Wide Web [WWW] interface). Work is on-going on the successor to StarView, StarView II, an astronomical database browser and research analysis tool. Developed in Java, StarView II provides an easy to use, highly capable user interface that runs on any Java-enabled platform as an applet or application. StarView II features a superior custom query and search form generation system. This system allows the user to define easily search forms from scratch or to use standard forms as templates. Multiple forms, each potentially using a different database site, can run simultaneously within the same session. The flexibility to interactively define database and attribute specifications introduces a new level of power for the astronomical research community. At the same time, standard, pre-defined forms supply a ready-made solution for most users. An “alpha” version of StarView II has been demonstrated at the recent Astronomical Data Analysis Software and Systems meeting in Hawaii. A public release of StarView II is expected for Summer 2000.

Searchable HST and FUSE Abstracts

Abstracts for *HST* and FUSE observing proposals are now searchable through the WWW. The search syntax is similar to AltaVista’s simple search format, allowing the user to match or exclude abstracts that contain search words. Abstracts may be searched directly from the *HST* and FUSE archive pages or at: *http://archive.stsci.edu/cgi-bin/hst_abstracts* and *http://archive.stsci.edu/cgi-bin/fuse/abstracts* respectively. The *HST* abstract search features pointers to archived data and further information from Presto. The FUSE abstract search contains only the program ID and the abstract, but additional information will be added in the near future. On-line help is available.

Direct Retrievals of International Ultraviolet Explorer (IUE) Data from MAST

IUE data can now be downloaded directly to the user’s machine from MAST. After searching the archive using the WWW interface at *http://archive.stsci.edu/cgi-bin/iue*, selected datasets, stored locally on two CD-ROM jukeboxes, can be downloaded at a push of a button. No username or password is required. Users may request the MXLO or MXHI data directly from the IUE search results page as a tar file. Additional data type and file format options are available from the “more retrieval options” page. Besides being able to select any NEWSIPS or IUESIPS file type, the original IUESIPS files can be requested in either GO or RDAF format, and any selected files can be downloaded as a tar, tar.gz or zip file. Requesters should be cautioned that there may be a slight delay while the appropriate CD-ROM is loaded into the MAST jukebox. If a large request

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The 2000 STScI May Symposium: “A Decade of HST Science”

April 11-14, 2000

at the SPACE TELESCOPE SCIENCE INSTITUTE, in Baltimore.

April 24, 2000, marks the tenth anniversary of *HST*’s launch, and to commemorate that event this symposium will review all of the main scientific results obtained with *HST*, their impact on astronomy and astrophysics, and their meaning for future research.

For registration and program information contact Lorraine Garcia, the meeting coordinator, at: garcia@stsci.edu (tel: (410)338-4402), or go to *http://www.stsci.edu.*

MAST *from page 11*

is issued, several CD-ROMs may be required, thus increasing the time needed to fill the request. Information on how to read the downloaded files on different platforms is available at *http://archive.stsci.edu/iue/mdr_help.html*. IUE data can also be accessed from archive.stsci.edu via anonymous ftp. The files are accessed via symbolic links which are stored in subdirectories under /pub/iue/data. The subdirectories are structured according to the camera name and image sequence numbers. Ftp access currently requires that the user already know the camera name, image sequence number, and data type of the requested files, and no file conversion options are available. For additional information on this option see *http://archive.stsci.edu/iue/ftp_retrieve.html*.

Availability of ORFEUS/BEFS Data at MAST

ORFEUS (Orbiting and Retrieval Far and Extreme Ultraviolet Spectrograph) is a telescope constructed and deployed by the German-US space agencies. It was deployed during two Space Shuttle missions for 5 days in September, 1993, and 14 days in November, 1996. The full telescope brings light to one of three spectrographs, including the BEFS (Berkeley Extreme and Far-UV Spectrometer) at its prime focus. The BEFS was designed to obtain spectra of UV point sources simultaneously at FUV and EUV wavelengths (380 - 1175 Angstroms) at a resolution of about 5000. With these capabilities, BEFS provides a link with previous UV spectroscopic missions such as Copernicus, EUVE, HUT, IUE, and of course GHRS and STIS. MAST has ingested raw and processed spectra of Orfeus-1 (Sept. 1993) data from the BEFS project. The data can be accessed on the WWW at *http://archive.stsci.edu/orfeus/befs*. The spectra can be downloaded from a request page or as clickable links in a catalog page and can be read with standard IDL-based or IRAF/STSDAS software. This data set includes 75 UV sources. The BEFS group plans to deliver the Orfeus-2 data to MAST before the end of 1999.

Coordinated EUVE/Chandra Calibration Observations

MAST has made available Extreme Ultraviolet Explorer (EUVE) data taken as part of the cross calibration of the Chandra X-ray Observatory. EUVE observations of emission-line sources have been undertaken for comparison to those observed with the Low Energy Transmission Grating (LETG), to possibly help separate higher orders in the LETG, and to extend the Emission Line Project to EUV wavelengths. Calibration targets include Capella, V711 Tau, Procyon, and HZ 43. The Capella observations, taken on September 8, 1999, are available at *http://archive.stsci.edu/pub/euve/axafcal*. Subsequent observations will be made available as soon as possible.

Hubble's Tenth: A Milestone and an Opportunity

Hubble will soon celebrate its tenth anniversary. Helping us get the word out are planetariums and science museums across the U.S. many of which are planning special events to mark the first decade of Hubble's unique contributions to our understanding of the universe. STScI's Office of Public Outreach (OPO) plans to facilitate those efforts by releasing the names of all Hubble users to those organizations' directors in hopes that they will seek speakers and other types of assistance.

Hubble's discoveries during the past ten years have engaged people's imaginations and excited them about space science and exploration. We at OPO strongly encourage all Hubble users — whether contacted or not — to help these organizations make their celebrations a success. Such special events represent a meaningful opportunity for Hubble users to give back to the public. Please do your part to help these organizations celebrate Hubble's discoveries, none of which would have been possible without the public's ongoing support.

HST: Ten Years in Orbit!

On April 24, 2000, the *Hubble Space Telescope* will have been in orbit for a full ten spectacular, exciting, rewarding, and anxious years. We want to hear from you, our readers, to find out

- What has been *HST*'s greatest achievement?
- What was the biggest disappointment?
- What experience related to *HST* can you tell us about? Were you there at launch? Did a particular image or dataset change your view of your science? Did *HST* fundamentally affect your career?

The March, 2000, issue of the STScI Newsletter will celebrate *HST*'s tenth anniversary. Please share with us and your colleagues your feelings and experiences from this past decade. Short contributions are especially welcome, but longer ones will receive attention too. Send messages to: *soderblom@stsci.edu*.

Panels

Solar System
David Jewitt, University of Hawaii
Luke Dones, Southwest Research Institute
Andy Ingersoll, California Institute of Technology
Julie Moses, Lunar and Planetary Institute
John Trauger, California Institute of Technology
Iwan Williams, University of London

Galactic 1
Norbert Langer, Universität Potsdam
Luciana Bianchi, Johns Hopkins University
Patrick Huggins, New York University
Judy Provencal, University of Delaware
Sumner Starrfield, Arizona State University
Jean Swank, Goddard Space Flight Center
Richard Wade, Pennsylvania State University
Klaus Werner, Universität Tübingen

Galactic 2
David Branch, University of Oklahoma
Roger Ferlet, Institut d'Astrophysique de Paris
Karen Kwitter, Williams College
Susana Lizano, Universidad Nacional Autónoma de México
Jon Morse, University of Colorado
Rex Saffer, Villanova University
Dave Skillman, University of Minnesota
Rens Waters, Universiteit van Amsterdam

Galactic 3
Caty Pilachowski, Nat'l Optical Astronomical Observatories
Beatriz Barbuy, Universidade de São Paulo
Nuria Calvet, Harvard/Smithsonian Center for Astrophysics
John Carr, US Naval Research Laboratory
Laura Greggio, Università di Bologna
Paul Hemenwey, University of Rhode Island
Ken Janes, Boston University
Rene Walterbos, New Mexico State University

Galactic 4
Gloria Koenigsberger, U. Nacional Autónoma de México
Suzan Edwards, Smith College
Suzanne Hawley, University of Washington
Todd Henry, Johns Hopkins University
Lynne Hillenbrand, California Institute of Technology
Burt Jones, University of California, Santa Cruz
Georges Meylan, European Southern Observatory
Bob Rood, University of Virginia

Extra Galactic 1
Paul Schechter, Massachusetts Institute of Technology
Itziar Aretxaga, Instituto Nacional de Astrofísica, Puebla
Ron Buta, University of Alabama
Fred Hamann, University of Florida
Lars Hernquist, Harvard/Smithsonian Center for Astrophys.
Daniel Kunth, Institut d'Astrophysique de Paris
Michael Ledlow, University of New Mexico
Smita Mathur, Ohio State University

Extra Galactic 2
John Stocke, University of Colorado
Robert Becker, Lawrence Livermore National Laboratory
Omar Blaes, University of California, Santa Barbara
Ortwin Gerhard, Universität Basel
Jules Halpern, Columbia University
Luis Ho, Carnegie Observatories
Alice Quillen, University of Arizona
Guy Worthey, Saint Ambrose University

Extra Galactic 3
Jacqueline Bergeron, European Southern Observatory
Arjun Dey, National Optical Astronomical Observatories
John Hutchings, Dominion Astrophysical Observatory
Priya Natarajan, Cambridge/Yale University
Michael Pierce, Indiana University
Brent Tully, University of Hawaii
Dave Turnshek, University of Pittsburgh
Raymond White, University of Alabama

Extra Galactic 4
John Huchra, Harvard/Smithsonian Center for Astrophys.
Lee Armus, California Institute of Technology
Xavier Barcons, Universidad de Cantabria
Renyue Cen, Princeton University
Jane Charlton, Pennsylvania State University
David Hogg, Institute for Advanced Study, Princeton
Nial Tanvir, University of Hertfordshire
Rogier Windhorst, Arizona State University

TAC
Alan Dressler, Carnegie Observatories
Jacqueline Bergeron, European Southern Observatory
David Branch, University of Oklahoma
John Huchra, Harvard/Smithsonian Center for Astrophys.
Gloria Koenigsberger, U. Nacional Autónoma de México
David Jewitt, University of Hawaii
Norbert Langer, Universität Potsdam
Caty Pilachowski, Nat'l Optical Astronomical Observatories
Paul Schechter, Massachusetts Institute of Technology
John Stocke, University of Colorado

CYCLE 9

Proposals by Country:

Country	Submitted	Approved
Australia	16	4
Austria	2	0
Brazil	2	1
Canada	18	2
Denmark	6	3
France	22	3
Germany	46	11
Greece	1	0
India	1	0
Ireland	1	0
Israel	4	0
Italy	20	4
Japan	3	0
Kazakhstan	1	0
Mexico	1	0
Russia	1	0
Spain	13	3
Sweden	8	1
Switzerland	4	1
Netherlands	11	1
United Kingdom	57	10
United States	676	168
ESA Proposals	197	40

US PIs by State:

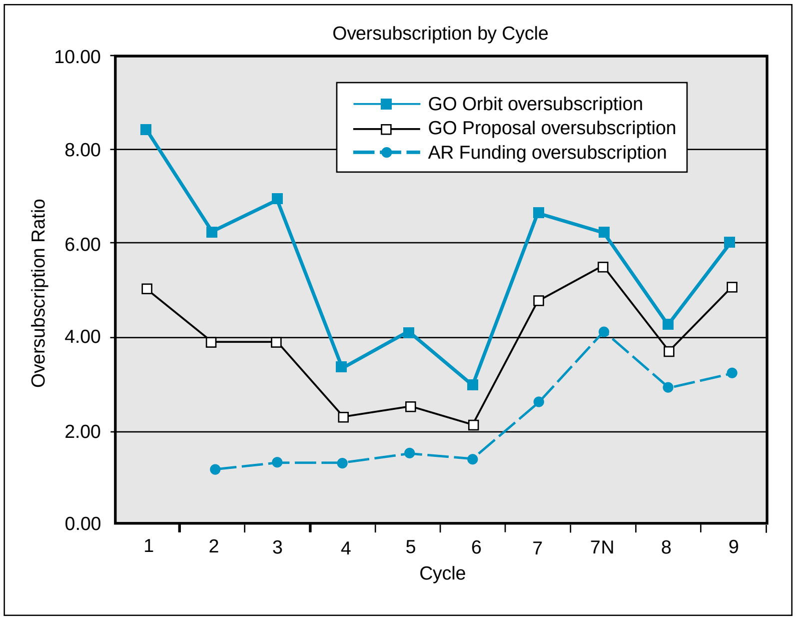
Country	Submitted	Approved
AL --------	9	2
AR --------	1	0
AZ --------	63	14
CA --------	127	38
CO --------	26	5
DC --------	9	2
DE --------	4	1
FL ---------	1	0
GA --------	3	1
HI ---------	15	4
IA ---------	2	1
IL ----------	21	2
IN ---------	13	4
KY --------	1	0
LA --------	1	1
MA --------	37	11
MD -------	150	31
MI ---------	14	5
MN -------	3	2
NC --------	5	1
NE --------	1	0
NH --------	1	1
NJ --------	8	3
NM -------	7	1
NV --------	4	0
NY --------	31	4
OH --------	6	1
OK --------	1	0
OR --------	3	1
PA --------	36	11
RI ---------	1	0
SC --------	1	0
TN --------	4	0
TX ---------	17	7
VA --------	12	3
WA --------	14	4
WI ---------	10	2
WV --------	1	0
STScI ----	80	20

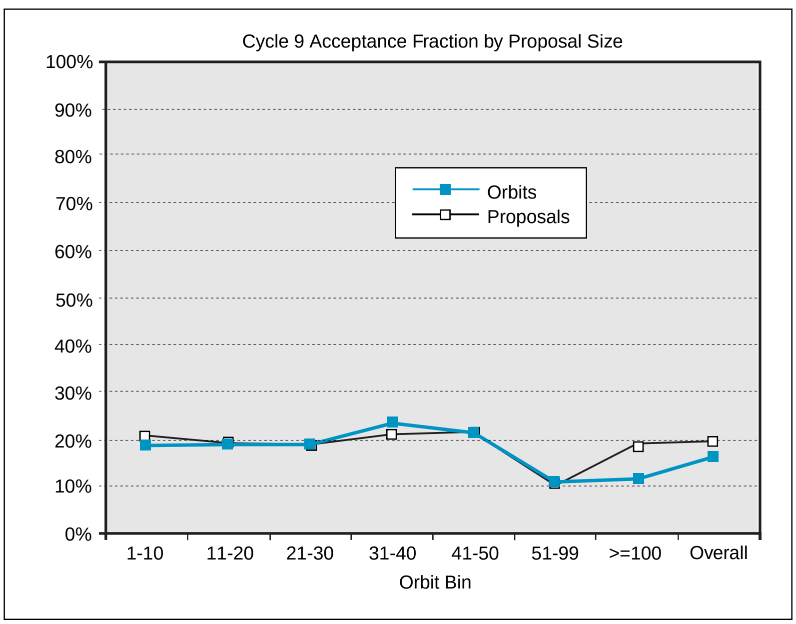
Panel and TAC Orbit Trimming by Cycle

	Median Orbits Submitted	Median Orbits Approved
Cycle 6	12	8
Cycle 7	14	9
Cycle 7N	12	12
Cycle 8	12	10
Cycle 9	15	13.5

Cycle 6: 174 out of 435 Approved GO programs were trimmed (40%)
Cycle 7: 82 out of 241 Approved GO programs were trimmed (34%)
Cycle 8: 58 out of 231 Approved GO programs were trimmed (25%)
Cycle 9: only 13 out of 145 Approved GO programs were trimmed! (9%)

Panels finally listened to our Guidelines of either approving or rejecting, even as community is submitting larger programs.





CYCLE 9

Summary of Cycle 9 Results

	Requested	Accepted	% Accepted	ESA Accepted	ESA % Total
Proposals					
GO	738	145	19.4%	32	22.1%
SNAP	85	30	35.3%	8	26.7%
TARGETS	6,285	2,131	33.9%	444	20.8%
AR	91	37	40.7%	—	—
Total	**914**	**212**	**23.2%**	**40**	**22.9%**
Primary Orbits	17,690	2,866	16.2%	483*	16.9%
AR Funding	~$6M	~$1.8M	~$30	—	—

* Doesn't include 1200 Parallel orbits.

	Accepted	% Total	Orbits	% Total
GO Proposals by SI*				
FGS	6	3.1%	40	1.2%
STIS / CCD	55	28.4%	980 + (1200)*	29.1%*
STIS / MAMA	66	34%	945	28.1%
WFPC2	67	34.5%	1,405	41.7%

* Excludes 1200 Pure Parallel orbits.

Cycle 9 Proposal Results by Panel

	Gal1	Gal2	Gal3	Gal4	Exgal1	Exgal2	Exgal3	Exgal4	SS	TAC	TOTAL
Proposals Submitted											
GO	100	99	84	87	80	83	68	69	37	31	738
SNAP	10	10	13	8	14	13	8	6	3	–	85
AR	5	4	7	10	11	10	19	18	7	–	91
Total	115	113	104	105	105	106	95	93	47	31	914
Proposals Approved											
GO	18	18	18	17	13	18	12	15	10	6	145
SNAP	3	4	6	1	6	4	1	3	2	–	30
AR	3	2	5	4	3	3	7	6	4	–	37
Total	24	24	29	22	22	25	20	24	16	6	212

Cycle 9 Orbit Results by Panel

	Gal1	Gal2	Gal3	Gal4	Exgal1	Exgal2	Exgal3	Exgal4	SS	TAC	TOTAL
Submitted											
	1366	1265	1667	1628	1626	1579	1902	1923	471	4263	17690
Approved											
	242	228	266	248	293	246	352	361	96	534	2866
Panel Fraction of Total Approved											
	8.4%	8%	9.3%	8.7%	10.2%	8.6%	12.3%	12.6%	3.3%	18.6%	–
Fraction of Orbits Approved/Submitted											
	17.7%	18%	16%	15.2%	18%	15.6%	18.5%	18.8%	20.4%	12.5%	16.2%

Approved Observing Programs for Cycle 9

EXTRAGALACTIC

Anderson	AR	University of Washington	A Morphological and Multicolor HST Survey for Ultrafaint Quasars, Sampling A Broad Redshift Range
Aparicio	GO	Instituto de Astrofísica de Canarias	Phoenix: "halo/disk" structures in dwarf galaxies
Boeker	SNAP	Space Telescope Science Institute	A Census of Nuclear Star Clusters in Late-Type Spiral Galaxies
Bowen	GO	Princeton Observatory	The Metallicity of Gas in the Local Universe: Beyond the Milky Way
Bower	GO	National Optical Astronomy Obs.	Stellar-Dynamical Measurements of the Black Hole Masses of Reverberation-Mapped AGN
Brainerd	AR	Boston University	Constraints on the Flattening of Dark Matter Halos from Galaxy--Galaxy Lensing
Brotherton	GO	Lawrence Livermore National Laboratory	A Spectacular Post-Starburst Quasar and the AGN--Starburst Connection
Brown	GO	Goddard Space Flight Center	Measuring the Evolution of the UV Upturn
Burg	AR	Arizona State University	An Archival Study of The Mid-UV Structure of Nearby Early-Type Galaxies
Buta	GO	University of Alabama	A Study of Star Formation in Galactic Resonance Rings
Calzetti	SNAP	Space Telescope Science Institute	A UV Imaging Survey of IR-Bright Star-Forming Galaxies
Charlton	AR	The Pennsylvania State University	The Cause of Narrow Absorption Lines Intrinsic to Quasi-Stellar Objects
Charlton	SNAP	The Pennsylvania State University	A Snapshot Survey of Variability of Narrow and Broad Associated Absorption Lines in Quasars
Churchill	GO	The Pennsylvania State University	Establishing the Gaseous Phases of Galaxies Following the Epoch of Star Formation
Colina	GO	Instituto de Física de Cantabria	The Starburst - AGN Connection: The Nature of the UV-bright Core in NGC 4303
Cote	GO	California Institute of Technology	Strömgren Photometry of Globular Clusters in M87: Breaking the Age-Metallicity Degeneracy
Crenshaw	GO	Catholic University of America	Determining the Nature of the Variable Absorption in AGN: Monitoring NGC 3783 with HST and Chandra
Davis	AR	University of California	Local Cosmology: The Nearby Flow Field and its Structure
Djorgovski	AR	California Institute of Technology	The Fundamental Plane of Cluster Ellipticals at $z = 0.18$: Establishing the Local Baseline
Drinkwater	GO	University of Melbourne	Isolated compact stellar systems in the Fornax Cluster
Edge	SNAP	University of Durham	A Continuation of a SNAPSHOT survey of X-ray selected central cluster galaxies
Ellis	GO	California Institute of Technology	The Role of Dark Matter in Cluster Formation and Galaxy Evolution
Ellison	GO	Institute of Astronomy	Spatially Resolved Spectroscopy of APM08279+5255
Eracleous	GO	The Pennsylvania State University	Emission Lines from Photoionized Accretion Disks and Winds in AGNs
Ferguson	SNAP	Space Telescope Science Institute	Dwarf Elliptical Galaxy Snapshot Survey III
Ford	GO	Space Telescope Science Institute	Outflows from the Disk Fueling the Massive Black Hole in M87
Garnavich	GO	University of Notre Dame	The Distance to the Type Ia SN 1999by in NGC 2841
Gebhardt	GO	UCSC/Lick Observatory	Orbital Structure and Black Hole in NGC 3379
Giavalisco	SNAP	Space Telescope Science Institute	A UV Atlas of Nearby Galaxies
Goudfrooij	GO	Space Telescope Science Institute	LINERs in Early-type Galaxies: Ionized by the UV-upturn Population ?
Gregg	SNAP	University of California, Davis	Bright Quasar Close Lensing Search II
Guzman	AR	Yale University	The Fundamental Plane of Cluster Dwarf Ellipticals
Hjorth	GO	University of Copenhagen	External Shear in the Time-Delay Lens RX J0911+05
Ho	GO	Obs. of the Carnegie Inst. of Washington	Completing the Local AGN Inventory: The AGN Content of Composite Nuclei
Holland	GO	University of Aarhus	A Public STIS Survey of the Host Galaxies of Gamma-Ray Bursts
Im	AR	University of California Obs./Lick Obs.	Evolution of 1200 Field E/S0 Galaxies to $z = 1$
Jaffe	GO	Leiden Observatory	Nuclear Stellar Disks in Early Galaxies: Black Hole Masses and Disk/Bar/Bulge Evolution
Jannuzi	GO	National Optical Astronomy Obs.	The Properties of Ly-Alpha Absorbers at Redshifts Between $0.9<z<1.5$
Kanbur	AR	University of Massachusetts	The calibration of the distance scale using Cepheid Period Luminosity relations at maximum light
Keel	GO	University of Alabama	Where Does Lyman Alpha Escape from Galaxy Disks?
Kennicutt	GO	Steward Observatory	Calibrating the Metallicity Dependence of the Cepheid PL Relation
Kobulnicky	GO	University of Wisconsin-Madison	STIS UV Spectroscopy in the Magellanic Bridge: A Typical QSO Absorption Line System?

Kormendy	GO	University of Hawaii	Elliptical Galaxies With Nuclear Disks of Stars: Black Hole Search and Stellar Populations
Kriss	GO	Space Telescope Science Institute	Simultaneous HST, Chandra, and FUSE Spectroscopy of NGC 4151
Lowenthal	GO	University of Massachusetts	UV Imaging and Spectroscopy of Luminous Blue Compact Galaxies from z=0 to z=1
Lubin	GO	California Institute of Technology	Large Scale Structure at $z \sim 0.9$
Malkan	AR	University of California Los Angeles	Testing The AGN/QSO Accretion Disk Paradigm Using New Non-LTE Models
Malkan	GO	University of California	The Ionizing Flux from Star-Forming Galaxies
Martel	SNAP	The Johns Hopkins University	A STIS Spectroscopic Snapshot Survey of 3CR Radio Galaxies
Miller	GO	Oxford University Department of Physics	Host galaxy luminosities of the most luminous QSOs
Mundell	GO	University of Maryland	A Black Hole Offset from the Host Galaxy Mass Center?
Nugent	GO	Lawrence Berkeley National Laboratory	UV Observations of Nearby Type Ia Supernovae
O'Connell	GO	University of Virginia	Ultraviolet Properties of the Metal Rich M87 Globular Cluster System
Oestlin	GO	Institut d'Astrophysique de Paris	Spectroscopy of candidate, very massive, intermediate age globular clusters in ESO 338-IG04
Pahre	AR	Smithsonian Astrophysical Observatory	Color Gradients in Elliptical Galaxies at z = 0.5:, An Indicator of Galaxy Formation Processes
Perlmutter	GO	Lawrence Berkeley Laboratory	Cosmological Parameters from Type Ia Supernovae at High Redshift
Pettini	GO	Institute of Astronomy	Environmental Pollution: The Outflow in the Archetypal Galaxy-Quasar Pair NGC3067/3C232
Rao	GO	University of Pittsburgh	A New Survey for Low-Redshift Damped Lyman-Alpha Lines in QSO MgII Systems
Regan	SNAP	Carnegie Institution of Washington	The Fueling of Active Nuclei:, Why are Active Galaxies Active?
Rhoads	GO	Kitt Peak National Observatory	UV extinction in Dusty Ellipticals
Richstone	GO	University of Michigan	The Smallest Nuclear Black Holes
Rose	AR	University of North Carolina	Star Formation in E+A Galaxies in Distant Clusters
Sakai	AR	National Optical Astronomy Observatories	A Broken Rung on the Distance Scale Ladder? - The Case of NGC 4258
Sasselov	AR	Harvard-Center for Astrophysics	Blending and the Extragalactic Distance Scale: Accurate DIRECT Distance to M33
Schmitt	SNAP	Space Telescope Science Institute	Snapshot Survey of Extended OIII λ 5007Å Emission in Seyfert Galaxies
Schombert	AR	University of Oregon	Morphology of Butcher-Oemler Galaxies
Schreier	GO	Space Telescope Science Institute	Ultra-High Resolution Studies of AGNs III: nuclear extent and the SIM astrometric grid
Schulte-Ladbeck	GO	University of Pittsburgh	HS 1543+5921: A bright quasar seen through a nearby star-forming dwarf galaxy
Seitzer	SNAP	University of Michigan	A Snapshot Survey of Probable Nearby Galaxies
Serjeant	SNAP	Astrophysics Group, Imperial College	A snapshot study of $0<z<1$ sub-mJy starburst galaxies
Shull	GO	University of Colorado, Boulder	Metallicity and D/H abundance in Low-z LyAlpha Absorbers towards PG 1211+143
Silk	GO	University of California, Berkeley	Pixel Microlensing of M87
Skillman	GO	University of Minnesota	NGC 625: An Intriguing Nearby Dwarf Starburst Galaxy
Smette	GO	NASA/Goddard Space Flight Center	Evolution of the Extinction Curve
Sparks	GO	Space Telescope Science Institute	The Central Region of NGC4696: Manifestation of the Physics of Mergers?
Storrie-Lombardi	GO	California Institute of Technology	Identifying Normal Galaxies at $1.3 < z < 2.5$
Thuan	GO	University of Virginia	The red giant stellar population in three nearby low-metallicity blue compact dwarf galaxies
Tripp	GO	Princeton University Observatory	The Nature and Distribution of O VI Absorbers in the Vicinity of Galaxies
Urry	GO	Space Telescope Science Institute	Deep Imaging of the Probable Einstein Ring 1517+656
Valluri	AR	Univerisity of Chicago	Kinematics of nuclear stellar disks around massive central black holes
van der Marel	GO	Space Telescope Science Institute	Merger-driven evolution of galactic nuclei: observations of the Toomre sequence
van der Marel	SNAP	Space Telescope Science Institute	Imaging of brightest cluster galaxies: the high end of the black hole mass distribution
Waddington	AR	Arizona State University	The Morphological Mix of Faint Radio Sources From Archival WFPC2 Images
Webster	GO	University of Melbourne	Microarcsecond Imaging of a Gravitationally Lensed QSO: 2237+0305
West	GO	University of Hawaii	Galaxy Recycling in Clusters
Wilson	GO	University of Maryland	The Origin of Gaseous Outflows in Active Galaxies

Approved Observing Programs for Cycle 9

Windhorst	GO	Arizona State Univ., Physics & Astronomy	A Survey of Mid-UV Morphology of Nearby Galaxies: Galaxy Structure and Faint Galaxy Evolution
Yan	AR	The Obs. of Carnegie Inst. of Washington	A Search for Extremely Red Objects Using Archival WFPC2 Images
Zepf	GO	Yale University	The Formation Epoch(s) of Globular Clusters Around Ellipticals from Ultraviolet Photometry
Zepf	AR	Yale University	The Radii and Destruction Timescales of Globular Clusters in NGC 3610
Zheng	SNAP	The Johns Hopkins University	UV Detectability of Bright Quasars in the Sloan Fields

GALACTIC

Bahcall	GO	Institute for Advanced Study	Observing the next nearby supernova
Behr	GO	California Institute of Technology	Ultraviolet Spectroscopy of Hot Horizontal-Branch Stars in the Globular Cluster M13
Bennett	GO	University of Notre Dame	Confirmation of Black Hole, Planetary, and Binary Microlensing Events
Beuermann	GO	Universitäts-Sternwarte Göttingen	FGS parallaxes of magnetic CVs
Bianchi	GO	The Johns Hopkins University	The Massive Star Content of NGC 6822
Boesgaard	GO	Institute for Astronomy, University of Hawaii	The Nucleosynthesis of Boron - Benchmarks for the Galactic Disk
Bond	GO	Space Telescope Science Institute	Sakurai's Novalike Object: Real-Time Monitoring of a Stellar Thermal Pulse
Bond	GO	Space Telescope Science Institute	WFPC2 Observations of Astrophysically Important Visual Binaries
Brandner	SNAP	University of Hawaii, Institute for Astronomy	Masses and Multiplicity of Nearby Free-floating Methane and L Dwarfs
Bruhweiler	GO	The Catholic Univ. of America	The Search for 'True' Starburst Dust and the Importance of Metallicity on Properties of O & B Stars
Calvet	GO	Smithsonian Astrophysical Observatory	Testing Theories of Wind/Jet Productions in YSOs
Clarke	GO	University of Michigan	The Interplanetary Medium Hydrogen Velocity Distribution
Clayton	GO	Louisiana State University	The Role of Polycyclic Aromatic Hydrocarbons in Ultraviolet Extinction
Cook	GO	Lawrence Livermore National Laboratory	Halo Microlens Source Systems and their Backgrounds and Reddening
Crotts	AR	Columbia University	Archival Search for a White Dwarf Dark Matter Component via WFPC2 Proper Motion Measurements
Davidson	GO	University of Minnesota	Critical spectroscopic variations in Eta Carinae
de la Reza	GO	Observatorio Nacional	Boron in the Lithium-Rich K-Giants: A Critical Test of Deep Stellar Mixing Versus Brown-Dwarf Ingestion
De Marco	GO	University College London	C/O abundance ratios across WCL planetary nebulae with strong PAH and crystalline silicate emission
Deutsch	AR	University of Washington	Systematic Serendipitous Discovery of Cataclysmic Variables and Other Odd Stars in Globular Clusters
Dinescu	AR	University of Virginia	Absolute Proper Motion of the Fornax Dwarf Spheroidal
Djorgovski	AR	California Institute of Technology	Dynamical Correlations for Globular Clusters in the Local Group Galaxies: Clues About Their Formation
Dufour	GO	Rice University	A Seminal Spectroscopic and Imagery Investigation of the Brightest Wolf-Rayet Shell Nebula: NGC 6888
Dumm	GO	Swiss Federal Institute of Technology	The wind accretion wake in a detached binary system
Feltzing	GO	Lund Observatory	Disentangling the Bulge and NGC 6528 - a proper motion study
Ferguson	GO	Institute of Astronomy	Stellar Populations in the Disk-Halo Interface of NGC 55
Ferrarese	GO	California Institute of Technology	Extragalactic Novae: the Maximum Magnitude - Rate of Decline Relation in NGC 4472
Ferraro	GO	Osservatorio Astronomico di Bologna	UV Light from Old Stellar Populations: A Census of UV Bright Stars in 'Blue Tail' Globular Clusters
Fesen	GO	Dartmouth College	Search for an Optical Counterpart to the Central X-ray Point Source in Cas A
Filippenko	AR	University of California at Berkeley	Probing the Nature of Supernovae through Archival Images of their Environments
Filippenko	SNAP	University of California at Berkeley	A Snapshot Survey of the Sites of Recent, Nearby Supernovae
Fitzpatrick	AR	Villanova University	Confirming the Interstellar Abundance of Oxygen
Franz	GO	Lowell Observatory	The Low-Mass Multiple System GL 831 (Wolf 922): Definitive Orbit and the Mass-Luminosity Relation
Gaensicke	GO	Universitäts-Sternwarte Göttingen	Taking a glance at the beating heart of 4 Draconis
Gies	GO	Georgia State University	The Masses of the O-type Binary 15 Monocerotis
Gomez de Castro	GO	Instituto de Astronomiá y Geodésia	High Density (~ 10^9 cm^{-3}) gas in the jet formation region of T Tauri stars
Grillmair	GO	California Institute of Technology	Proper Motions in Baade's Window

Approved Observing Programs for Cycle 9

Guinan	GO	Villanova University	Calibrating the Cosmic Meter Stick: The Distance to the LMC Using Eclipsing Binaries
Guzman	GO	Yale University	Galaxy Mass and the Fate of the ISM in Candidate Proto-Spheroidals at z~0.2-0.4
Harris	SNAP	McMaster University	Structural Measurement of Globular Clusters in M31 and NGC 5128: Stalking the Fundamental Plane
Hartigan	GO	Rice University	Collimation and Physical Conditions Within the HH 30 Protostellar Jet
Haswell	GO	Open University	HST/RXTE Observations of SXTs: Black Hole Accretion Outbursts
Hawley	GO	University of Washington	Coordinated Observations of Stellar Flares on AD Leo
Heber	GO	Dr. Remeis-Sternwarte	A test of pulsation and diffusion theory for subluminous B stars
Henry	GO	Johns Hopkins Universtiy	Speedy Gonzales Mass Determinations: Fast Orbiting Red Dwarf Systems
Hinkle	GO	National Optical Astronomy Observatories	NUV Extension of the Arcturus Project: Probing the Onset of Chromospheric Heating
Holtzman	AR	New Mexico State University	Comparisons of Local Group Stellar Populations: Construction of a Public Database
Hunsberger	GO	Lowell Observatory	Observations of Stellar Systems in Seyfert's Sextet
Jeffery	SNAP	Armagh Observatory	Secular changes in the temperatures and radii of extreme helium stars
King	AR	University of California, Berkeley	Geometric Distances of Globular Clusters (AR part)
King	AR	University of California, Berkeley	The Hydrogen-Burning Limit in the Globular Cluster NGC 6397 (AR part)
King	AR	University of California, Berkeley	Proper Motions in Well-Observed Fields in Omega Centauri
King	GO	University of California, Berkeley	Geometric Distances of Globular Clusters (GO part)
King	GO	University of California, Berkeley	The Hydrogen-Burning Limit in the Globular Cluster NGC 6397 (GO part)
Kirkpatrick	GO	Infrared Processing and Analysis Center	Determining the Duplicity of Nearby T Dwarfs (Methane Brown Dwarfs)
Kirshner	GO	Harvard College Observatory	SINS: The Supernova INtensive Study-Cycle 9
Lagrange	GO	Laboratoire d'Astrophysique de Grenoble	STIS coronographic imaging of old PMS stars
Lambert	GO	University of Texas at Austin	The Galactic Abundance Gradients of Boron and Iron
Lambert	GO	University of Texas at Austin	The Interstellar Isotopic Ratio of Boron toward Omicron Persei and Nearby Sight Lines
Lambert	GO	University of Texas at Austin	Ultraviolet Spectroscopy of R Coronae Borealis Stars — Broad Lines from an Accretion Disc?
Larsen	GO	Copenhagen University Observatory	A Young Globular Cluster Surrounded by Numerous Smaller Clusters and a Giant Bubble in NGC 6946
Lauroesch	SNAP	Northwestern University	A SNAPSHOT Survey of the Hot Interstellar Medium
Liu	GO	University College London	H-deficient condensations in PNe-a key to discrepancies in abundance determinations
Luhman	GO	Harvard-Smithsonian Center for Astrophysics	Newborn Planets and Brown Dwarf Companions in IC 348
Margon	AR	University of Washington	The Millisecond Pulsars of 47 Tucanae: Mining the Unique Stellar Equivalent of the Hubble Deep Field
Martín	SNAP	Caltech	Multiplicity among Very-Low Mass Stars and Brown Dwarfs in Alpha Persei and the Pleiades
Massey	SNAP	National Optical Astronomy Observatories	The Physical Parameters of the Hottest, Most Luminous Stars as a Function of Metallicity
Megeath	GO	Harvard Smithsonian Center for Astrophsycis	The Photoevaporation of Protostellar Envelopes in the NGC 281 Young Stellar Cluster
Mignani	GO	ESA Space Tele. Euro. Coordinating Facility	Timing and proper motion measurement of the proposed opt. counterpart of the nearby pulsar PSR1929+10.
Mignani	SNAP	ESA Space Tele. Euro. Coordinating Facility	Is Cir X-1 associated with SNR G321.9-0.3?
Mould	GO	Australian National University	Identification of the Galaxy's Missing Mass
Napiwotzki	GO	Dr. Remeis-Sternwarte	Metal abundances in very hot DA white dwarfs -- a test of diffusion theory
Nelan	SNAP	Space Telescope Science Institute	A High Angular Resolution Survey of the Most Massive Stars in the SMC
Neuhaeuser	GO	MPI Extraterrestrische Physik	Search for sub-stellar companions to young brown dwarfs in the Chamaeleon I dark cloud
O'Dell	GO	Rice University	Cometary Knots in Planetary Nebulae
Palla	GO	Osservatorio Astrofisico di Arcetri	The $^{12}C/^{13}C$ abundance ratio in NGC 3242
Pavlov	AR	The Pennsylvania State University	Geminga's Parallax Revisited
Piotto	GO	Università di Padova	Understanding the Anomalous Hot Stellar Population in Galactic Globular Clusters
Piotto	SNAP	Università di Padova	A Snapshot Survey of Galactic Globular Clusters
Provencal	GO	University of Delaware	Probing Stellar Interiors Via Convective Dredge-up in DQ White Dwarfs
Reid	SNAP	University of Pennsylvania	A search for low-mass companions to ultracool dwarfs
Rich	AR	University of California at Los Angeles	The Age of the Central 100 pc of the Galaxy

Approved Observing Programs for Cycle 9

Sahu	GO	NASA/Goddard Space Flight Center	Does the D/H Ratio Vary in Local Interstellar Gas?
Schulte-Ladbeck	GO	University of Pittsburgh	Leo A — Evidence for the Delayed Formation of 'Dwarfs' Scenario?
Shara	GO	American Museum of Natural History	The Deepest Far-UV Imaging Survey of Globular Clusters: NGC 6752 and NGC 6397
Shaw	SNAP	Space Telescope Science Institute	The Most Elusive Nuclei of LMC Planetary Nebulae
Shore	GO	Indiana University South Bend	STIS Observations of a Magellanic Cloud Nova in Outburst
Simon	GO	State University of New York	Masses of Pre-Main Sequence Binaries
Smecker-Hane	GO	University of California, Irvine	The Star-Formation History of the Large Magellanic Cloud
Smith	GO	University of Texas El Paso	Interstellar Boron & Oxygen Abundances in the Cep OB2 Association: Probing Neutrino Nucleosynthesis
Snow	GO	University of Colorado	HST, Chandra, and FUSE Studies of Interstellar Material toward HD 24534 (aka X Persei)
Sonneborn	GO	NASA's Goddard Space Flight Center	Probing the Galactic Halo and Beyond with Young Supernovae
Stanghellini	SNAP	Space Telescope Science Institute	Survey of SMC Planetary Nebulae: Nebular and Stellar Evolution in a Low-Metallicity Environment
Tolstoy	SNAP	European Southern Observatory	Stellar Populations Across the Small Magellanic Cloud: History and Structure
Vrtilek	GO	Smithsonian Astrophysical Observatory	High Resolution UV/X-ray Spectroscopy of SMC X-1
Walter	GO	State University of New York	Confirming the parallax of the neutron star RX J185635-3754
Weinberger	GO	University of California Los Angeles	Imaging and Spectroscopy of Dusty Circumstellar Disks
Werner	GO	Universität Tübingen	Distance to the prototype WD showing signatures of a super-hot wind
Werner	GO	Universität Tübingen	Temperature scale and metal abundances of hot hydrogen-rich central stars of planetary nebulae
Worthey	AR	Saint Ambrose University	Chemistry of Messier 31

SOLAR SYSTEM

Bosh	AR	Lowell Observatory	Inclined Features in Saturn's Rings
Brown	AR	Caltech	Probing the Surface Composition of Europa through Atmospheric Spectroscopy
Clarke	GO	University of Michigan	Jovian Auroral Variability Due to the Solar Wind/Magnetosphere Interaction
Clarke	GO	University of Michigan	Atmospheric Escape and the D/H Ratio in Mars' Atmosphere
Colwell	GO	Southwest Research Institute	High Resolution Spectrum of the Venus Lyman-Alpha Line Profile
French	GO	Wellesley College	Saturn's Rings and Small Moons
Hammel	GO	Space Science Institute	The Asymmetric Atmosphere of Uranus
James	GO	University of Toledo	Ozone, Condensates, and Dust in the Martian Atmosphere
Merline	GO	Southwest Research Institute	First Spectroscopy of an Asteroid and its Satellite: (45) Eugenia and S/1998 (45) 1
Rages	SNAP	NASA Ames Research Center	Atmospheric Variability on Uranus and Neptune
Rettig	AR	University of Notre Dame	Understanding the Physical Structure of the Comet Shoemaker-Levy 9 Fragments
Showalter	GO	NASA Ames Research Center	A Search for the Martian Dust Belts
Sromovsky	AR	University of Wisconsin-Madison	The Dynamics of Dark Spots on Neptune
Storrs	SNAP	Space Telescope Science Institute	Imaging Snapshots of Asteroids
Yelle	GO	Northern Arizona University	UV Spectroscopy of the Giant Planet Atmospheres with STIS
Young	GO	Southwest Research Institute	Pre-Cassini/Huygens Studies of Titan's Surface, Troposphere and Stratosphere

LARGE PROGRAMS

Fruchter	GO	Space Telescope Science Institute	Gamma-Ray Bursts and their Host Environments
Kulkarni	GO	California Institute of Technology	Gamma-ray bursts: discovering the progenitors and understanding the explosion
Lamy	GO	Laboratoire d'Astronomie Spatiale	The Origin of Short-Period Comets
Richer	GO	University of British Columbia	Constraining the Age of the Oldest Stars from the White Dwarf Cooling Sequence in M4
Schmidt	GO	Mt.Stromlo & Siding Spring Observatories	Testing the Accelerating Universe
Schneider	GO	Max-Planck-Institut f. Astrophysik	Probing the Large Scale Structure: Cosmic Shear observations with STIS

How the New Cycle 9 Review Process Worked

by Meg Urry, cmu@stsci.edu

There were five key changes in the proposal review process for Cycle 9. With the review now completed, we have received extensive feedback from the Cycle 9 panels and TAC (Telescope Allocation Committee) indicating the changes were very successful, hence we plan to repeat the new process (with minor changes) in Cycle 10. Here we summarize the process changes, followed by some advice for proposers in future *HST* cycles.

Goals, Changes, and Outcome

Goal 1: Increase the fraction of large observing programs, to the 10-30% levels that have been recommended by external advisory committees. Changes: The role of the TAC was redefined to be review of Large proposals (≥ 100 orbits), for which up to 1000 orbits were available. Medium-sized proposals (15-99 orbits) were encouraged via orbit subsidies in the review process. To encourage more submissions, these new opportunities were heavily advertized in the Call for Proposals, the STScI Newsletter, and elsewhere. Results: More than 15 times as many Large proposals were submitted as in Cycle 8, constituting 1/4 of proposed orbits rather than a few percent. The TAC recommended a total of six Large programs, for ~1/4 of the total allocated orbits. Requests for medium-sized allocations doubled, constituting ~60% of the requested orbits and a similar percentage of the selected orbits. Thus the acceptance rate was largely independent of proposal size.

Goal 2: Better determine the balance among scientific sub-disciplines. Changes: We greatly broadened the scientific focus of each review panel and charged them with allocating 100% of the Regular (<99 orbit) proposals, so that science balance could be achieved within individual panels. In preparation for this change, proposers were explicitly told to address the overall importance of their program to astronomy (the "big picture"). Results: All proposals were evaluated via in-depth discussions by experts, rather than one third (the gray-area proposals) being discussed by a much broader and overly large TAC. The Cycle 9 panels were highly supportive of this change. Interestingly, quite a few panelists admitted to pre-meeting apprehensions about the breadth of expertise required, but by the end they embraced the new process. With redundant panels for each broad area (see next goal), there were effectively two independent determinations of science priorities per cycle; in a few cases, mirror panels came up with quite different mixes of science, making the new process more robust against the vagaries of peer review.

Goal 3: Minimize the impact of conflicts of interest while still allowing experienced *HST* users to participate in

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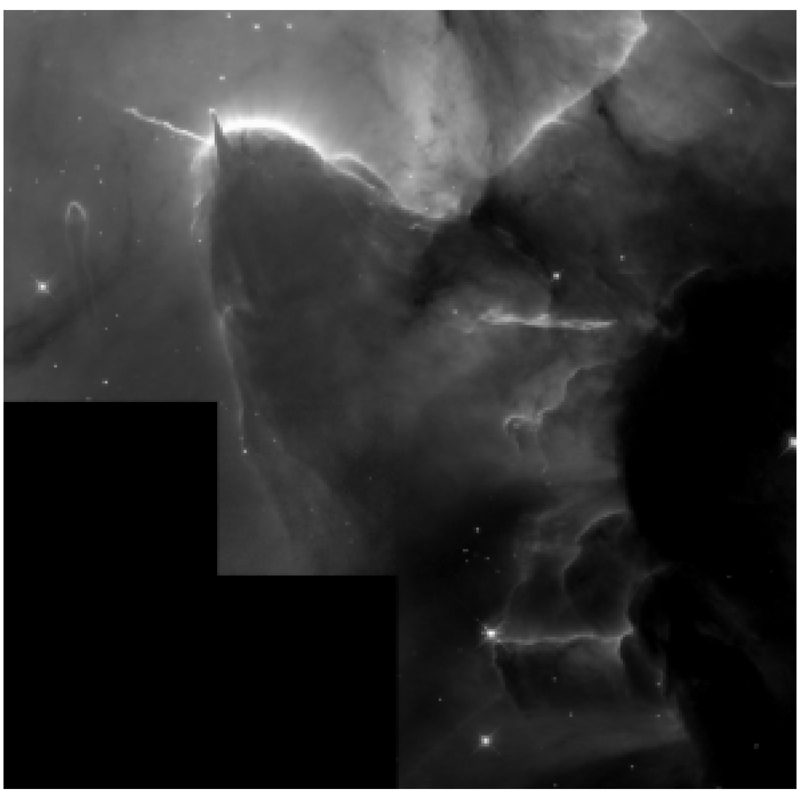

HST Recent Release: Star Birth in the Trifid Nebula

This NASA Hubble Space Telescope image of the Trifid Nebula reveals a stellar nursery being torn apart by radiation from a nearby, massive star. The picture also provides a peek at embryonic stars that are forming within an ill-fated cloud of dust and gas that is destined to be eaten away by the glare from the massive neighbor. This stellar activity is a beautiful example of how the life cycle of stars like our Sun is intimately connected with their more powerful siblings.

Credits: NASA and Jeff Hester (Arizona State University)

Web Address: http://oposite.stsci.edu/pubinfo/pr/1999/42/index.html

Review Process *from page 21*

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the review. Changes: We assigned two panels to each broad science area (with the exception of the Solar System panel, for which there are too few proposals), so that a panelist's proposals could be reviewed by the other panel. Results: The acceptance rate was the same for PIs who served as reviewers and those outside the process. There were also dramatically fewer instances of panelists having to recuse themselves because of conflicts of interest, leading to a more consistent review involving a larger fraction of panel expertise.

Goal 4: Enable exciting science with fast ToOs and multiwavelength *HST*+Chandra proposals. Changes: We increased the number of fast ToOs allowed, and reduced the minimum activation time proposers could request (with actual implementation to be driven by the proposed science). We instituted the first joint multiwavelength opportunity, for Chandra and *HST*, awarding up to 400 ksec of Chandra time and giving the Chandra project 100 orbits of *HST* time for their next review. Results: Several of the top-rated Cycle 9 proposals involved fast ToOs and Chandra-coordinated science, attesting to the importance of these opportunities.

Goal 5: Reduce the burden on the astronomical community. Changes: We halved the number of panels, and thus panelists (and cost). We implemented a triage process to keep the burden on individual reviewers manageable, after verifying, via tests on the review databases from previous cycles, that it accurately identified the bottom 1/3 of proposals. Results: Only ~75 reviewers served in Cycle 9, compared to ~150 in Cycle 8. The panels completed their work just as quickly, in part because of the triage approach, which they overwhelmingly supported.

Advice for Future Cycles

The new *HST* review process having been highly successful, we plan to continue it in future cycles. This means proposers should keep in mind several key points. First, don't be shy about submitting Large proposals — they have the same chance of success as any other proposal (a 1 in 5 chance). The TAC discusses each Large proposal in considerable detail, so winning proposals are not only of compelling scientific interest, they are well thought out and involve expert teams.

Second, make the effort to address the non-expert. Most successful proposals set the context with sufficient background information, and clearly described the importance of the investigation to all astronomy — "the big picture." Since this was an explicit criterion for evaluation, proposals could be downgraded for failing to include it.

Third, don't pad your request for time: fewer than 10% of the approved proposals were cut (and those largely to avoid duplicate observations), so proposers either got what they asked for or were rejected.

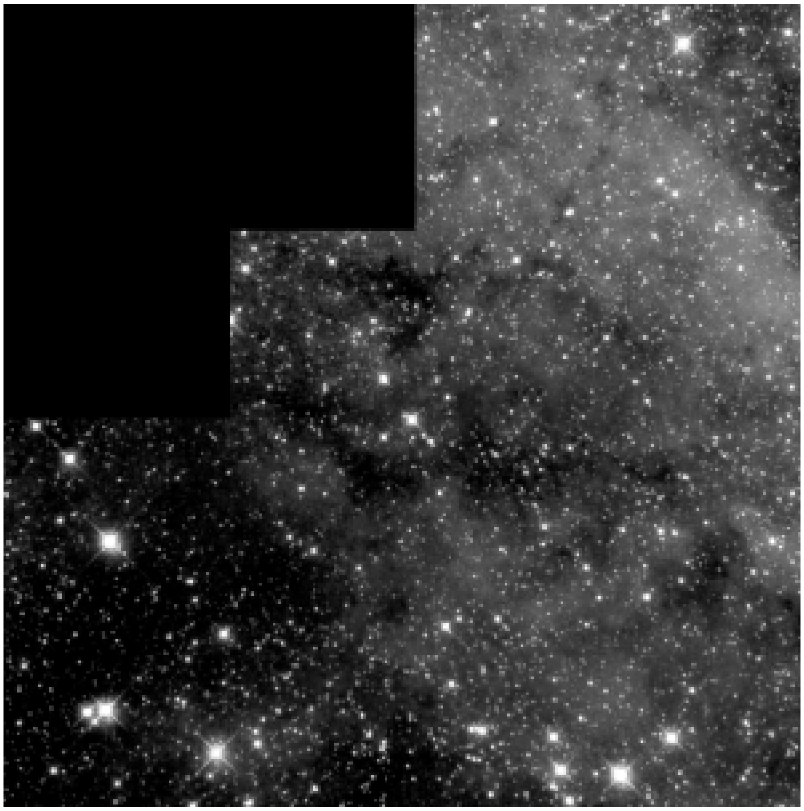
The main advice? Start from the science, write a compelling story for your fellow astronomers, ask for the resources you really need, and submit those proposals whatever their size. With such a high oversubscription (1/6 by orbits), many truly excellent proposals had to be rejected. Remember that rejected PIs are in good company, and that many of these proposals, possibly revised according to comments from the panel or TAC, may succeed in future years.

HST Recent Release: A Grazing Encounter Between Two Spiral Galaxies

In the direction of the constellation Canis Major, two spiral galaxies pass by each other like majestic ships in the night. The near-collision has been caught in images taken by NASA's Hubble Space Telescope and its Wide Field Planetary Camera 2.

Image Credit: NASA and Hubble Heritage Team (STScI)

Web Address: http://oposite.stsci.edu/pubinfo/pr/1999/41/index.html



HST Recent Release:
Hubble Telescope Reveals Swarm of Glittering Stars in Nearby Galaxy

NASA's Hubble Space Telescope has peered at a small area within the Large Magellanic Cloud (LMC) to provide the deepest color picture ever obtained in that satellite galaxy of our own Milky Way.

Over 10,000 stars can be seen in the photo, covering a region in the LMC about 130 light-years wide. The faintest stars in the picture are some 100 million times dimmer than the human eye's limit of visibility. Our Sun, if located in the LMC, would be one of the faintest stars in the photograph, indistinguishable from the swarm of other similar stars.

Credits: NASA and The Hubble Heritage Team (STScI)

Web Address: http://oposite.stsci.edu/pubinfo/pr/1999/44/content/9944.tif

Calendar

Cycle 10

Call for Proposals issued	June, 2000 (tentative)
Phase I proposals due	September, 2000 (tentative)
Proposers notified	December, 2000 (tentative)
Phase II Proposals Due	February, 2000 (tentative)
Routine Observing Begins	July, 2000 (tentative)

Meetings and Symposia

STScI May Workshop	April 11-14, 2000 (see page 11)
Space Telescope Users Committee	May, 2000

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:

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Debbie Elmegreen, Vassar College
Jay Frogel, Ohio State University
Chris Impey, U. Arizona
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