Report on a Classical Observing Run

Fred Walter (State University of New York at Stony Brook)

I decided to request classical observing time when I proposed for time on Gemini South last year. There were multiple reasons. I enjoy travelling to mountaintops. The solitude is refreshing; the night sky reminds me of why we do astronomy in the first place. A more practical reason is that I had never observed with GMOS, or on Gemini, and I find I learn the quirks of instruments better and faster in person, rather than remotely. Queue observations rarely afford one the opportunity to respond quickly to mistakes/miscalculations. Finally, as a member of the AURA Observatory Council, I had heard gripes from some members of the community about how poorly their queue observations had been executed. This was an opportunity to investigate the system, and see if things were as bad as some said.

My proposal was accepted and, as they say, the hard work then began.

Observing Run Preparations—and Problems
At the outset, I was dubious about the need for filling out the Phase II specifications. After all, this was a classical run, and I would be present at the telescope. I am used to running things manually. But it was required, so I plunged in. Filling out the Phase II forms required a steep learning curve. Tom Matheson (the US National Gemini Office contact for this program) was extremely helpful and patient with me throughout the process. [Ed. Note: NGSC provides Phase I and Phase II support for US classical programs. Support at the telescope is provided by Gemini.]

There are certainly areas where the process can be streamlined and simplified, but, by and large, the Phase II process worked well. Problem number one arose when I attempted to enter the program parameters in the Observing Tool. I intended to use the B1200 grating at 8000 Angstroms, a regime that had never been tested, much less used. The Observing Tool returned all sorts of warnings and cautions, which I ignored. Tom arranged for some advance calibration frames to be taken, and the system did indeed have some efficiency out there.

At this point, I needed to register with the Gemini Science Archive (GSA) in order to download the B1200 calibration data, which resulted in problem two. I waited and waited, but never received a confirmation that my account had been activated. Tom sent me the data directly. Upon inquiring about access to the GSA on my arrival in La Serena, I was informed that I did indeed have an account—I just was never notified.

The third problem also involved a failure to communicate. In this case, the Observing Tool complained about too many guide stars. But I could not find them. The default window on my MacBook was so small that the table of wave-front sensor targets on the “Target Environment” page did not show, and I had no idea that it was missing. It took a couple of days of back and forth to figure out what the problem was.

Problem four arose when I attempted to add an unrelated target, essentially a Target of Opportunity (ToO), to the program. Since this was a classical run, I naively assumed that I would be able to modify the run within reason. Any real observer knows that the great “discoveries” are often made in garbage time—in twilight or through clouds, when one can observe those interesting objects for which no TAC in its right mind would allocate time. My request to add two ToO targets, one of which would be observed in twilight, was denied.

The Observing Run
The run itself started on an inauspicious note. When I arrived at La Serena on Sunday, February 15, I was greeted by a building closed for fumigation (figure 1).

On Monday, February 16, the building was open. I discussed my program with Ruben Diaz (the Gemini contact scientist for this program), who had some good suggestions for working in the far red, where the night sky line background is large and the fringing is significant. I pled with Bernadette Rogers (Gemini South Head of Science Operations) for the ToO targets I wanted to observe, and she bumped my request up the chain of command. I later sat in on the daily afternoon telecon and got a good sense of how the Gemini operation worked.

The dorm on Cerro Pachón is new and very well designed. There was a herd of wild horses lingering outside the dorm (figure 2) on arrival, and they stayed for the two days I was there.

The observer needs to know that, unlike at Cerro Tololo, the dorm (figure 3) is located far from the restaurant (figure 4) and the telescopes. It is about a nice 1.5-mile run from the dorm to the summit.

Figure 1: Signs of things to come?

Figure 2: Horses on siesta, outside the Cerro Pachón dorm.

continued
Report on a Classical Observing Run continued

but, in general, you will need to coordinate with the telescope operator (the System Support Associate, or SSA) and the queue observer.

Once you are at the telescope and observing, the reason for investing all the effort in the Phase II specifications becomes apparent. The system is designed for queue operations. Efficiencies are made possible by having all the information needed to drive the telescope and instrument ready in advance. An advantage of this is that, as viewed by the observer, little critical thinking need be done at the telescope (at 3 am). Gemini is a ground-based telescope that thinks it is a spacecraft. It is high-tech, and when it works, it does so smoothly and almost autonomously. But it is complex—there are instrument failures—and it is located in a remote environment (the earthquake was one of the better ones I’ve experienced, and a 1.5-hour Internet failure showed why one should not rely completely on the Web).

You will be accompanied to the summit by the queue observer, whose job is to take over if conditions preclude the execution of your program. If you design your program with targets for marginal conditions, the queue observer is essentially superfluous. However, the queue observer will teach you how to operate the instrument and will help you maximize the efficiency of your observations.

Summary
I recommend that first-time observers take the trip to Mauna Kea or Cerro Pachón if practical. The experience gained from working together with the queue observer is clearly worthwhile. Being there affords one the ability to tweak the program as necessary to maximize the science. The scientific staff will appreciate it if you do—they are somewhat isolated and like to keep in contact with the outside world.

The entire staff acted professionally during my few days on Cerro Pachón and in La Serena. I thank T. Matheson (NOAO/NGSC) and R. Diaz (Gemini) for help with the preparations, B. Rogers and J.-R. Roy (Gemini) for eventually approving my observing plans, and E. Wenderoth and G. Gimeno (Gemini) for their assistance at the summit.

Postscript
In the end, my pleas did not fall on deaf ears—I was able to observe my ToOs, though it took the dispensation of the Deputy Director of Gemini and the formal awarding of a Director’s Discretionary program ID number. The data from that observation, of the radial velocity variations of the H-alpha line of the inactive polar EF Eridani (figure 5), are simply spectacular.

This image is made from seventy-one 60-second integrations covering just over one orbital period. My goal is to determine the source of the H-alpha emission.

Figure 3: The Cerro Pachón dorm, as seen from the road to the summit.

Figure 4: The restaurant at the “top of the Universe.”

Figure 5: The trailed H-alpha spectrum of EF Eri in the low state (R ~ 18.5).
Visiting Gemini North: Graduate Students’ Perspectives

Ross Fadely (Rutgers U.), Angela Speck, Daniel Caputo (U. Missouri) & Kenneth Hinkle (NGSC)

NOAO has historically encouraged the use of Kitt Peak National Observatory and Cerro Tololo Inter-American Observatory by thesis students. The NOAO Gemini Science Center is continuing this policy by advocating graduate student visits to the Gemini facilities. Here are reports from two graduate students. First, Ross Fadely (Rutgers University) reports on visiting Gemini North. Mr. Fadely’s thesis project “A Gemini Search for Dark Matter Substructure” was granted queue time. He reports:

In December 2008, I flew to Hilo and started my visit at the Hilo Base Facility. I attended the daily (sometimes more frequent) meetings and quickly gained an appreciation for the hard work and sacrifices that contribute to each night’s science. Planning at the 4 pm meeting includes scenarios for all possible weather conditions, correcting any faults that happened from previous nights, and even discussing the future of the telescope. After witnessing the demanding efforts required to run the observatory, I was convinced that the Gemini scientific staff must not have any time for research. Much to my surprise, the case was quite the opposite. Visiting with the scientists, I discovered that almost everyone there is able to keep up their research, a fact that was highlighted by scientific talks during my visit.

The days leading up to my time at the summit were ominous. Just a few days before, a large snowstorm hit the top of Mauna Kea. In addition, cirrus clouds had been plaguing observations the whole week prior. However, as the night of my visit approached, the weather changed and there were four photometric nights out of five. Time at the telescope was the most exciting of the visit. On a given night we would take up to six different types of observations—coronographic imaging of exoplanets, Near Infrared (NIR) Integral Field Unit (IFU) observations of compact galaxies, multi-object spectroscopy,… Being exposed to such a diversity of observations, I gained a deep appreciation for the difficulty of running such a wide array of instruments. However, the high point of my visit was being present when the last of my 2008B data, NIR observations of four gravitational lenses, were observed.

A more traditional scenario is for a student and advisor to observe together. Here is a report submitted by Angela Speck (University of Missouri) concerning a classical observing run carried out at Gemini North with her graduate student Dan Caputo. Mr. Caputo’s thesis observations are entitled “NIRI/Altair Imaging of PAH bands around carbon stars: determining the formation and processing mechanisms of organic molecules.”

This February, astronomers from the University of Missouri had the opportunity to use the Gemini North telescope for two nights of classical observing. Professor Angela Speck and her graduate student Dan Caputo were set to use NIRI in order to image PAH emission around carbon-rich stars. For Dan, this was his first time at a major telescope; his reaction: “Whoa, it’s huge!” Upon seeing the scale of the dome, all Dan could think of was the Death Star; when told it could also fire a huge laser, the imagery and thoughts of total galactic domination were solidified. It was an inspiring experience to see the result of so many minds working together for the sake of understanding the Universe.

From a graduate student’s perspective, being on top of Mauna Kea when collecting the data, rather than just downloading it, gives a real sense of ownership and pride. And seeing how everything works at the time of observation made all the struggles of the Phase II process make sense. Moreover, working with the Gemini staff directly and benefiting from their expertise in person, made the experience all the more rewarding. The mountain staff was extremely proficient and helpful, and when a technical issue arose, it was dealt with quickly. Seeing how the telescope is operated was a very good experience, particularly for Dan. For a graduate student to have experience using a world-class facility, and through the process, learning to understand the detail that is needed to make good observations and to recognize limitations in the data was incredibly edifying. We highly recommend classical observing at Gemini as an awe-inspiring, educational experience.

From the viewpoint of NOAO, we remind everyone that Gemini is a versatile facility that can be used for either queue or classical observing in both Northern and Southern Hemispheres. NOAO especially encourages graduate students and first-time Gemini users to propose for classical observing if it is appropriate for their observing program. For additional information, see: www.noao.edu/noao/noaonews/jun08/pdf/94ngsc.pdf and www.noao.edu/noaoprop/help/policies.html#grads.
The recently released Access to Large Telescopes for Astronomical Instruction and Research (ALTAIR) committee report (www.noao.edu/system/altair/files/ALTAIR_Report_Final.pdf) addressed issues related to US community open-access time on large telescopes having apertures in the range of 6.5 to 10 meters. This time includes Telescope System Instrument Program (TSIP) access to Keck I and II, the Magellan telescopes (Clay and Baade), the MMT, and past access to the Hobby-Eberly Telescope. In addition, the US community has approximately 40% of the observing time on the Gemini North and Gemini South telescopes, which results from the NSF-funded US partnership in the international Gemini Observatory. Two of several recommendations from the ALTAIR report involve both TSIP and US participation in Gemini: 1) increase the TSIP program, and 2) acquire a larger share of the Gemini telescope time provided the instrument suite can be evolved to be more in line with what US astronomers desire. Currently, Gemini access provides the lion’s share of open-access large telescope time, accounting for about 200 nights per year in total on the two Gemini telescopes. In order to increase community awareness of what instruments Gemini has offered and to foster discussion over the coming months on possible future instrument capabilities for Gemini, this article presents and discusses historical time and instrument demand on both of the Gemini telescopes, as well as an eye towards future capabilities.

US Demand on the Gemini Telescopes

One straightforward and rather simple metric for a telescope is how heavily requested is the observing time. For the case of US Gemini requests, the oversubscription rates for the two Gemini telescopes for semesters 2004B through 2009B are plotted in figure 1. The oversubscription is defined simply as the ratio of the number of nights requested divided by the number of nights scheduled. The evolution of the oversubscription rate is, in general, similar for the two telescopes past 2005B, with an overall decline in the demand with time: the oversubscription rates stay roughly constant until 2007B and then decline through 2008B. Within the last year, the oversubscription factor on the two telescopes seems to have begun to rebound.

There are a number of issues that have affected the gradual decline in US requested time on Gemini. One point to note is that the average length of proposals has evolved towards smaller time requests, such that the total number of proposals received has not declined to the same extent as the requested time (but the total number of proposals has decreased). The loss of GNIRS on Gemini South significantly affected the US demand on that telescope, as will be discussed in the next section.

US Usage of Instruments

In beginning to plan for future instrument capabilities for the Gemini telescopes into the next decade, it is instructive to view how the US community has used the telescopes, that is, what instruments have been the most heavily used. The breakdown of US awarded nights continued
US Community Usage of the Gemini Telescopes continued

per instrument since 2004B for Gemini North and Gemini South is shown in figures 2 and 3, respectively. Although these are awarded nights, it should be noted that statistics tracking the fraction of submitted proposals that are awarded time are nearly constant for the different instruments, thus the number of awarded nights closely maps the number of requested nights for that instrument.

There are a few points to take away for the instrument breakdown for Gemini North:

1. In general, GMOS-North is the instrument with the largest number of nights on Gemini North. It has been consistently the most heavily scheduled instrument since 2006B, and it continues its popularity through 2009A.

2. NIRI is a strong second and in some semesters (2005A, 2006A, and 2008B) it has more nights scheduled than GMOS-North. It went through its lowest number of scheduled nights, however, in 2006B when TEXES, a very popular instrument with the US community, was a visiting instrument on Gemini North.

3. Time trades of up to five nights with each of the Subaru and Keck telescopes account for the time scheduled for SuprimeCam, MOIRCS, and HIRES. These time trades have been small, so the Gemini scheduled time has been necessarily small, although the HIRES time in particular has been heavily requested by the US community.

In the case of Gemini South, the following points are highlighted:

1. GNIRS, while in operation on Gemini South (until the accident which removed it from service in 2007A), was a very popular instrument with the US users, having a consistently large demand throughout the entire period between 2004B and 2007A. Phoenix was second to GNIRS in number of scheduled nights until 2007A.

2. Beginning in 2007B and continuing on, GMOS-South filled in some of the demand left by GNIRS, but Phoenix continued to be a popular instrument with more nights scheduled than GMOS-South in 2008A and 2009A.

3. T-ReCS saw more nights scheduled after 2008A with the loss of GNIRS. T-ReCS seems to have built a solid base of US mid-infrared (IR) users.

Near-Term Future Gemini Capabilities

With the historical usage of the Gemini telescopes discussed above, it is now worth highlighting the near-term new capabilities that will be arriving at Gemini during the remainder of calendar year 2009 and into 2010. Based on the historical trends presented in this article, it is expected that all of the near-term new capabilities will represent important new observing modes that will be of interest to US observers. The upcoming changes are:

- A repaired and refurbished GNIRS commissioned and deployed on Gemini North. GNIRS was the most requested instrument by US users when on Gemini South, and it is expected that it will be requested and used heavily on Gemini North. As this article is written, GNIRS is undergoing assembly and checkout at Gemini in Hilo, Hawai`i.

- Upgraded CCDs for GMOS on Gemini North. This upgrade for GMOS-North will result in detectors with significantly increased red sensitivity. GMOS represents one of the versatile "workhorse" instruments that the community counts on for routine optical imaging, along with single-slit, multi-object, and integral field unit spectroscopy, so increased sensitivity will revitalize its usage. The installation of new CCDs in GMOS-North will occur during semester 2009B.

- Delivery and commissioning of FLAMINGOS-2 on Gemini South. FLAMINGOS-2 will provide near-IR imaging and multi-object spectroscopy and is currently in the midst of final acceptance testing at the University of Florida (for an update, see the article in this section).

On a somewhat longer timescale (late 2010 and into 2011), a multi-conjugate adaptive optics (MCAO) system will be commissioned and made available for user use on Gemini South. The MCAO system will be used to feed both FLAMINGOS-2 and a high-spatial resolution imager, Gemini South Adaptive Optics Imager. Thus, if most of the above-mentioned capabilities proceed to telescope deployment as planned, the time period from early 2010 to the end of 2010 will see significantly enhanced observing opportunities for the Gemini community.

2012 and Beyond

Even as the Gemini Observatory continues to work on additional future instruments, such as the Gemini Planet Imager, this year will see the beginnings of community discussion on what should be included in the next round of instruments to build and deploy on Gemini in the years beyond 2012. NOAO is in the midst of planning for this discussion later in 2009, with these ideas to be presented for consideration at an NOAO Town Hall meeting during the January 2010 AAS meeting, which will be held in Washington, DC. We urge all of you to monitor the NOAO Web pages for the most recent announcements and updates, as well as to check the NOAO electronic newsletter, Currents, for articles concerning the next set of instruments for Gemini.
Band 3 Helpful Hint

Tom Matheson & Ken Hinkle

Band 3 Gemini programs are used to fill up the queue schedule. Hence, every semester, some Band 3 programs will not be observed or not be completed. Here are some strategies that will improve the chances for the success of a Band 3 program.

• Keep the program short. The more time a program needs, the less likely it is to be started. Gemini would prefer to complete programs rather than leave programs partly completed.

• Choose inferior observing conditions. Programs are scheduled to match weather statistics. The available time when seeing is good, skies are clear, and water-vapor content is low is scheduled for programs in Bands 1 and 2. If a program can take advantage of poor conditions when no other programs can be observed, then it has a greater chance of success.

• Be realistic about the observing conditions. The project must still be feasible. Setting all observing constraints to ANY typically is not realistic and will be flagged during the technical review.

Gemini’s Poor Weather Queue

Susan Ridgway

“Ill blows the wind that profits nobody.” – Henry VI, Part 3, Act 2, Scene 5

Variable weather conditions on Cerro Pachón and Mauna Kea create a great opportunity for observers who have targets that can be observed in queue mode under much poorer than average conditions. The Gemini North and Gemini South queues are often underfilled with conventional Band 1, 2, or 3 program targets for very poor but usable conditions. To supplement these, Gemini accepts proposals for a special “poor weather” (PW) queue at any time (not necessarily linked to the semester timings of the standard proposal process). These proposals must be submitted using the Gemini Phase I Tool (PIT), as they go directly to Gemini, not to any national Time Allocation Committee (TAC). If approved, these poor weather program targets (termed “Band 4”) will ONLY be observed when no Band 1, 2, or 3 targets can be done. Also, programs can make it into the PW queue through the national TAC process. If a program is not granted Band 1, 2, or 3 status but has appropriate targets for Band 4, the national TAC can choose to send these on to Gemini as poor weather targets.

What observing constraints qualify a program for the PW queue?

• If you can use very poor seeing, non-photometric weather (and do not need low water vapor): i.e., Image Quality (IQ) = “Any;” Cloud Cover (CC) = 70%, 90% or “Any;” and WV = “Any.” (Any phase of the moon is okay: i.e., SB can be 20%, 50%, 80%, or “Any.”)

  or

• If you can use very cloudy conditions (and do not need low water vapor): i.e., CC = 90% or “Any,” and WV = “Any.” (Any phase of the moon and any seeing conditions are okay—IQ can be 20%, 70%, 85%, or “Any.”)

Thus, mid-infrared observations or any program needing photometric conditions are inappropriate for Band 4. However, programs that can tolerate either very poor seeing or very cloudy conditions can benefit from the existence of the PW queue.

To submit a poor weather proposal using the PIT, at the “submit” step, select “Poor Weather” from the list of partner countries. Poor weather time is not counted against any partner’s time allotment. Enter the total time requested and then click “submit proposal” to send it off. These proposals are reviewed by Gemini, not the national TACs.

If your proposal is approved, it will go through the Phase II process required for all queue proposals; you will be assigned a National Gemini Office contact and a Gemini contact who will help you prepare your observations to be ready to enter the queue. Poor weather programs will be assigned a program ID for the semester in which they were submitted, and the targets will stay in the queue for the remainder of that semester. If targets from the proposal fill a necessary gap in the queue planning process, they can be retained over the semester boundary as arranged during the Phase I process and at the discretion of the Heads of Science Operations.

Some hints for getting the best out of the PW queue system:

The PW queue does fill up. Particularly if applying later into the semester, it is probably advisable to check the Gemini home page for “Science Operations Announcements” about openings in the PW queue or, if no information is available, to email the Heads of Science Operations about whether poor weather targets are needed at that time (and at what right ascensions the queue is least filled).

The ability to be scheduled is a key to getting poor weather targets observed—target observations with many timing constraints, for example, probably would not fare well. There are also no “completion” goals for poor weather programs—it is important to be sure you can get science out of any data taken without a guarantee of any percentage of your target list.

continued
Gemini’s Poor Weather Queue continued

Gemini scientists experienced with poor weather proposals say that careful preparation of your Phase II, as well as keeping an eye on the progress of the program, can be a key to getting good science. As poor weather conditions are so much more variable than good weather conditions, consultation with your contact scientists about how to prepare your Phase II program with the most flexibility is even more important than for good weather programs. As an example, you might provide the observers with several alternate observations for the same target, depending on the exact CC conditions: e.g., for CC = 70%, integrate so long and use this guide star, but for CC = 90%, integrate longer and use this alternate guide star. The wave-front sensor star must be bright enough to be observed under poor weather conditions.

In summary, if you have targets that would be observable under the poor conditions outlined above, and are willing to put in a little more effort at the Phase II point to enable the best science results, the poor weather queue can be an excellent way to collect observations and help Gemini use all available time. See the following Web page for details of the proposal submission process: www.gemini.edu/sciops/observing-with-gemini-new/observing-modes/poor-weather.

AAS Meeting in Long Beach, January 2009

Ken Hinkle & the NGSC Staff

The scheduling of the winter American Astronomical Society (AAS) meeting coincides with the Gemini proposal Phase II deadline. This allows NGSC to meet with anyone granted US Gemini time to help with Phase II preparation. Many problems can be resolved quickly in person. The AAS also gives us a chance to meet you and talk about Gemini. We encourage you to travel to Washington, D.C., next January for the winter AAS. The entire NGSC staff was present at the Long Beach meeting and we plan on being in Washington in 2010.
NGSC Instrumentation Program Update

Verne Smith & Mark Trueblood

This article gives a status update on Gemini instrumentation being developed under the oversight of the NGSC, with progress since the March 2009 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-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.

Considerable progress was made at the second Pre-ship Acceptance Test (AT) held in Gainesville, Florida, 15–18 December 2008. At the end of that test, approximately three-quarters of the requirements had been successfully tested and passed. However, several test items remained at the conclusion of that week of testing, due primarily to mechanical misalignments and other issues.

Since then, the University of Florida FLAMINGOS-2 Team has been hard at work improving the performance and reliability of mechanisms and testing the instrument to ensure that it will pass its remaining acceptance tests.

As a result, a third AT is scheduled (as of this writing) for 5–8 May 2009. Assuming the remaining test items are completed, the instrument will be partially disassembled (e.g., electronics cabinets and the Dewars removed from the mounting frame), major subsystems placed into large shipping containers, and the instrument shipped to Cerro Pachón in Chile. Arrival is expected in June. This will be followed by a period of reassembly and checkout in the Gemini instrument lab accompanied by training of Gemini instrumentation personnel by the University of Florida FLAMINGOS-2 Team. After checkout in the instrument lab, the instrument will be mounted on the Gemini Instrument Support Structure and Final Acceptance Testing will proceed.