Gemini Observing Opportunities for Semester 2006A

Taft Armandroff

The NOAO Gemini Science Center (NGSC) invites and encourages the US community to submit proposals for Gemini observing opportunities during semester 2006A. US Gemini observing proposals are submitted and evaluated via the NOAO Time Allocation Committee (TAC) process. Although the Gemini Call for Proposals for 2006A will not be released until 1 September 2005 for the US proposal deadline of September 30, the following are our expectations of what will be offered in semester 2006A. Please watch the NGSC Web page (*www.noao.edu/usgp*) for the Call for Proposals for Gemini observing, which will clearly list the capabilities that one can request.

NGSC is pleased to inform the US community of the following suite of scientifically important instrumental capabilities that will be offered in semester 2006A:

Gemini North:

- The GMOS-North optical multi-object spectrograph and imager will be offered in 2006A. Multi-object spectroscopy and long-slit spectroscopy (both optionally with nod-and-shuffle mode), integral-field unit (IFU) spectroscopy, and imaging modes will be available.
- The NIRI infrared imager/spectrograph will be offered in 2006A. Both imaging mode and grism spectroscopy mode will be available.
- The Altair adaptive optics (AO) system will be offered in natural-guide-star mode in 2006A. Gemini plans to offer the following modes of Altair in 2006A: AO-enhanced infrared imaging and spectroscopy using NIRI.
- Michelle is a mid-infrared (8–25 micron) imager and spectrograph. Michelle will be available for imaging and for spectroscopy (with resolutions of R=200 to 3,000, and echelle spectroscopy at R≈10,000 to 30,000).
- All instruments and modes are offered for both queue and classical observing. Classical observing will be offered only to programs with a length of three nights or longer.

Gemini South:

- The GMOS-South optical multi-object spectrograph and imager will be offered during semester 2006A. Multi-object spectroscopy, long-slit spectroscopy, IFU spectroscopy (all optionally with nod-and-shuffle mode), and imaging modes will be available.
- The T-ReCS mid-infrared imager and spectrograph will be available in semester 2006A. Both the imaging and spectroscopic modes of T-ReCS will be available in 2006A.
- The GNIRS facility infrared spectrograph will be offered in semester 2006A. Four GNIRS observing modes will be available: long-slit spectroscopy with resolutions R=2,000 and 6,000; cross-dispersed spectroscopy at R=2,000 (with continuous coverage from 1 to 2.5 microns) and R=6,000 (non-continuous coverage); higher-resolution narrow-slit mode with R=18,000; and IFU spectroscopy (R=2,000 and 6,000).
- The Phoenix infrared high-resolution spectrograph (R=50,000 to 70,000) will be offered in semester 2006A. Phoenix is available only in classical mode (in whole nights, with no three-night minimum). NGSC staff will provide training and start-up assistance to Phoenix classical observers.
- The Acquisition Camera will be available for time-series photometry in 2006A.
- bHROS is a bench-mounted high-resolution (R=150,000) optical spectrograph that features a fiber feed and prism cross dispersion. bHROS is expected to be available during semester 2006A in queue only (see related article in this *Newsletter*). There will be a faint limit on science targets that can be observed. Please see the Call for Proposals for the specific magnitude limit.
- All modes for GMOS-South, GNIRS, and T-ReCS are offered for both queue and classical observing. bHROS is only available for queue observing, while Phoenix is only available for classical observing. Classical observing will be offered only to programs with a length of three nights or longer (except in the case of Phoenix).

Detailed information on these instrument capabilities is available at *www.gemini.edu/sciops/instruments/instrumentIndex.html.*

The percentage of time devoted to observations for science programs in semester 2006A is planned to be 70 percent at both Gemini North and Gemini South. The primary use of the remainder of the time will be instrument commissioning, system verification (SV), and demonstration science (DS) programs. Calls for SV and DS programs will be issued by Gemini for each of these opportunities.

We remind the community that US Gemini proposals can be submitted jointly with collaborators in another Gemini partner country. An observing team requests time from each relevant partner country. Such multipartner proposals are encouraged because they access a larger fraction of the available Gemini time, thus enabling larger programs that are likely to have substantial scientific impact. Please note that all multipartner proposals must be submitted using the Phase I Tool (PIT).

continued

Gemini Observing Opportunities for Semester 2006A continued

Proper operation of the Gemini queue requires that it be populated with programs that can profitably use the full range of observing conditions. Gemini proposers and users have become accustomed to specifying the conditions that are required to carry out their observations, with the help of the Gemini Integration Time Calculators (ITCs). NGSC wishes to remind the US community that a program has a higher probability of being awarded time and being executed if ideal observing conditions are not requested. The two conditions that are in the greatest demand are excellent image quality and no cloud cover. We understand the high demand for these excellent conditions, but wish to remind proposers that programs that make use of less-than-ideal conditions are also needed in the queue.

NOAO accepts Gemini proposals via the standard NOAO Web proposal form and the Gemini PIT software. We remind proposers that NOAO offers a tool to allow PIT submitters to view their proposal in the printout version that will be seen by the TAC (see *www.noao.edu/noaoprop/help/pit.html)*.

The ITCs at the Gemini Web site are an important resource that proposers use in estimating the amount of Gemini time required to meet their scientific goals (*www.gemini.edu/sciops/instruments/instrumentITCIndex.html*). The Gemini ITCs for the infrared (IR) instruments were updated in June 2005 with new near-IR and mid-IR background files and updated throughputs to provide improved agreement with observed instrumental performance.

Pre-Submission Technical Review of Proposals

Proposers for Gemini time may not realize that NGSC staff members check each proposal for technical accuracy and feasibility. Problems are occasionally uncovered that can affect the proposal, but this is often after submission. As an aid to the US community, NGSC offers the opportunity to have proposals undergo a technical review before submission. The NGSC staff will not write the proposal, of course, or develop the observing strategy, but they will provide comments on the operational aspects of the program. Contact the instrument scientist relevant to your proposal at NOAO through the NGSC support Web page (*www.noao.edu/usgp/noaosupport.html)*. The NGSC staff will only be able to respond to requests made well in advance of proposal submission deadlines.

A New Addition to the Gemini Instrument Suite: bHROS

Verne Smith

The bench-mounted high-resolution optical spectrograph (bHROS) for the Gemini Observatory is now coming on-line and should become available to the Gemini user community in the near future. bHROS is mounted in the pier of the Gemini South telescope, where it is fed by optical fibers with input and output micro lenses. The input fibers are mounted inside the Gemini Multi-Object Spectrograph (GMOS), which will position them in the Cassegrain focal plane of the telescope.

The spectrograph itself is a prism cross-dispersed echelle that is designed to operate at quite high spectral resolution (R=150,000, with three-pixel sampling). Lower spectral resolutions can be obtained by pixel binning. There are two observing modes: one mode uses two 0.7-arcsec-diameter fibers separated by 20 arcsec in order to achieve both object and sky spectra; the other mode uses one fiber for object-only, with a fiber diameter of one arcsec. In order to maximize throughput at high spectral resolution and maintain a relatively compact instrument, image slicers are employed. As a result, the imaged spectra consist of eight adjacent bands for each order. The figure shows the fiber bundles emerging from the telescope pier and being routed into the climate-controlled bHROS enclosure. bHROS was designed and built by a team at University College London, with Mike Barlow as principal investigator.

continued

New Addition to the Gemini Instrument Suite continued

The spectrograph can operate over the wavelength range from 400 to 1,000 nanometers using a mosaic of two CCDs having 2048 × 4608 13.5-micron pixels. Due to the high dispersion of the echelle orders, wavelength coverage is not complete. The echelle grating has two degrees of motion, allowing specified wavelength regions to be placed effectively on the CCD arrays.

The first on-sky commissioning run for bHROS at Gemini South was conducted July 21–27, followed by Demonstration Science observations the nights of August 22–27. Contingent on final commissioning, it is anticipated that bHROS will be available to the Gemini community in 2006A as a facility instrument. Stay tuned to the Gemini Observatory Web page (*www.gemini.edu*) for the latest bHROS news.

If you have questions about the status of bHROS, or about instrument specifics, please contact Verne Smith (*vsmith@noao.edu*), the NGSC instrument scientist for bHROS.

The bHROS fiber bundles emerge from the bottom of the pier of the Gemini South telescope and enter the climate-controlled bHROS enclosure.

NICI Planet Search Campaign

Taft Armandroff

The Near Infrared Coronagraphic Imager (NICI) being developed for use at Gemini South will facilitate the detection of faint sources around relatively bright objects. Thus, NICI will be a pathfinder toward Gemini detecting and studying giant planets orbiting nearby stars. The instrument includes a curvature-sensing adaptive optics system and is optimized for coronagraphic imaging. NICI's two imaging channels facilitate the technique of simultaneous differential imaging. The instrument also includes high-quality 1.6-micron narrowband methane filters that will increase the contrast between a giant planet and the brighter stellar source. NICI is expected to be delivered to Gemini South before the end of 2005.

Recognizing the contributions that NICI is expected to make toward the discovery and study of extrasolar planets, Gemini Observatory is organizing a planet-finding campaign using this instrument. The team selected will be allocated approximately 50 NICI nights distributed over two to three years. Proposals are due 1 October 2005. Please see the NICI Planet Search Campaign Call for Proposals on the Gemini Web page (*www.gemini.edu*) for more information.

Proposals for the NICI Planet Search Campaign will likely be required to include information about team membership and Gemini partner participation, proposed observing strategies, possible external resources (student support, data from other facilities, etc.), data processing software, project schedule, and data release plans. Please note that proposals should be sent directly to Gemini and should *not* be submitted to the NOAO TAC or other Gemini partner country TACs. The Gemini International TAC (ITAC) will assess campaign proposals.

NICI will be available for other research projects in addition to the planet search campaign, with such observing time awarded through the regular TAC process starting in semester 2006B.

Reminder! All papers containing data from the Gemini telescopes should include the general Gemini acknowledgement (see *www.gemini.edu/sciops/ObsProcess/defAcknowledgement.html*) and the specific acknowledgement for a visiting instrument if any (for example, see the Phoenix-specific acknowledgement at *www.gemini.edu/sciops/instruments/phoenix/phoenixRefs.html*).

GNIRS Servicing Mission

Jay Elias

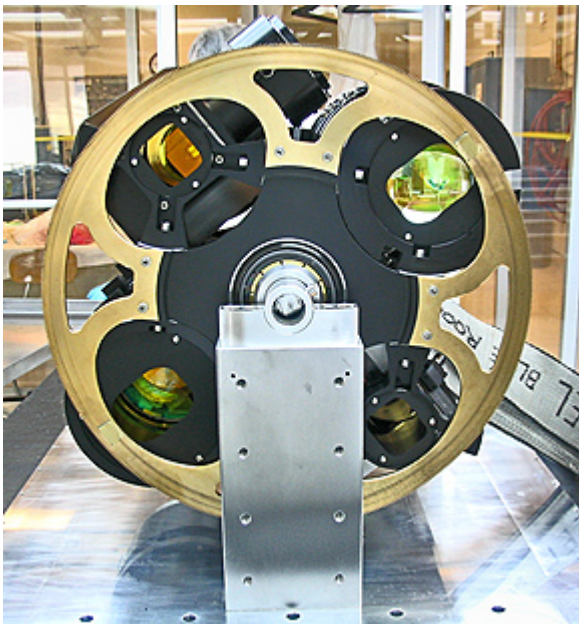
The Gemini Near-Infrared Spectrograph (GNIRS) was commissioned at Gemini South in January 2004 and has been in general use there since semester 2004B. GNIRS allows spectroscopic observations from 0.9 to 5 microns at different spectral resolutions and pixel scales, of which the most used are R=1,800 and 6,000 at a scale of 0.15 arcsec/pixel. (See *www.gemini.edu/sciops/instruments/nirs/nirsIndex.html* for further information). As prospective users of the instrument are probably aware, GNIRS was taken out of service for portions of semesters 2005A and 2005B to permit an extensive overhaul of the instrument.

This work was carried out jointly by NOAO and Gemini technical staff and scientists over an eight-week period. During this period, the instrument was removed from the telescope and the internal cold structure was removed in the Cerro Pachón laboratory, where it was then opened to allow access to the camera turret and other mechanisms.

The GNIRS main cold structure after removal from the dewar, prior to accessing the internal mechanisms. The work is done in clean environment to avoid contamination. The individuals in the photo are Felipe Daruich (left, Gemini) and Ron George (right, NOAO).

The following tasks were undertaken on GNIRS:

- The final lens in each of the short-focus cameras (0.15 arcsec/pixel) was replaced with a lens with a thorium-free, antireflection coating. This pixel scale is the most frequently used, since it provides a good match to the telescope's typical image quality. The lens change will eliminate the particle events seen with these cameras, resulting in better signal-to-noise on long integrations. Only the final lenses of these two cameras required replacement, since the detector does not have an unblocked and unfolded line of sight to the other lenses, nor to the lenses in the long-focus cameras. The alpha particles emitted by the thorium do not have enough energy to pass through metal or optical materials.



The GNIRS camera turret after lens replacement, prior to installation in the cold structure. The view is from the rear (a "detector's eye view"). The lenses that were replaced are the two on the top right and bottom left.

- Three new filters were installed:
  - A replacement blocking filter for the cross-dispersed mode, which provides continuous coverage at spectral resolution ~1,800 from 2.5 microns down to below 0.9 microns. The new filter has better overall transmission, especially at wavelengths below 1 micron, where the improvement should be at least 20 percent. There is no "blue" cutoff with the new filter, but performance at and below 0.8 microns may still be limited by the rest of the optics.
  - Two narrowband filters intended primarily for acquisition. One is a 1.5 percent narrowband filter centered on the 2.12-micron H_2 line, and the second is a 1.5 percent narrowband filter centered on the 3.3-micron polycyclic aromatic hydrocarbon (PAH) feature. The H_2 filter is intended for use in acquiring

continued

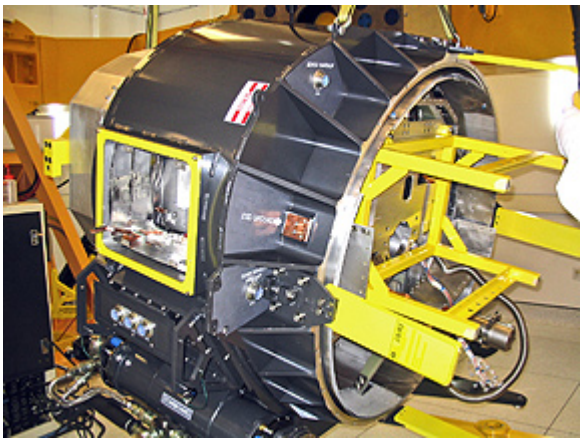
GNIRS Servicing Mission continued

Installing a lens using the NOAO vacuum chuck. This work is done in a "clean room" to prevent contamination of the optics.

bright objects (e.g., standards) and for diffuse objects with molecular hydrogen emission (e.g., Herbig-Haro objects). The PAH filter is intended to allow acquisition of objects at 3 microns, where the standard order sorter has too much background, and should also permit acquisition of diffuse objects with strong PAH emission.

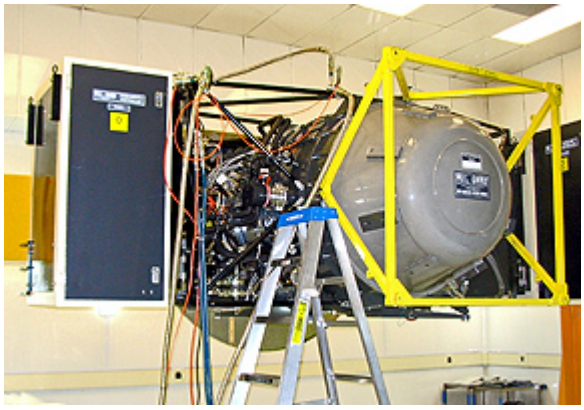
- The on-instrument wavefront sensor (OIWFS) gimbal mirror was modified to cure a mechanical interference that cut off one corner of the patrol field. This modification will allow the OIWFS to be used for better flexure correction or for guiding where there are no visible-wavelength guide stars. Additional software work is required to implement these capabilities, so they will not be available immediately.
- A problem with the detector grounding was identified and cured; this should help with the noise "bands" seen in some GNIRS data. The detector operating parameters (mainly temperature) were also reevaluated.
- All four of the coldheads were rebuilt; this should provide reliable operation for at least another year.
- Finally, the team took advantage of having the instrument fully disassembled to inspect major mechanisms for wear and make minor adjustments.

Following the work detailed above, the cold structure was re-assembled and its optical alignment was verified, after which it was reinstalled in the dewar. The instrument was then fully reassembled for verification.



Going back together. The main cold structure is installed in the dewar mid-section. Note the handling fixtures still attached to the dewar shell (right) and cold structure (at both ends).

Initial verification of the work has been carried out in the Cerro Pachón laboratory, including tests on the flexure rig. These initial tests include mechanism calibration and reoptimization of detector parameters. At the time this article was written, further testing on the telescope was scheduled for mid-August and should be complete prior to the call for proposals, unless bad weather intervenes. Additional commissioning time is scheduled for mid-September, if required.



GNIRS back in service on the Cerro Pachón flexure rig prior to testing.

NGSC Instrumentation Program Update

Taft Armandroff & Mark Trueblood

The NGSC Instrumentation Program continues its mission to provide innovative and capable instrumentation for the Gemini telescopes in support of frontline science programs. This article gives a status update on Gemini instrumentation under development in the United States, with progress since the June 2005 *NOAO-NSO Newsletter*.

NICI

The Near Infrared Coronagraphic Imager (NICI) will provide a 1- to 5-micron dual-beam coronagraphic imaging capability on the Gemini South telescope. Mauna Kea Infrared (MKIR) in Hilo, HI, is building NICI, under the leadership of Doug Toomey.

NICI is in the final assembly and test phase of the project. A detailed cold test of the integrated NICI system took place in May and June. The two Aladdin array detectors and the NICI array electronics are performing near specification. The NICI high-level software is being used to interface with the NICI arrays/controllers, motors, and temperature controllers.

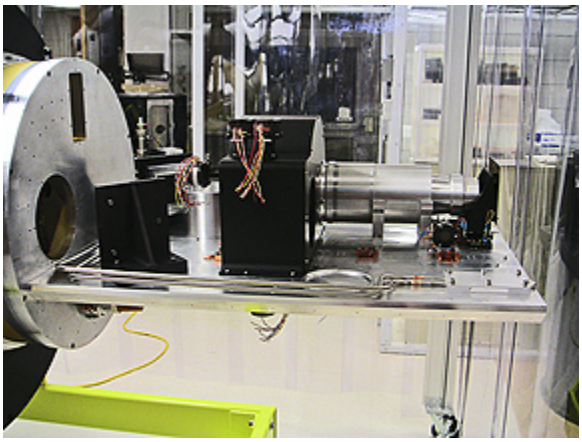
As of the end of June, MKIR reported that 97 percent of the work toward final acceptance of NICI by Gemini is complete. NICI is expected to be deployed on Gemini South in 2005.

FLAMINGOS-2

FLAMINGOS-2 is a near-infrared multi-object spectrograph and imager for the Gemini South telescope. FLAMINGOS-2 will cover a 6.1-arcmin diameter field at the standard Gemini *f*/16 focus in imaging mode, and will provide multi-object spectra over a 6.1×2-arcmin field. It will also provide a multi-object spectroscopic capability for Gemini South's multi-conjugate adaptive optics system. The University of Florida is building FLAMINGOS-2, under the leadership of Principal Investigator Steve Eikenberry.

The FLAMINGOS-2 team is proceeding with the integration and testing phase of the project. FLAMINGOS-2 has two cryostats: the main cryostat that contains the collimator, grisms, camera, and detector; and the "MOS" cryostat that contains the masks for multi-object spectroscopy, and the wheel and mechanism that select a mask for observing. Both cryostats are now assembled and mostly populated. Florida has successfully carried out cold testing and vacuum testing of both cryostats. In addition, the FLAMINGOS-2 array controller has been used to read out the detector multiplexer.

As of July, Florida reports that 78 percent of the work toward FLAMINGOS-2 final acceptance by Gemini is complete.



The FLAMINGOS-2 camera bench and bulkhead, with the filter wheel box, mirror mounts, camera lens tube assembly, and detector focus stage visible. The liquid nitrogen pre-cool lines are visible on the left, and running along the optical bench.

FLAMINGOS-2, supported vertically in its handling and flexure-testing cart, is shown with University of Florida engineering team members Jeff Julian(left) and Greg Bennett (right).