Classical and Queue Observing Opportunities with the Gemini Telescopes for Semester 2009B

Verne V. Smith

Semester 2009B runs from 1 August 2009 to 31 January 2010, and the NOAO Gemini Science Center (NGSC) encourages the US community to propose for Gemini observing time during this semester. The Gemini Observatory provides unique opportunities in observational and operational capabilities, such as the ability to support both classically- and queue-scheduled programs. In an effort to increase interactions between US users and the Gemini staff, as well as observing directly with the telescopes and instruments, **NOAO strongly encourages US proposers to consider classical programs, which can be as short as 1 night, on the Gemini telescopes.**

US Gemini observing proposals are submitted to and evaluated by the NOAO Time Allocation Committee (TAC). The formal Gemini Call for Proposals for 2009B will be released in late-February 2009 (before you receive this *Newsletter* issue), with a US proposal deadline of Tuesday, 31 March 2009. As this article is prepared well before the release of the Call for Proposals, the following list of instruments and capabilities are only our expectations of what will be offered in semester 2009B. Please watch the NGSC Web page (*www.noao.edu/usgp*) for the Gemini Call for Proposals, which will list clearly and in detail the instruments and capabilities that will be offered.

NGSC anticipates the following instruments and modes on Gemini telescopes in 2009B:

Gemini North:

- Near-Infrared Integral-Field Spectrograph (NIFS).
- Near-Infrared Imager (NIRI) and spectrograph with both imaging and grism spectroscopy modes.
- Altair adaptive optics (AO) system in natural guide star (NGS) mode, as well as in laser guide star (LGS) mode. Altair can be used with NIRI imaging and spectroscopy and with NIFS integral field unit (IFU) imaging and spectroscopy, as well as NIFS IFU spectral coronagraphy.
- Michelle, mid-infrared (7–26 microns) imager and spectrometer, which includes an imaging polarimetry mode.
- Gemini Multi-Object Spectrograph (GMOS-North) and imager. Science modes are multi-object spectroscopy (MOS), long-slit spectroscopy, and IFU spectroscopy and imaging. Nod-and-shuffle mode is also available.
- All of the above instruments and modes are offered for both queue and classical observing, except for LGS which is available as queue only. **It is important to note that classical runs are now offered to programs that are one night or longer, and consist of integer nights.** The offer of one-night classical runs opens up the possibility of many more Gemini programs being eligible for classical observing, if the program principal investigator (PI) wants to use this mode.
- Details on use of the laser guide star (LGS) system can be found at *www.gemini.edu/sciops/ObsProcess/ObsProcIndex.html*, but a few points are emphasized here. Target elevations must be >40 degrees and proposers must request good weather conditions (Cloud Cover = 50%, or better, and Image Quality = 70%, or better, in the parlance of Gemini observing conditions). Proposals should specify "Laser guide star" in the Resources section of the Observing Proposal. Because of the need for good weather, LGS programs must be ranked in Bands 1 or 2 to be scheduled on the telescope.
- Time trades will allow community access to the high-resolution echelle spectrograph, HIRES, on Keck, as well as to the Suprime-Cam wide-field imager and the infrared imager and spectrograph (MOIRCS) on Subaru.
- Gemini Near-Infrared Spectrograph (GNIRS). The repair and refurbishment of GNIRS continues in Hilo, and it is planned that sometime during 2009B the spectrograph will be deployed on Gemini North to undergo commissioning on this telescope. It will not be available as a general-user instrument in the 2009B Call for Proposals; however, its commissioning on Gemini North may affect the telescope schedule.

Gemini South:

- Thermal-Region Camera Spectrograph (T-ReCS) mid-infrared (2–26 microns) imager and spectrograph.
- Gemini Multi-Object Spectrograph (GMOS-South) and imager. Science modes are multi-object spectroscopy (MOS), long-slit spectroscopy, and IFU spectroscopy and imaging. Nod-and-shuffle mode is also available.
- Phoenix, the NOAO high-resolution infrared spectrograph (1–5 microns), is expected to be available during 2009B.
- Near-Infrared Coronagraphic Imager (NICI). With the continuing NICI Science Campaign taking place during this semester, NICI is available for general-user proposals.
- All modes for GMOS-South, T-ReCS, Phoenix, and NICI are offered for both queue and classical observing. **As with Gemini North, classical runs are now offered to programs with a length of at least one or more integer nights.**

Detailed information on all of the above instruments and their respective capabilities is available at: *www.gemini.edu/sciops/instruments/instrumentIndex.html*.

The percentage of telescope time devoted to science program observations in 2009B is expected to be greater than 85 percent at Gemini North and greater than 75 percent at Gemini South.

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Classical and Queue Observing Opportunities with Gemini continued

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

Note that queue-proposers have the option to fill in a so-called "Band 3" box, in which they can optimize their program execution if it is scheduled on the telescope in Band 3. Historically, it has been found that somewhat smaller than average queue programs have a higher probability of completion if they are in Band 3, as well as if they use weather conditions that are more likely to occur. Users might want to think about this option when they prepare their proposals.

Efficient operation of the Gemini queue requires that it be populated with programs that can effectively use the full range of observing conditions. Gemini proposers and users have become increasingly experienced at specifying the conditions required to carry out their observations using the online Gemini Integration Time Calculators for each instrument. NGSC reminds you that a program has a higher probability of being awarded time and of being executed if ideal observing conditions are not requested. The two conditions that are in greatest demand are excellent image quality and no cloud cover. We understand the natural high demand for these excellent conditions, but wish to remind proposers that programs that make use of less than ideal conditions are also needed for the queue.

There is continuing need for proposals that can be run under the poorest conditions. To help fully populate the queue, a Poor Weather category for proposals has been established. Poor weather programs may be submitted for any facility instrument; for these proposals, neither the PI nor the partner country will be charged for any time used. For additional information, see the link at: *www.gemini.edu/sciops/ObsProcess/ObsProcCfP_background.html*.

NOAO accepts Gemini proposals via either the standard NOAO Web proposal form or the Gemini PIT software. We note to proposers who plan to use the PIT that NOAO offers a tool that allows one to view how the PIT proposal will print out for the NOAO TAC (*www.noao.edu/noaoprop/help/pit.html*).

Feel free to contact me (*vsmith@noao.edu*) if you have any questions about proposing for US Gemini observing time.

Understanding Observing Constraints at Gemini

Tom Matheson

One of the advantages of queue scheduling at Gemini is that principal investigators (PIs) can specify the observing conditions under which their observations will be obtained, be it excellent seeing, the darkest skies, or the driest atmosphere. The time for the best conditions fills up rapidly. Programs that can take advantage of less-than-ideal conditions are likely to obtain data. Programs in Band 3 typically need to relax their observing constraints. Understanding the nature of the constraints is crucial to planning a successful program.

Gemini has four observing constraints under the control of the PI during the proposal process: image quality (IQ), cloud cover (CC), water vapor (WV), and sky background (SB). Some of these constraints are correlated, so not all combinations are possible. In addition, some constraints are not relevant for certain wavelength regimes. The percentiles used to define the range of conditions within each constraint are based on long-term records at each site (or extrapolations from other sites in Chile, in the case of Gemini South). Revisions to these distributions may be made as a result of observations made by Gemini itself. For complete details, please see the Gemini Web page concerning observation constraints. All the tables in this article are derived from that Web page (*www.gemini.edu/node/10781*).

Image quality is mainly a reflection of atmospheric seeing, but includes other factors such as wind shake. Table 1 lists the values in each IQ bin for various wavelength regimes when using the wavefront sensor typically operated for that regime (see the complete table on the Gemini Web site: *www.gemini.edu/node/10781#ImageQuality*). The numbers in the table are the 50% encircled energy diameter in arcseconds (this corresponds to full width at half maximum [FWHM] for a Gaussian profile). For the IQ ANY bin, the values represent typical measurements during poor conditions, but selection of ANY means that any level of image quality is acceptable, including worse than the numbers in the table. Note that the values in the table are for observations at zenith. If a target is observed at a larger airmass, delivered IQ may be lower. The IQ is usually determined from acquisition images.

Table 1: FWHM as a function of image quality and wavelength

Wavelength	IQ = 20	IQ = 70	IQ = 85	IQ = ANY
V (0.5μ)	0.45	0.80	1.10	1.90
I (0.9μ)	0.45	0.80	1.10	1.70
J (1.2μ)	0.40	0.60	0.85	1.55
K (2.2μ)	0.35	0.55	0.80	1.40
L (3.4μ)	0.35	0.50	0.75	1.25
N (11.7μ)	0.31–0.34	0.37	0.45	0.75
Q (18.3μ)	0.49–0.54	0.49–0.54	0.49–0.54	0.85

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Understanding Observing Constraints at Gemini continued

Cloud cover is an estimate of the sky transparency. The values in table 2 represent the extinction in magnitudes for each CC bin. This is an average; patchy clouds could result in higher extinctions for some observations. Evaluation on any given night is more subjective, being based on the estimate of the observer at the telescope. For wavelength regimes above 3 microns (μ), observing is not possible for CC 90 and greater. For observations below 3 μ, CC ANY is possible, but unlikely to produce useful results. Note that even at CC 50, careful use of standard stars is still recommended for photometric accuracy when observing in the mid-infrared (IR) range (8–25 μ).

Table 2: Extinction in magnitudes as a function of cloud cover

Wavelength	CC = 50	CC = 70	CC = 90	CC = ANY
0.4–2.5μ	0	0.3	2	3+
3–25μ	0	0.3	NA	NA

Water vapor is a measure of the precipitable water column. At Gemini North, this is determined from the Caltech Sub-millimeter Observatory 220 gigaHertz optical depth; at Gemini South, it is estimated from the sky background in T-ReCS *N*- and *Q*-band images. Table 3a lists values for the precipitable water for Gemini North; table 3b has similar data for Gemini South. For optical observations, water vapor is not a major concern, so WV should be ANY. In the near- and mid-IR, the effects of water vapor are strongly dependent on wavelength. Please see the model spectra on the Gemini Web site for details: *www.gemini.edu/node/10781?q=node/10789*.

Table 3a: Precipitable water as a function of water vapor at Gemini North

Wavelength	WV = 20	WV = 50	WV = 80	WV = ANY
0.4–1.0μ	NA	NA	NA	NA
1.0–2.5μ	1.0mm	>1.0mm	>1.0mm	>1.0mm
3–25μ	1.0mm	1.6mm	3.0mm	>3.0mm

Table 3b: Precipitable water as a function of water vapor at Gemini South

Wavelength	WV = 20	WV = 50	WV = 80	WV = ANY
0.4–1.0μ	NA	NA	NA	NA
1.0–2.5μ	2.3mm	>2.3mm	>2.3mm	>2.3mm
3–25μ	2.3mm	4.3mm	7.6mm	>7.6mm

The sky background is an indicator of the brightness of the night sky. At optical wavelengths, this is dominated by moonlight, but there are other factors. Table 4 lists the *V*-band magnitude per square arcsecond (μ_V) for each SB constraint. Note that the sky color also changes with the degree of illumination. For the near-IR, the background is mainly OH emission, with some thermal emission at longer wavelengths (*K*-band). Typical brightnesses in magnitudes per square arcsecond of the night sky in near-IR bands are 16.0 in *J*, 13.9 in *H*, and 13.5 in *K*. At longer IR wavelengths, the WV and CC constraints dominate the background. In practice, the SB constraint for all IR observations (>1.0 μ) should be ANY. As with IQ, these values for SB are determined at zenith. Brighter backgrounds may occur at larger airmass.

Table 4: *V*-band magnitude per square arcsecond as a function of sky background

Wavelength	SB = 20	SB = 50	SB = 80	SB = ANY
0.4–1.0μ	$\mu_V > 21.3$	$\mu_V > 20.7$	$\mu_V > 19.5$	$\mu_V > 18.0$
1.0–25μ	NA	NA	NA	NA

An additional observing constraint is the elevation of the telescope. This restriction is not allowed during the proposal (Phase I) process, but can be implemented in Phase II. The Observing Conditions section of the Phase II contains a pull-down menu for elevation constraints, either by hour angle or airmass. Hour angle constraints can also help for observing near the parallactic angle. Use of this constraint requires the approval of the head of science operations of the appropriate telescope. Instructions are on the Gemini observing constraints Web page (*www.gemini.edu/node/10781*).

If you have further questions, please consult the Gemini Web pages or contact NGSC directly. NL

Classical Observing at Cerro Pachón

Ken Hinkle

Gemini programs requiring one or more integer nights of telescope time can be either classically or queue scheduled. While many Gemini observers prefer queue, observers can reap a number of benefits by being at the telescope. For instance, the observer can make real-time decisions and implement optimizing strategies. Being at the telescope allows observers insight into the operation of the instrument. This results in more efficient observing and optimal reduction techniques. Many observers also note a sense of ownership and responsibility for the data that results from doing their own observing.

Recently I was at Cerro Pachón as a co-investigator on a Phoenix run. The run took place in the Chilean summer. The short nights were countered by nearly perfect observing conditions. As has now become commonplace, the Gemini South telescope performed flawlessly. The delivered image quality each night was better than 0.4 arcseconds.

While the telescope and instrument performed very much as for my run a year before, there were noteworthy operational changes. Observers now stay at Cerro Pachón. There is a new dormitory located about a mile drive from the summit (photo). If you are familiar with the summit, the new dormitory is located next to the 20-units building. However, the dining room remains near the summit. Cars are provided for the observers to drive between the dining room, dormitory, and telescope. The new dormitory at Cerro Pachón is a significant improvement in observer convenience and safety. Previously, observers stayed at Cerro Tololo, which is a nearly 30-minute drive away.

The new dormitory for Gemini users at Cerro Pachón.

Another change is the shuttle (carryall) service between La Serena and Cerro Pachón. At the time of my visit, there was a shuttle three times a day. Observers should consult the Gemini Web site for details (see Instructions for Gemini South Visitors at *www.gemini.edu/sciops/observing-with-gemini?q=node/10993*).

Helpful Hint: Gemini HelpDesk

The Gemini HelpDesk provides a pull-down menu with various topics to direct your question to the proper people. This ensures a faster and better response to your inquiry. A misdirected question can result in delays. One of the more common misdirections is to select an instrument as the topic when actually the problem is related to the data reduction software. If your question involves IRAF or Gemini IRAF (such as installation problems or some failure to run), then choose those topics rather than the instrument used to obtain your data.

NICI–AO Imaging Capability at Gemini South

Ken Hinkle

NGSC expects that the Near-Infrared Coronagraphic Imager (NICI) will be offered at Gemini South in 2009B. NICI is an adaptive optics (AO) dual-channel camera with a coronagraph that is optimized to search for and image large Jovian-type planets around nearby stars. NICI can also be used without the coronagraph as a natural guide star AO imager. The detector is a 1024 × 1024 ALADDIN InSb array with 18 mas/pixel yielding a field of view of 18 × 18 arcseconds. A variety of broadband and narrowband filters are available including J, H, K, and Ks. The field of view and pixel scale are similar to those of the Hokupa'a/QUIRK system used at Gemini North until 2003. AO imaging is a new feature at Gemini South.

Joint Subaru/Gemini Science Conference in May 2009

Katia Cunha

The Subaru and Gemini Observatories will jointly host a science meeting in Kyoto, Japan, from 18–21 May 2009. The main goals of the meeting are to promote a mutual understanding of the Gemini and Subaru communities as well as to highlight the international nature of modern astronomy. Registration is now open, and a preliminary program for the meeting is available at: *www.kusastro.kyoto-u.ac.jp/kyoto2009/schedule.html*. The deadlines are 31 March 2009 for early registration and 24 April 2009 for late registration. A Gemini Users Meeting will be held on May 22 at the same venue.

NGSC Instrumentation Program Update

Verne V. Smith & Mark Trueblood

This article gives a status update on Gemini instrumentation being developed under the oversight of the NGSC, with progress since the December 2008 *NOAO/NSO Newsletter*.

FLAMINGOS-2

The Florida Multi-Object Imaging Near-Infrared Grism Observational Spectrometer (FLAMINGOS-2) is a near-infrared multi-object spectrograph and imager for the Gemini South telescope. FLAMINGOS-2 will cover a 6.1-arcminute-diameter field at the standard Gemini f/16 focus in imaging mode, and will provide multi-object spectra over a 6.1 × 2-arcminute 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.

After the August 2008 Pre-ship Acceptance Test (AT), the University of Florida team worked long hours to prepare FLAMINGOS-2 for a second Pre-ship AT held in Gainesville, December 15–18. Changes since the first AT include applying labels to electrical connectors and dual-language warning placards to the instrument exterior, routing cables and hoses in a neat and orderly manner, and delivering required documentation electronically.

Many items not tested at the August 2008 AT were tested in December, with 41 items passing in this AT. As of this writing, some items are still pending resolution and analysis, while others have been deferred to the Final Acceptance Test on the telescope, or to Commissioning. Following the test, the Gemini Observatory produced a Punch List of items to be completed in a future test (probably in March 2009) before the instrument is shipped to Cerro Pachón.

The group of participants in the Flamingos-2 Pre-ship Acceptance Test includes Primary Investigator Steve Eikenberry and members of the University of Florida scientific and engineering staffs; Gemini Instrument Scientist Percy Gomez and members of the Gemini scientific and engineering staffs; and Chris Packham and Nancy Levenson, members of the Gemini Science Committee, who acted as observers. Photo by Mark Trueblood/NOAO/NGSC.