

NOAO Users Committee
2007 Report
22 December 2007

The Users Committee (UC) of the National Optical Astronomy Observatory (NOAO) held its annual meeting at NOAO in Tucson on 9 and 10 October, 2007. We summarize the committee's charge, as given by NOAO:

1. Comment on the planned infrastructure improvements and modernization of KPNO and CTIO and on their capabilities, in the context of the US telescope system;
2. Comment on plans for defining the capabilities the US community requires, including ReSTAR;
3. Review and comment on the "community needs" requirements for DECcam;
4. Comment on the planned process for soliciting community input on LSST and contribute ideas to ensure substantial community involvement and return;
5. Comment on plans for engaging the community in the development of GSMT; and
6. Comment on the plans for strengthening the connection of the NOAO program with the community.

Committee members present were James Lowenthal (Chair), Ian Dell'Antonio, Eric Gawiser, Stacy McGaugh, Nathan Smith, Angela Speck, and Nicole Vogt. Absent (but participating via email and telecon) was Matthew Bershad.

In preparation for the meeting, UC members discussed the relevant NOAO issues and documents with optical astronomy colleagues at conferences, in home university departments, and by telephone via direct "cold calls" to NOAO users. During the two-day meeting, NOAO staff members gave the UC presentations on the status of and plans for Gemini, KPNO, CTIO, WIYN, the Dark Energy Collaboration, LSST, GSMT, NASA agreements, Building the System, and Engaging the Community.

The NSF Senior Review of NSF's Division of Astronomical Sciences facilities, including NOAO, was released on 3 November 2006. The ensuing year has seen many important discussions in the community, within NOAO, and with the NSF about the future of NOAO and US astronomy, and significant changes to NOAO's organizational structure, funding, and plans have already been implemented or are imminent. We recognize the huge amount of work NOAO staff has invested in planning and implementing those changes, and we especially appreciate the attention being paid to community input and engagement.

We are grateful to NOAO and Interim Director Todd Boroson for the opportunity to weigh in on these important issues affecting the future of NOAO, and for the assistance and information we were provided to help us make informed recommendations. The annual meeting continues to provide an important venue for us to provide that feedback and to learn from NOAO about the status and plans of the observatory. All the presentations from NOAO staff were useful and informative, and we felt our questions were answered thoughtfully and openly. There is always room for more discussion, in fact, and so we suggest that the trend begun this year towards shorter presentations be continued: the reports should de-emphasize the scientific issues and background, exciting though they are to us all, and focus more on the pressing issues to which the UC needs to respond. Our preferred model is that each presentation take only one-half the time allotted for the topic, with the other half reserved for discussion. The agenda should reflect that breakdown explicitly.

We recognize that several of our top recommendations would require additional funding from NSF, and we attempt to prioritize them in the final section.

Our report, structured loosely on the committee charge, follows below.

1 Capabilities and planned improvements at NOAO facilities in the context of the US Telescope System

1.1 The Telescope System and Community Access

The idea of developing and maintaining a system of public and private telescopes accessible to the US astronomy community is attractive and significant on many levels. On its own, NOAO has a remarkable versatility in both hemispheres, and the UC recognizes the need to present NOAO as more than the sum of all its parts. The committee endorses the perspective that a "system" view is essential to optimizing the scientific productivity of US astronomy infrastructure and the available pool of talent, and getting this message out to the community is an imperative. Defining clearly "the system" as NOAO sees it, and specifying if and how this differs from the NSF view, will help the community collaborate in the system's development.

The opportunity to purchase NASA's share of Keck should be grabbed with both hands. It provides the chance to make access to Keck truly part of the system, and demand is clearly strong within the NOAO user community. This is a compelling opportunity that should not be passed up.

Enabling student access to KPNO and CTIO facilities remains an important goal. In addition to the existing travel support for students with thesis proposals, we encourage NOAO to consider providing travel support to all student PI's and possibly Co-I's to facilitate training

of the next generation of observers and/or telescope support staff.

Development of summer workshops for students to be involved in service/queue observing should be considered. We envisage a system by which several (n=6-7) students visit an NOAO site (Kitt Peak, Mauna Kea, Chile) and work hands on to facilitate running the queue/service observing. The program could last several weeks and would again provide training of the next generation of observers and/or telescope support staff. In the age of service/queue mode observing, such a system view of training seems all the more important.

Ideally we would like to explore the possibility of moving towards the NASA model of funding, whereby successful proposers receive funds to defray the costs associated with observing and publishing results. As an extension of the student training funding from NOAO, should funds be available, all users would ideally have access to support for travel, page charges and/or data reduction costs. One possible model would have NOAO develop a mechanism by which users can send a funding request to the director. This request should not be seen by the TAC. The director could decide how to prioritize the allocation of funding based upon budget justifications from users, perhaps in a Phase II mode following proposal approval.

1.2 KPNO and CTIO

The committee was very encouraged to learn of NOAO's renewed commitment to repairing and maintaining existing facilities at KPNO and CTIO. This is a huge step to achieving the goal of a system that supports high-performance facilities with a broad range of apertures and instruments. The implementation of a preventative maintenance program along with the funds to support it is laudable.

The committee approves of the ongoing development of new observing modes at KPNO and CTIO. Supplementing classical observing with service and/or queue and possibly remote observing or eavesdropping mode can improve the utility and efficiency of existing and planned facilities and enhance access while cutting costs for the observatory and for users.

The main instrumentation need for the 4m telescopes remains state-of-the-art, modern workhorse spectroscopic capabilities, including wide-field multi-object capability. This has been a consistent complaint from the users at large for several years. WIYN+HYDRA and CTIO+HYDRA don't offer the needed throughput and performance. Even after the Bench Upgrade is complete, Hydra will need to be outfitted with new fibers, and the spectrograph will need to be completed with a suite of VPH gratings. The same should be done for CTIO+HYDRA. The committee is concerned that even once the Goodman spectrograph is available on SOAR the desired wide-field capability will still be lacking, and we would like to hear NOAO's opinion about a reasonable timescale for improving the spectroscopic capabilities at both KPNO and CTIO.

Two additional questions arose regarding the timing of the arrival of DECam at CTIO: (1) Does the arrival of DECam and NEWFIRM in the same semester cause problems? and (2) Can NEWFIRM's deployment to CTIO be altered if DECam arrives at that time?

The senior review has emphasized the need for more instruments on "small" telescopes, although there is a community perception that not enough time is available on small telescopes at CTIO; the increase in service/queue modes may help this. Publicity is needed to explain to the community what is available and how the availability of time is being maximized.

The need to upgrade the KPNO 2.1m and the potential purchase of the Calypso observatory need to be seen in the context of the whole system. To some extent, comments on these telescopes need to wait for the outcome of ReSTAR. If these telescopes can add capabilities to the system that are needed by the community, then we support efforts to maintain/acquire these facilities.

1.3 Gemini

Gemini is apparently doing well, and the changes made have improved scientific output. NGSC is to be commended for its efforts to balance commissioning work at the two sites. The move of GNIRS to the north is clearly popular. Since Flamingos2 is going to be available in the south this is probably an acceptable status quo, although the community should be asked whether the available spectral resolution is adequate. Phoenix should be kept available.

The Gemini telescopes are the most heavily over-subscribed of the NOAO suite, superseded only by the TSIP heavy-hitters Keck and Magellan. It is important to start talking about the Gemini agreement renewal process in order to bring the US end of Gemini back into the NOAO fold. This will increase community optimism about both Gemini and NOAO. If more of Gemini becomes available (e.g., we have recently learned that the UK plans to pull out of Gemini), the US should try to acquire it.

Gemini still suffers from a somewhat negative image in the community. We recognize the importance of overcoming that image, and recommend continued clear communication of Gemini's successes. The rates of science project completion and publication should be widely advertised. In addition, the graph we were shown demonstrating the lack of bias against mid-IR is very useful and could be posted on a Gemini FAQ or website.

Recommendation 1.1

The Users Committee applauds the efforts already underway to modernize KPNO and CTIO observing facilities and infrastructure, implement preventive maintenance programs, and explore new observing modes, and recommend that they continue full steam ahead.

Recommendation 1.2

We urge NOAO to pursue opportunities for increased access to Keck.

Recommendation 1.3

We recommend that NOAO maintain and preferably enhance support for student travel for observing runs, including if possible non-thesis projects.

Recommendation 1.4

We suggest that NOAO consider running a summer workshop for students to participate in queue/service observing.

Recommendation 1.5

We suggest that the observatory explore possibilities for funding data reduction in the manner of NASA space-based facilities.

Recommendation 1.6

We urge the observatory to place a very high priority on maintaining and enhancing workhorse spectroscopic capabilities for the 4-m telescopes, including wide-field multi-object spectroscopy.

Recommendation 1.7

The committee urges NOAO, as the major partner, to work during the upcoming agreement renewal to increase the role of NOAO in hosting and operating Gemini.

Recommendation 1.8

We recommend that NOAO continue to advertise to the community Gemini's successes, especially program completion rates and publication rates, as widely as possible.

Recommendation 1.9

We recommend that Phoenix be kept available on Gemini south and SOAR, as currently planned.

2 Plans for defining capabilities that the US community requires (including ReSTAR), and how to provide them

2.1 Process and Structure

The committee applauds NOAO's recommitment to seeking the input of the users community about their needs. In particular, we wholeheartedly endorse the ReSTAR process, especially the consideration of small telescopes separate from large. From the information presented to us, the capabilities identified to date through ReSTAR seem to be consistent with the general instrumentation the UC favors. We have already sent the ReSTAR committee specific suggestions regarding instrumentation priorities (see below).

We emphasize the importance of avoiding excessive redundancy and of developing a broad suite of capabilities in the whole telescope system as NOAO proceeds with long-term instrument plans. At the same time, we stress that individual telescope capabilities must be considered in tandem with the level of community access to that telescope; e.g., a few heavily oversubscribed nights' access to an instrument per semester on Keck does not qualify as satisfactory "access" to that capability needed by the community. Similar capabilities on smaller telescopes may also still be needed.

The UC recognizes TSIP as a promising early model for the larger telescope system. We believe significant improvements should include requiring high-level usable data products from all potential telescope partners and instruments; i.e, NOAO should set clear and explicit minimum data product standards for TSIP partners.

The CATCH website, which lists telescopes and instruments organized by their capability and therefore illustrates the system concept, is excellent and should be promoted more widely, perhaps as the single standard route towards NOAO observing proposal preparation.

We also recommend that NOAO enhance access to TSIP facilities by encouraging NOAO proposers to provide a prioritized list of desired time allocations on different facilities. For example, an observer may prefer 1 night with DEIMOS on Keck, but be able to achieve the stated scientific goals with 2 nights on Gemini/GMOS if Keck time is unavailable. We understand that proposers are not actively discouraged from such a request now, but the standard proposal form and attendant instructions could be rewritten to make the possibility much more obvious.

2.2 Suggested Priorities for Instrument Capabilities

We recognize that most of the recommendations below have probably all been suggested already. Nevertheless, for completeness we include here our thoughts on prioritizing NOAO instrument capabilities:

For Large (> 6 m) telescopes:

- AO imaging (NIR), AO IFU, and longslit spectroscopy
- MCAO wide-field imaging (NIR) and spectroscopy
- Wide-field (and medium-field) multi-object spectroscopy
- "High"-resolution spectroscopy for galaxies, $R = 10 - 30K$ (optical, NIR) —duplicate GNIRS

For Medium (2-6m) telescopes:

- We need to envision a wider-field NIR imager to conduct surveys in the LSST area, unless we wish to cede that science to ESO. NEWFIRM arrives as an already-outclassed imager: $30' \times 30'$ versus the square-degree FOV available at VISTA. UKIRT+WFCAM (i.e. the UKIDSS survey) is a square-degree FOV on a smaller telescope but has already done public data releases.
- DECam and LSST will provide wide-field broad-band imaging in the South, but not in the North; medium-aperture telescopes can supplement LSST there. ODI is great but will need upgrading as the LSST era approaches.
- We desperately need versatile workhorse spectrographs!
 - Aside from basic infrastructure/facility improvements, this is the TOP priority for the near future
 - Something like modes of GNIRS in the optical and IR is highly desirable; wide field MOS?
 - Echelle spectroscopy, longslit and cross-dispersed remains a strong user interest (basically replace/upgrade capabilities of 4m optical echelles)
- NIR high-resolution spectroscopy
- MIR cameras. Imaging/low-resolution spectroscopy, SEDs; relatively wide-field (2-3 arcmin) imaging of bright sources. T-ReCS and Michelle are in high demand, but an 8-m telescope is not always required for MIR science.

- Polarimetry
- Time domain science of dim objects in queue mode; can be single-object/narrow-FOV imaging and spectroscopy (UV, optical, NIR)
- 30% of DCT is potentially interesting to fill the need for wide field imaging and MOS spectroscopy. We'd like to hear more.

For Small (< 2 m) telescopes:

- time domain science of bright objects in queue mode including rapid response
- single-object/small-FOV imaging and spectroscopy (UV, optical, NIR)
- wide field optical imaging

Recommendation 2.1

The committee applauds NOAO's efforts to review and upgrade the telescope system's small- and medium-aperture capabilities via the ReSTAR process, and recommends that the community dialogue and resulting plan be acted upon with high priority.

Recommendation 2.2

We encourage NOAO to weigh the amount of access to TSIP facilities heavily as it seeks a balanced suite of capabilities.

Recommendation 2.3

We recommend that NOAO negotiate with TSIP partners to guarantee high-level data products from all TSIP facilities.

Recommendation 2.4

We recommend that the observing proposal forms and process be modified to facilitate requests for time on multiple prioritized facilities.

Recommendation 2.5

We recommend that CATCH be made an enhanced or even the default portal in the NOAO observing proposal process.

3 The Dark Energy Collaboration and DECam

The Dark Energy Collaboration will deliver a wide-field optical imager to the Blanco telescope in 2010, including a data-reduction pipeline to be integrated into NOAOs end-to-end data management system. In return, they will receive a substantial allocation of telescope time up to 525 nights over 5 years to carry out the Dark Energy Survey. During this time, and for at least 5 years following the completion of the survey, the camera will be available to all users of the Blanco telescope. NOAO has developed a set of community needs for the delivered system.

The Users Committee is pleased that very substantial progress has been made towards specifying the requirements in detail and a lot of thought has gone into the community needs that have to be met for DECam to be considered a full facility instrument. For instance, the requirements on the pipeline software now appear substantially more mature and the demarcation between the community needs pipeline and the DES pipeline is adequately made, although clearly there will be areas where the community will benefit from developments in the DES pipeline. The documentation details reasonable mechanisms for this transfer. The committee feels that at the pipeline level, no explicit changes are needed in the document, but that NOAO should be aware of the need to provide tools/training to allow for efficient community analysis of DECam data. Something like workshops on efficient use of DECam data should be planned.

The specifications of requirements for observational tools to make DECam observations viable appear complete, at least for the common observing modes that have been used with MOSAIC. There appear to be adequate provisions for the transfer of documentation and expertise on the operation of the camera to CTIO.

Plans for the commissioning phase of DECam are not complete, but they are progressing and appear to be adequate, provided they are included in an MOU.

Of the requirements listed in the versions of the requirements documents we were shown, the one that raised the most concern with the UC was the requirement on filter capabilities, particularly narrowband filters. The limitation on narrowband filter changes was troubling, as there are a variety of science cases that would doubtless use these during the (desirable!) DES season. Furthermore, the UC was concerned about encoding assurances into the document that narrowband filters would be supported and usable if they could be built and purchased. In addition, the UC was interested in the possibility of the option of grisms being designed to fit in the filter wheel mechanism.

Of the pipeline requirements, the one that the UC felt needed clarification is the photometric requirements. We felt that the difference in requirements for areas where accurate photometric catalogs (i.e. Sloan) exist and where reliance on USNO-B is necessary should be explicitly spelled out.

In addition, the UC recommends that the requirement that throughput be always higher than the MOSAIC throughput also consider the potential image quality degradation in the bluest bands caused by the lack of an ADC.

Recommendation 3.1

The committee encourages NOAO to provide tools and training to DECam users, e.g. through workshops.

Recommendation 3.2

We recommend that NOAO pursue grism capabilities for DECam and work to guarantee reasonable narrowband filter support (including during the DES observing season).

Recommendation 3.3

We recommend that the photometric pipeline requirements for DECam be clarified with regard to reliance on and relationship to pre-existing catalogs such as SDSS and USNO.

Recommendation 3.4

We suggest that the requirement for higher DECam throughput than MOSAIC be reconsidered in the bluest bands.

4 LSST

We support the call for community involvement in the LSST science collaborations that NOAO is planning in concert with SLAC. We suggest that NOAO publicize this call as broadly as possible, including a direct email to its user base as well as the planned placement of the call in the AAS and NOAO newsletters. This should also be advertised at the Winter AAS meeting. We also suggest that the expected repeated nature of this opportunity and a rough prediction of its frequency be stated clearly in the call for participation.

Continuing pressure should be put upon the LSST simulations team to make their cadence simulation program publicly available, perhaps through a web interface, so that interested users could investigate whether changes in cadence could influence the quality of their intended science. This is necessary in order for those users to decide if joining an LSST science collaboration (or starting a new one) is of interest to them and would allow them to submit a compelling application justifying the value of including them.

We are slightly concerned about the invitation for "competing collaborations" as the science collaborations do not appear to have settled on specific approaches at this time, so people with

fresh ideas may be better served by joining the existing teams. However, we appreciate the competitive push provided by reserving this possibility for future participation opportunities. Finally, we note that none of the webpages promised in the NOAO Newsletter "pre-call" is yet operational, although our query to lsstcollabqueries@noao.edu was responded to quickly and thoroughly.

Recommendation 4.1

The committee urges the observatory to broadcast the call for community involvement in LSST as widely as possible and to make clear the continuing nature of those opportunities.

Recommendation 4.2

We recommend that the proposed and/or simulated cadences for LSST observations be made publicly available.

5 GSMT

The Users Committee commends the efforts of NOAO to engage as much of the community as possible in the development of GSMT. NOAO can play a critical role in reassuring the community that the GSMT does not threaten access to extant telescopes. Active diplomacy is required to assuage this common misconception. NOAO must play the role of advocate for the community to mitigate the tendency for the community to degenerate into hostile camps of haves and have-nots.

Indeed, the UC strongly encourages NOAO to be an active participant in GSMT and not merely an advocate thereof. We understand the neutral role with respect to competing projects that the Senior Review compels NOAO to play, but do not believe this should be construed to mean a limited role or a hands-off policy. Active NOAO involvement at all stages of the GSMT's definition and development is essential to avoid disenfranchising substantial segments of the community - a bedrock principle of the Senior Review.

The community and the NSF need to be realistic about the number of GSMT's that can be built, instrumented, and operated. Is it two, one, or a fraction (i.e., partnering with the EU)? This has to be evaluated in the context of ALMA and future radio initiatives such as SKA, as well as future optical facilities (e.g., LSST). We are concerned that NSF is putting off this difficult decision, and in so doing we may waste precious time and resources - and likely more of our competitive edge with respect to ESO.

We believe that NOAO should study the proposed GSMT telescopes and their capabilities and, based on the study results, make recommendations to the NSF as to (a) which design

is likely more cost- and science-effective, or if some alternative design should be considered; and (b) what capabilities are highest priority to support.

We emphasize that NOAO and NSF must remain vital partners in the design and construction phase of the GSMT and its instruments. This is all the more true in light of the recent announcement (5 December 2007) of the commitment of \$200M to the TMT.

Recommendation 5.1

We strongly recommend that, together with the NSF and the community, NOAO play as active a leadership role as possible in defining GSMT requirements, deciding which GSMT projects move forward, and in developing the design and implementation of the chosen project(s).

Recommendation 5.2

The committee urges NOAO to work to correct the misperception in the community that development of GSMT is expected to come at the expense of smaller facilities such as those on KPNO and CTIO.

6 Connection to community

The UC believes strongly in the mission of NOAO and in the importance of engaging the community in planning the observatory's direction. We are committed to helping effect that engagement throughout the year in various ways and venues. We applaud NOAO on establishing an NOAO-wide Working Group on Engaging Community and expect to work closely with that WG.

6.1 What media are effective at communicating with the community?

We note that we have attempted to solicit user community input through all of the following modes, almost all with only very limited success:

- Random, unsolicited input, e.g. through NOAO webform
- Presence at AAS meeting
- NOAO Newsletter

However, we suspect that most NOAO users need multiple reminders of the existence of the Users Committee, and are not yet ready to abandon any of those modes. We believe the same probably holds true for more general engagement in NOAO.

We Propose:

- sending a blanket email to AAS members
- including NOAO UC presence at AAS booths
- posing specific, targeted questions to users for the UC, not just providing a link for them to visit
- arranging to have a summary of end-of-run comments sent to the UC at least once per semester
- adding a webpage link to provide UC feedback at the end of the proposal process
- adding a link to UC web input in several places, e.g. end-of-run form; proposal form; instrument webpages; CATCH site; etc.

Users Committee solicitation of input and connections to the community can supplement or complement NOAO efforts in the following ways, and we offer our continuing availability to assist the observatory in carrying out its mission:

- We can accept confidential comments and maintain anonymity
- We bring users' perspective to the process, and so can help shape the solicitation to reflect or take into account popular mis/perceptions and opinions, e.g. of the system
- We benefit from hearing from both NOAO and its users, and so can (as requested by NOAO) help educate users, e.g. that investment in GSMT is NOT threatening small telescopes in the post-Senior Review era.

In summary, the Users Committee lauds the observatory's efforts to increase community engagement in charting NOAO's future and we stand ready to assist the observatory in pursuing its mission in any way we can.

7 Prioritizing requests for funding increases

It is clear that implementing all the recommendations laid out above would require additional funding from the NSF or other sources. Here we list the most significant such recommendations and attempt to prioritize them according to the User's Committee's evaluation of their expected impact on the scientific productivity of and community access to the national telescope system. From most to least important:

1. Lead development of GSMT
2. Increase access to Keck
3. Increase access to Gemini
4. Improve workhorse spectroscopic capabilities on the 4-m telescopes, including wide-field multi-object spectroscopy
5. Enhance instrumentation on small- and medium-aperture telescopes as per ReSTAR, such as MIR instrumentation that could relieve some of the oversubscription pressure on Gemini
6. Organize student observing workshops
7. Enhance student financial support for travel and data analysis
8. Provide financial support for data reduction and analysis to all observers