

NOAO Users Committee
2008 Report
Revised 30 December 2008

The Users Committee (UC) of the National Optical Astronomy Observatory (NOAO) held its annual meeting at NOAO in Tucson on 2 and 3 October, 2008. The committee was asked by NOAO Director Dave Silva to comment on:

1. the planned infrastructure improvements and modernization of KPNO and CTIO and on their capabilities, in the context of the US telescope system;
2. the ReSTAR implementation plan;
3. the ALTAIR survey results and their implications, especially for Gemini;
4. NOAO's design and development efforts in the LSST program;
5. current and planned NOAO data management and processing systems;
6. current NOAO efforts in developing GSMT; and
7. the balance of NOAO's activities with an eye toward meeting the current and future needs of its user community.

All committee members were present for the meeting: Ian Dell'Antonio, Eric Gawiser, James Lowenthal (Chair), Stacy McGaugh, Nathan Smith, Angela Speck, and Nicole Vogt.

We warmly welcome Dave Silva as NOAO's new Director and applaud him on coming quickly up to speed and providing clear, strong leadership at the helm. Despite the grim budget outlook, we believe there is ample evidence that the next 5 years will continue to see a strong NOAO with most major observing modes still provided at 1-8 m apertures, with ambitious plans beyond that timescale well under way. We look forward to working together.

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 as per lists provided by NOAO. During the two-day meeting, NOAO staff members gave the UC presentations on the status of and plans for the ALTAIR survey, CTIO, KPNO, ReSTAR implementation, the Data Products Program, Gemini, LSST, and GSMT. We appreciate very much the effort that went into preparing those presentations, updating us on the status of NOAO programs and initiatives, and engaging in fruitful and frank discussion with us about the status and future of NOAO.

The cold calls are biased since they currently reach only successful NOAO proposers, so we would like to expand those efforts to include a random sample of all NOAO proposers, successful and unsuccessful alike. We request the observatory's assistance in obtaining such a contact list well in advance of the next meeting.

We would also very much appreciate a brief summary in future meetings of the NOAO budget. We recognize that most of the information is available online at the NOAO website, but a rough breakdown of the observatory's budget by major programs and divisions as interpreted by the director would be helpful as we attempt to define priorities and strike the appropriate balance between ambition and reality.

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

1 KPNO and CTIO

The strong emphasis in NOAO on support and renewal of the 4m class telescopes at CTIO and KPNO and on modernizing their instrument suites is heartening. We endorse NOAO's plans to preserve operations and implement as much modernization as is possible in the current fiscal environment. User feedback indicates that all the telescopes managed by NOAO continue to do valuable science.

The continued efforts at KPNO to maintain and improve relations with the Tohono O'odham nation have been both critically important and very successful, and great credit for this should go to KPNO director Buell Jannuzi and his office. The outreach component of the efforts both at KPNO and CTIO greatly broaden the range of audiences we reach. We agree that the confluence between the 50th anniversary of the founding of KPNO and the International Year of Astronomy provides an excellent opportunity for publicizing the observatory's successes past and present. The PAEO program has done great things to improve the awareness of NOAO and what it offers to groups ranging from the non-ground-based astronomical community to Congress to the general public. As far as possible, these activities should be continued even in an unfavorable funding climate.

The deployment of NEWFIRM at the Mayall telescope has been generally very successful both in terms of operations and in terms of community enthusiasm. In particular, the simultaneous deployment of an instrument and of (most of) the software tools to make the instrument immediately useful should be the model for future such deployments. However, we did receive some feedback about the difficulty of obtaining documentation associated with NEWFIRM, and in general on the continued need for up-to-date and easily available "cookbooks" for all the popular user instruments at both KPNO and CTIO. Ensuring this may require continued software support.

Operations and staff renewal at KPNO is progressing smoothly, but there are still operational issues that the users encounter. We received several complaints about the intermittent guiding problems at the Mayall and some problems with the NEWFIRM camera. The staff is aware of these problems, but perhaps some mechanism for broadcasting the efforts that are being done to fix these problems would make it visible to the community that the issues are being taken seriously. Also, for observers arriving to telescopes and detectors with known issues, more advance notification of the problems and of the steps being taken to address them would be useful. However, overall, the interactions with the facilities and scientific staff are very highly rated, and are considered by all the users we canvassed to be one of the major strengths of the observatories.

A major issue facing the KPNO complement of instruments is the fate of the One Degree Imager (ODI). The budget overruns are a very serious problem, especially given the financial situation at NOAO and at the WIYN partner institutions and the increase in reported overrun in the past year; the committee echoes the Director's conviction that this problem must not "eat up" the budget for the rest of KPNO. The ODI cost overrun problem has consequences for the community beyond KPNO; for example, the number 1 priority in the ReSTAR report for both the present and the future was the continued availability of wide-field optical broadband (and narrowband) imaging. Indeed, the proposal being prepared for ReSTAR implementation assumes that this capability is maintained, and would not be in line with the survey results if ODI doesn't happen or is delayed considerably. We recognize that there are two related issues here: access to a wide-field imager in the post-Mosaic era, and the new science that could be enabled by an OTA wide field imager. We urge that all creative solutions be pursued to overcome the problem, including as a last resort descoping ODI at least temporarily (i.e., deploy it initially without OTA, or reduce the number of CCDs and thus focal plane coverage).

A secondary recommendation for the longer term is that as NEWFIRM moves to CTIO in 2010A, some access to additional mid-to-wide-field NIR imaging in the north be considered, whether through the system or at KPNO. The partnership with Maryland has provided obvious value and the community response to this type of partnership is now very positive. Notwithstanding the NSF Senior Review guidance on preserving (and increasing) as much access as possible to 4m class telescopes, we urge the NOAO director to seek out and continue partnerships that provide tangible (instruments, software, etc) benefits to the community. The sharing of operations with the tenant observatories has clear advantages for the community as a whole, but cost considerations to NOAO are a priority in these discussions. New tenants such as Las Cumbres should be encouraged, particularly with the departure and imminent departure, respectively, of WHAM and Calypso.

The situation at CTIO is also improving, despite the uncertainty caused by currency fluctuations. The plans for improvements and the work already being done on the Blanco in advance of the arrival of NEWFIRM in 2010 and DECam in 2010-2011 are important, and should be preserved even in tough budget times. The commissioning of the Goodman spectrograph on SOAR is noted with some relief; the upcoming instrument suite should improve the reputation

SOAR enjoys in the community, and we endorse aggressive advertising of its new capabilities. We encourage CTIO to consider allowing some form of remote observing at least on SOAR but also possibly on the Blanco. The continued access to the small telescopes provided by SMARTS II is valuable, and it is important for CTIO to keep informed about developments in that program as a representative for the community.

Finally, we continue to receive complaints that the food at KPNO is less than ideal and that at CTIO it is often difficult to determine which dishes are vegetarian.

Recommendation 1.1

NOAO should continue its maintenance and upgrade programs on small- and medium-aperture telescopes, and, as much as possible, upgrade their instrument complement at both CTIO and KPNO, especially on the 4m telescopes. These facilities remain the centerpieces of the system as envisioned in the ReSTAR report.

Recommendation 1.2

NOAO's efforts to maintain and enhance relations with the Tohono O'odham nation should be continued and supported.

Recommendation 1.3

We endorse the plans to celebrate the 50th anniversary of KPNO in conjunction with IYA 2009.

Recommendation 1.4

Adequate analysis tools and cookbooks are essential to the scientific output of the observatories. The current efforts towards final Mosaic and NEWFIRM data reduction pipelines should continue. For the other existing instruments, adequate support to ensure that there are cookbooks for data reduction and analysis is a high priority.

Recommendation 1.5

Some mechanism should be implemented to keep observers informed about the efforts being made to address the issues they report on end-of-run reports.

Recommendation 1.6

An additional effort should be made to emphasize to the community the availability of new instruments and capabilities on SOAR.

Recommendation 1.7

We emphasize the importance of wide-field imaging capabilities in the north, and encourage NOAO to pursue all creative solutions to the ODI cost overruns. For whatever ODI modes are eventually supported, a data pipeline should be provided.

Recommendation 1.8

We endorse pursuing additional partnerships for instrument and/or telescope time sharing when such partnerships provide tangible benefits (i.e., instrument or software that would not otherwise exist, rather than simply financial support). At the same time, we reiterate our strong belief that NOAO facilities should remain available for open access for the great majority of the time.

Recommendation 1.9

In anticipation of NEWFIRM’s move to the south, NOAO should continue to work to guarantee access to mid-to-wide-field NIR imaging in the north.

Recommendation 1.10

We recommend that food services at both KPNO and CTIO be improved, especially for vegetarians at CTIO.

2 ReSTAR

NOAO’s response to the recommendations of the ReSTAR committee is encouraging and realistic in the short term, given budgetary constraints. A phased implementation plan to rebuild, repair, and upgrade the suite of telescopes appears feasible and the vital improvements should be continued, and the phased nature of this plan is wise in that it allows adjustments as time proceeds.

The plan to address the instrumentation needs of the community takes important steps in the right direction. In particular, the observatory’s efforts toward acquiring spectrographs like OSMOS and TRIPLE-SPEC in Phase I (and on the Palomar 5m in the near term) may provide a short-term solution to the desperate community need for expanded access to versatile spectroscopic capabilities in the optical and near-IR with moderate spectral resolution, as emphasized in the ReSTAR report. But there remain important challenges for CTIO and KPNO to retain their status as world class facilities. Some users expressed concern that the process by which new replacement instruments were selected in Phase I was somewhat lacking in transparency, in the sense that it was not clear to what extent the selection process was open to competition or considered alternatives. The committee acknowledges that this was a practical solution for the short term goal of providing desired capability as quickly as possible,

but we feel that in Phase II the various options for instrument capabilities should be subject to healthy competition and review among a wider user community.

The availability of the Goodman spectrograph on SOAR helps, but the committee is concerned that the limited number of nights for which it will be available will severely limit its ability to address the needs of the US community in the southern hemisphere. This is evidenced by the continued high demand for RC SPec on the Blanco telescope (although we note that the relative demands for various modes may change significantly once DECam arrives). To the extent that it reflects continued demand among the community, the committee would be in favor of trading nights on the Blanco in exchange for increased access to the Goodman spectrograph on SOAR. Such a trade is not a net loss in 4m nights available to US observers, and so would not conflict with the ReSTAR recommendations.

The plan for access to capabilities providing high spectral resolution is less satisfying or immediate. The possibility of providing access to an echelle spectrograph on the DCT is an interesting one that should be pursued, but it does not address community needs in the southern hemisphere where work on Galactic/LMC/SMC stars places high demand on high resolution spectroscopy. In the meantime, the committee suggests pursuing, to the extent possible, temporary availability of the 4m echelle spectrograph at the Blanco telescope. Although it is currently in use on the 1.5 m for a specific project, the low efficiency of the echelle makes the possible applications of this setup very limited.

The ReSTAR committee listed wide-field optical imaging, including both broad-band and (to a lesser degree) narrow-band capabilities, as a high priority. It was assumed that this capability was well in hand with ODI and DECam. Thus, the delays and budget overruns with ODI put NOAO in danger of losing the capability of wide-field optical imaging in the northern hemisphere. If ODI can be implemented in a limited capacity, even without being able to realize its highest possible image quality, then the UC feels that this is a better option than having no imaging capability at all.

The ReSTAR committee prioritized the development of the system such that the top priority was that existing facilities need to be safe, reliable and efficient. This effort seems to be well in hand as described in the implementation plan. Second was that the instrumentation needs to be competitive and effective. Third was to provide an appropriate level of access. Thus, making the instrumentation "competitive" is more important than increasing the available time. Furthermore, the ReSTAR report charged that facilities need to be "held to high standards of...performance, documentation, usability, and data quality."

In light of these comments, the committee sees the Data Products Program (DPP; see Section ??) as an integral part of accomplishing the goals set out by the ReSTAR committee. Specifically, the capability to obtain raw data with a given suite of instruments is not enough; it is also part of the mission of the national observatory to provide some reasonable level of support in reducing and analyzing the data that are obtained with its facilities. This role

becomes increasingly important as instruments become increasingly complex and file sizes become unmanageable. To ensure the competitive productivity of coming generations of instruments, NOAO needs to ensure that it can provide users with some level of minimum pipeline data reduction, especially when it is instrument specific, ensuring that the data are useable. The term "useable" has some flexibility. Examples would be: 1) for a wide field imager, the pipeline should provide the user with a flat fielded, distortion corrected, combined mosaic image with an astrometric solution such as is now provided with the MOSAIC pipeline. 2) For a cross dispersed multi-order spectrograph such as TripleSpec, a pipeline should geometrically correct for curvature of individual orders and provide some baseline wavelength solution.

In the absence of a true pipeline, the minimum requirement in order for NOAO facilities to remain competitive is to provide simple, step-by-step cookbooks to allow a typical graduate student with moderate experience to reach this level of data product in short order. Such data reduction should be accomplished without requiring a major installation of instrument-specific software above and beyond, e.g., an additional IRAF package.

The committee emphasizes that this minimum level of support is essential in order for any instrument to meet high standards of performance, documentation, usability, and data quality as required in the ReSTAR report. This is particularly true for complex instruments like multi-chip imagers and multi-order cross-dispersed spectrographs. In other words, this minimum support should be considered an integral part of any (new) instrument and should be included in evaluating its cost. Without said support, the access to the new instrument is not useful to the community.

Recommendation 2.1

We endorse NOAO's three-phase plan to implement ReSTAR initiatives and reinvest in KPNO and CTIO.

Recommendation 2.2

At least in Phases II and III of ReSTAR implementation, we encourage NOAO to pursue as transparent and open an instrument selection process as possible, including broad discussion with the users community and careful review of competing options.

Recommendation 2.3

We believe that trading nights on the Blanco 4m in exchange for increased access to the Goodman spectrograph on SOAR is worth pursuing as long as it is consistent with continued oversubscription rates.

Recommendation 2.4

The committee emphasizes the need for high-resolution optical spectroscopy in the south, and suggests that NOAO pursue temporary availability of the 4m echelle spectrograph at the Blanco telescope.

Recommendation 2.5

In order for NOAO facilities to remain competitive, the observatory should continue to support, develop and provide mature, user-friendly data reduction and analysis software and documentation for all instruments. New instrumentation should have a full data pipeline; the minimum requirement for existing instruments is to provide simple, step-by-step cookbooks.

3 ALTAIR and Gemini

NOAO has been very effective in shepherding the successful ALTAIR survey, garnering an excellent response from a large range of institutions. It is clear that the broad opinions of the community are consistent across geographical regions, across institutions both with and without guaranteed access to large telescopes, and across different types of institution. Consequently, the results of the survey provide an excellent guide for NOAO on to how to proceed in developing and stewarding the large telescope end of the system.

The main results of the ALTAIR survey appear to be:

- the number of nights available on large telescopes needs to be increased;
- instrumentation needs to be improved; and
- both queue and classical observing modes are needed

The highest priority seems to be more access to non-federal facilities. However, the second priority was increased US share in Gemini, and this might have been ranked even higher if Gemini were more responsive to US users.

The current financial situation means that NOAO's response to these priorities is necessarily limited. In particular, acquiring more time on large telescopes, whether that be Gemini or non-federal facilities, is challenging at present. Since Gemini is the largest open access facility for US users, this offers the most likely avenue of attack for addressing US users needs and desires for large telescopes. However, creative expansion and/or renegotiation of the TSIP program may afford new opportunities for access.

We believe that NOAO should pursue efforts to increase the connection between Gemini and its US users. While the proposed increase in the fraction of classical observing may help,

we encourage NOAO to investigate some form of remote observing or "eavesdropping". This would be particularly useful for very short observing programs. Even simply informing queue observers of their schedule and allowing them to have contact with the queue observer and to have access to the data instantly for a quick look may be sufficient. The PI can then monitor the observations and evaluate data in real time, which may alleviate the problem of data quality as well as providing more of a connection to the observatory for US users.

The ALTAIR survey asked specific questions regarding Gemini, the answers to which should help to guide NOAO. The most common concerns with respect to Gemini are:

- $\sim 26\%$ of respondents said that Gemini doesn't have the instrumentation they want or the instruments are not competitive with those on Keck, VLT etc., and nearly half of all respondents said they wanted improvements to new or existing instruments.
- More than one-third of respondents compared Gemini unfavorably to other large telescope facilities, including concerns about the Phase I and II time overhead required in applying for Gemini time.

We endorse the efforts already made by NOAO/NGSC to address these issues, specifically pursuit of the "A++" Aspen instrumentation options and revision of the Gemini observing bands priority system. The pending new instruments and instrument upgrades (e.g. GNIRS+AO, FLAMINGOS2+MCAO, GSAIO+MCAO, GMOS red CCD) are promising, but careful attention will need to be applied to ensure that current and future user needs are being met.

We echo NOAO's concern about US users' perceived lack of responsiveness from Gemini. The current US community demand for Gemini may well continue to drop and the unfavorable perception of Gemini will continue to worsen if that perception is not addressed. The present problem is not the fault of NOAO/NGSC, but rather stems largely from NOAO's position in the broader Gemini structure, i.e., while Gemini and NOAO are both run by AURA, the direct connection between NOAO and Gemini is tenuous. NOAO, through NGSC, is the conduit for US users to access Gemini, and does a good job of working with US users. However, neither NGSC nor NOAO is currently in a strong position to persuade Gemini to respond to the needs of the US community.

The ALTAIR survey regards Gemini as part of the US system and rightly so. Consequently, we encourage both NOAO and NSF to investigate during the negotiations of the new agreements in 2013 how NOAO could be better fit into the Gemini structure in order to facilitate NOAO's response to ALTAIR in building the large telescope end of the US System.

We emphasize the large and growing need for wide-field multi-object spectroscopy of faint targets, especially as we now enter the LSST era by way of PanSTARRS/DES.

Recommendation 3.1

NOAO should ensure that the red CCD upgrade to GMOS actually happens.

Recommendation 3.2

We urge NOAO to ensure that various upcoming instruments come on-line as planned (e.g. NICI, FLAMINGOS2, GNIRS etc.). Providing a suite of upcoming instruments (especially in the South) will go a long way to addressing the user community's concerns about the system's large telescopes in general and about Gemini in particular.

Recommendation 3.3

We encourage NOAO to investigate some form of remote observing or "eavesdropping" on large telescopes in the system.

Recommendation 3.4

We recommend that NOAO investigate ways to alleviate the perception that the time spent on observation preparation is not commensurate with the actual amount/quality of data acquired for users proposing on Gemini. We commend the attitude of learning to manage users' expectations. The data quality aspect may be ameliorated by Recommendation ??, in that an eavesdropping mode will fix both operational problems and perceptions.

Recommendation 3.5

We recommend giving observers guidance on how to optimize their chances in getting Band 3 observations done; since short programs are much more successful, perhaps even give an upper limit to the time allowed in Band 3.

Recommendation 3.6

We suggest that NOAO simplify the requirements in Phase II. One possible tactic would be to provide more useful templates for doing simple observations in Phase II.

4 LSST

The Large Synoptic Survey Telescope is an exciting next-generation project that will offer a revolutionary leap in time-domain and wide-deep astronomical imaging, with the data publicly available to the U.S. community. The Users Committee is pleased to see NOAO playing a leading role in design and development efforts in the areas of site and telescope systems. NOAO also serves as a valuable interface between the community and the LSST science collaborations and survey design. The LSST project appears to be progressing rapidly, with NOAO's involvement a major contribution that is keeping NOAO at the forefront of

astronomical technology.

At the same time, the committee has some concern about LSST being such a big piece of the pie in the currently tight fiscal situation. We understand that the NOAO resources allocated to working on LSST are largely supporting highly trained technicians with a skill base in astronomical facilities and instrumentation that, in contrast to generic software developers, is not readily available on the open market. Nevertheless, we believe that NOAO should weigh carefully the urgency of LSST against other priorities that are so pressing, especially at existing facilities on KPNO, CTIO, and Gemini. Given the harsh budget realities, we suggest that NOAO consider reducing in-kind contributions to LSST if this is possible without breaking its commitments to the project and thereby losing influence for the US community.

Recommendation 4.1

NOAO's contributions to LSST design and development benefit the user community by helping guarantee LSST's success; those contributions should continue. But the level of contributions may need to be revised to avoid jeopardizing other high-priority needs at KPNO, CTIO, and Gemini.

Recommendation 4.2

The level of community engagement should be increased. Toward this end, NOAO should help LSST advertise for the next call for community participation in science collaborations and continue to provide informational assistance to prospective applicants.

Recommendation 4.3

Availability of the LSST simulator to test cadence options and new survey designs is important for the user community; anyone planning a new science project or science collaboration is likely to need this. We urge NOAO to lobby for completion of and access to the simulator as soon as possible.

Recommendation 4.4

It is important for the users community that complete LSST data products be easily available and understandable to all potential users in the US and international communities, not just to science collaborations, and we urge NOAO to continue advocating for this.

Recommendation 4.5

Las Cumbres and the ReSTAR spectrographs are a start towards providing LSST follow-up for bright objects including transients; faint object spectroscopic follow-up requires wide-field multi-object capability on large aperture telescopes – currently a glaring need in the NOAO system, as discussed elsewhere in this report.

5 Data Products Program (DPP)

The Users Committee believes that high quality data processing is integral to the science of modern astronomy. The scientific productivity of a telescope depends not only on the quality of its instrumentation, but also on the utility and accessibility of the data that is produced. There is no point in building expensive, highly capable instruments if no sense can be made of the data they produce.

Instruments should have either a data pipeline or a data reduction cookbook (preferably both), as appropriate to each specific instrument. A minimum requirement is a data reduction cookbook that is comprehensible to and can be implemented by a graduate student at the beginning of her observing career. The cookbook should be authored by a member of the NOAO scientific staff with a vested scientific interest in the data produced by the instrument in question. In the case of cloned instruments proposed under ReSTAR, the Users Committee encourages the adoption of existing software and cookbooks. These should be vetted by members of DPP and the scientific staff. We echo the ReSTAR recommendation that all facilities that provide access to the community should be held to high standards of efficiency, reliability, performance, documentation, usability, and data quality.

The Users Committee sees the following priorities for DPP:

- Ensure and facilitate the acquisition, transport, and secure archiving of data from NOAO and system telescopes.
- Ensure the existence of practical data analysis tools.
- Complete development of the NEWFIRM and MOSAIC pipelines.
- Provide a mature scientific data pipeline for ODI.
- Provide appropriate support for new (e.g., ReSTAR) instruments.

The committee appreciates the efforts of DPP in the following areas, but considers them to be lower priorities:

- Continued development of IRAF.
- High level data products, e.g.,
 - NVO tools.
 - Catalogs.

- Domain tools (e.g., tools to map what other data are available at a given location on the sky).

The committee’s intention on these points is to emphasize scientific productivity. Tools that enhance functionality and scientific productivity — particularly to the observer using a specific NOAO instrument — are a more pressing need than advanced interfaces to archived data that may or may not prove useful to subsequent workers.

The User Committee reiterates its strong and unanimous opinion that scientifically capable data processing software is an integral part of modern astronomical instrumentation. Along these lines, we applaud DPP for its development of quick-reduce and science pipelines for the MOSAIC and NEWFIRM instruments. We consider these to be major successes with clear added-value to the user community. These should be considered models for future instruments, most obviously ODI. We realize that the completion of the ODI project is an open question at this time, but note that wide field imaging was identified as the highest priority in the ReSTAR report. Any imaging instrument that might supplant ODI will face similar requirements for a data processing pipeline.

The committee realizes and appreciates the management challenges inherent in a time of tight budgets. In this regard, we consider scientifically capable data processing to be such a high priority that we rank it equal with the acquisition of new instruments. The need for updated spectroscopic capability at KPNO and CTIO has been a frequent refrain of User Committee reports in recent years. We applaud the plan expressed in the white paper response to the ReSTAR report to acquire such capability rapidly by cloning extant instruments. Nevertheless, if providing adequate software means cutting back on the number of ReSTAR instruments (e.g., the number of copies of new spectrographs like TRIPLESPEC & OSMOS), then we consider it a price worth paying. Producing the best scientific end product is the tantamount priority.

Finally, we note that a healthy and readily accessible data archive may provide one route for broadening the participation of under-represented communities.

Recommendation 5.1

The observatory should support at a significant and continuing level the development of a data pipeline for each new instrument. A bare minimum, preferably to be reserved for existing instruments only, is a clear, user-friendly data reduction cookbook.

Recommendation 5.2

Practical software tools such as IRAF should be available to all NOAO users for all common data reduction and analysis needs.

Recommendation 5.3

NOAO should complete development of the NEWFIRM and MOSAIC pipelines.

Recommendation 5.4

The observatory should provide a mature scientific data pipeline for ODI, calling if necessary on the WIYN partners to help support its development.

Recommendation 5.5

NOAO should provide appropriate data acquisition, reduction, analysis, and archiving support for new (e.g., ReSTAR) instruments.

6 GSMT

The Users Committee and the broad US astronomical community look to NOAO and NSF to represent and advocate for them in the evolving GSMT process of both development and implementation of a 30-meter telescope. NOAO participation at the direct technical level has been drastically reduced, for the present. Given the current budgetary climate and the need to re-balance NOAO's role in maintaining and developing current national telescope resources (e.g., KPNO and CTIO) versus more exploratory work for longterm future development, we support this reduction in direct partner-level efforts. However, we emphasize the continuing need for the broad community to have proactive advocacy, both in the development and the operations phase, and remain convinced that NOAO, with the support of NSF, is in the best position to provide that advocacy in an even-handed fashion.

We acknowledge the NSF Senior Review directives to scale back on leading the technical development of GSMT. But as the process unfolds, when NSF funds are available for supporting GSMT projects, we reiterate our expectation on behalf of the users community that NOAO will provide the public gateway to 30-meter telescopes and will represent their interests with regard to instrumentation choices and access. We fear that the low-profile role recommended by the Senior Review and mandated by the current fiscal landscape at this stage will effectively jeopardize future access.

Given the difficulty NOAO and AURA have had in influencing Gemini decisions, due primarily to the complicated, bureaucratic relationship among Gemini's various institutions and countries, we urge NOAO and AURA to seek a clearer governance structure and more direct line of communication and decision-making in future GSMT institutional agreements.

Recommendation 6.1

Within the boundaries of the currently restricted financial landscape, NOAO should continue to seek ways to participate as actively as possible in the development of GSMT and to advocate

for 30-meter access for the entire US user community.

Recommendation 6.2

NOAO should seek a clearer governance structure and more direct line of communication and decision-making in future GSMT institutional agreements than those currently in place at Gemini.

7 Overall Balance

The Users Committee recognizes and endorses NOAO's major course change following the NSF Senior Review and its recommitment to community engagement and to facilities with a full range of apertures, including especially KPNO and CTIO. These changes are consistent with past recommendations of the committee. Meanwhile, feedback we have received from users indicates a high level of satisfaction at KPNO, CTIO, and even Gemini, modulo the trends and criticism evident in the ALTAIR survey.

The ReSTAR and ALTAIR processes show NOAO's strong commitment to understanding and meeting the community's needs and input on priorities. We encourage continued open communication about NOAO status – including jeopardized programs and trends in the balance of priorities – through Currents, town meetings, AAS, etc. The surveys are clearly important steps on the path towards a full US system of telescopes.

We recognize the merits of partnerships (e.g. U. Maryland/NEWFIRM) and endorse pursuing more, while also reiterating our strong belief that NOAO facilities should remain available for open access for the great majority of the time.

As for balance in instrumentation, we are glad to see NOAO providing workhorse spectroscopy both south and north, as the committee has recommended in years past. We look forward to seeing the Goodman spectrograph perform up to spec, and we endorse seeking DoubleSpec and TripleSpec time at Palomar Observatory until an OSMOS clone arrives at the Mayall. The possible loss of ODI and the ensuing repercussions for wide-field optical imaging are a major concern, as is possible cutting of DPP plans (see above for fuller discussion of both).

We reiterate our concern, given the grim budget landscape, about the huge allocation of resources to LSST, and recommend that the observatory keep a close eye on the evolving balance between that allocation and the support for KPNO, CTIO, and Gemini.

Support for graduate student travel continues to be a priority of NOAO users. The User's Committee is also pleased to hear of NSF AST plans to convene a working group to explore possibilities for a User's Grants program for all NSF-supported ground-based observatories.

We urge NOAO to cooperate with this working group, as ending the "double jeopardy" of applying for telescope time and data analysis funding separately would be a major improvement in the research climate for ground-based astronomy in the U.S.

Recommendation 7.1

We reiterate that to address questions of overall balance of NOAO's efforts, it would be very helpful for the Users Committee in future meetings to be shown a rough NOAO budget breakdown so we don't need to seek it out independently. Our goal here is not to micromanage, but to be effective in advising priorities.

Recommendation 7.2

We endorse NOAO's recommitment to community engagement and to facilities of all apertures, including especially those at KPNO and CTIO, while at the same time providing leadership and pathways to community access in the development of LSST and GSMT. We believe the overall balance of those current efforts is generally appropriate and well-considered. However, we suggest that NOAO consider revisiting or at least more explicitly justifying the currently large commitment of resources to LSST.

Recommendation 7.3

We believe the observatory's efforts to provide workhorse spectroscopy and O/IR wide-field imaging in both the north and the south are appropriately prioritized, and we recommend continuing those efforts at a high priority, including perhaps a temporarily descoped ODI if budget overruns prohibit initial completion of the fully specified instrument.

Recommendation 7.4

We recommend continuation and possible expansion of the graduate student travel support program.

Recommendation 7.5

We urge NOAO to cooperate with the NSF/AST working group that is exploring possibilities for a User's Grants program for all NSF-supported ground-based observatories.