NOAO Users Committee
2011 Report
Submitted 15 July 2011

The Users Committee (UC) of the National Optical Astronomy Observatory (NOAO) held its annual meeting at NOAO in Tucson on 15 and 16 June, 2011. The UC was asked by NOAO Director Dave Silva to comment on:

1. the on-going infrastructure and science capability modernization programs at KPNO and CTIO;
2. ongoing ReSTAR plans, including the current activities in phase 1 of ReSTAR and priorities for phase 2;
3. the plans for development of BigBOSS on the Mayall;
4. how to improve US observers use of the Gemini telescopes;
5. NOAO's efforts to connect the community-at-large to LSST and to provide follow-up capabilities;
6. whether or not NOAO is involved in the right balance of activities to meet the current and future needs of its user community given current fiscal constraints;
7. NOAO's new leadership role for ODI.

Five out of the eight committee members were present for the meeting: Ian Dell'Antonio, Vera Margoniner, Ginny McSwain, Nathan Smith, and Angela Speck (Chair) with Eric Gawiser and Adam Stanford attending via a remote connection.

In preparation for the meeting, UC members discussed the relevant NOAO issues and documents with optical astronomy colleagues at conferences, in university departments, and by telephone and email via direct "cold calls" to NOAO users as per lists provided by NOAO. We also used our Facebook group to solicit feedback from users.

During the two-day meeting, NOAO staff members gave the UC presentations on various aspects of the NOAO System including updates on the status of CTIO, KPNO, and the implementation of modernization efforts, as well as the updates on the progress towards a unified "System" and NOAO's participation in LSST. We greatly appreciate 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.

Our report follows below and is split into sections according to the items in the charge.

1 Renovation at KPNO and CTIO

We commend NOAO for the on-going infrastructure and science capability modernization programs at KPNO and CTIO We strongly support the renovation of infrastructure and instrumentation for these facilities, which continue to be extremely productive in terms of publication numbers and broadly used as measured by the breadth of telescopes and instruments the publications represent. The users of the NOAO core facilities by-and-large are delighted to see the effort that is being applied to improve the two mountaintops. In particular, MOSAIC 1.1 appears to be a popular and successful upgrade - a great example of NOAO gathering input directly from the community and serving its needs. The next 2-3 years will see a large number of new capabilities, including KOSMOS at KPNO and DECam, COSMOS and TripleSpec at CTIO (either Blanco or SOAR, see discussion in § 2 below). After expressing the need for workhorse spectrographs on 4-meter telescopes for years, the UC is very pleased to see these becoming a reality due to the infusion of funds from ReSTAR.

The UC is also pleased to note that the physical infrastructure at both observatories has been strengthened. The recent emergency structural repair on the Mayall brings home the importance of continued funding for infrastructure modernization.

However, we do have some concerns regarding planning for the deployment of new instruments. The observatories are understaffed, particularly at CTIO, where parallel deployment of instruments at the Blanco and SOAR may suffer delays because of staffing limits.

With the impending availability of DECam as a new capability at the Blanco, we need to ensure that access to and usability of the Blanco and of DECam provide maximum scientific output. With this in mind the UC recommends that DECam be available for surveys but with a "maximum time" guideline that is based on non-Dark energy Survey Blanco time in each semester.

A particular concern about DECam is the lack of concrete plans to provide a U-band filter for community use. The Dark Energy Survey agreement included a promise that the delivered camera would have U-band performance at least as good as that of the existing MOSAIC-2 camera. DECam will indeed have good U-band performance, and it makes no sense to have insisted on that if no such filter will be available. We believe that NOAO should coordinate the acquisition of a U-band filter for DECam as soon as possible.

Finally we would like to welcome the new director for KPNO, Dr. Tim Beers, and to express our gratitude to Dr. Abi Saha for stepping in as the interim director.

Recommendation 1.1
We recommend that DECam be made available to surveys. Regular survey rules should apply, with the "maximum time" guideline modified so that no more than 20% of *non-DES Blanco time* in each semester is available for surveys.

Recommendation 1.2
We recommend that NOAO find a way to provide a U-band filter for DECam

2 ReSTAR

In December 2007, the ReSTAR committee published its report on NOAO telescopes in the aperture range 1–6 meters. NOAO responded to the ReSTAR report with a 3-phase plan. Phase 1 of the ReSTAR Implementation Plan is underway with $3 million in funding from NSF in FY09 and discussion of priorities for Phase 2 is on-going. The funding that has been allocated thus far has been used very effectively, and in keeping with the spirit of ReSTAR. It is important to maintain an ongoing conversation with the user community in building and renewing the US System of O/IR telescopes and instruments. We applaud NOAO's efforts to engage the user-base to build consensus and take advantage of the available expertise.

We continue to endorse NOAO's three-phase plan to implement the ReSTAR initiatives and reinvest in KPNO and CTIO. The UC commends NOAO for excellent progress with ReSTAR Phase 1. MOSAIC 1.1 upgrade has been successfully completed, and the CTIO Hydra upgrade appears to be making adequate progress. Versions of OSMOS are being developed for KPNO and CTIO (KOSMOS and COSMOS, respectively). KOSMOS and COSMOS are also well on track, and the UC greatly appreciates the opportunity to provide input to the instrument builders on the trade-offs in the various component choices.

Another new instrument that is being procured to fulfill the ReSTAR needs is a copy of TripleSpec. NOAO has asked the UC to consider where this new near-IR spectrograph should deployed. The original plan was for NOAO to build TripleSpec4 for the CTIO Blanco telescope, but NOAO is considering SOAR as the destination instead. The performance characteristics of TripleSpec on either telescope are largely indistinguishable. The UC has noted the following pros and cons for placing the instrument at SOAR. The design of instrument ports on SOAR allows for faster, more efficient instrument changes. In the current budget climate, efficiency is a major advantage. With the imminent arrival of DECam on the Blanco, the user community will not have gaps in Right Ascension coverage if the instrument goes to SOAR. A further advantage for SOAR is that its f-ratio is more compatible with other telescopes in the NOAO System (e.g. Gemini), allowing the possibility to move TripleSpec at some point in the future. However, a major advantage for locating TripleSpec4 at the Blanco is the accessibility of nights for the user community. Even during the DES, the Blanco offers more nights of access than SOAR (but with a major gap in RA availability). Once the DES is complete, Blanco will offer 100% of nights to the US community, whereas the current agreement with SOAR is a 30% share for the US. The UC anticipates that TripleSpec4 will be an instrument of high demand to US astronomers; it is currently the most requested instrument for the NOAO share of Palomar Hale telescope time, which was oversubscribed by more than a factor of 2.4 during 2011. SOAR currently maintains a healthy oversubscription rate between 2.4-3.2, and the arrival of TripleSpec4 at SOAR is expected to add significant pressure to its popular suite of instruments. Post DES, the Blanco will also host several instruments that are expected to be popular with the US community, including DECam, NEWFIRM, and COSMOS. Both telescopes are likely to see a rise in proposal pressure in the long term.

The UC was pleased to see plans for ReSTAR Phase 2 involve a wide swath of the O/IR community. An open call for proposals for new partnerships with other observatories and universities was issued during Fall 2010, and review of the proposals took place during March 2011. NOAO received 16 proposals (a total request of more than $24M), of which 7 proposals

were recommended (for anticipated funding request of $10M). NOAO is currently drafting the ReSTAR Phase 2 proposal to NSF, which is expected to be submitted in October 2011. Not only will the proposed partnerships expand the range of instruments available to the US community, several will offer remote or service observing capabilities which the UC perceives as a significant asset for NOAO.

The UC has noted that the Phase 2 proposal plan will request funds to continue NOAO access to the Palomar Hale telescope at the current level of participation, 20 nights/year. The proposal will also include access to the ARC 3.5m telescope, with offers a duplicate of TripleSpec and an optical spectrometer comparable to the Double Spec available at Hale. ARC offers additional instrumentation (a medium-high resolution echelle spectrograph, IR and visible imagers) plus remote observing capabilities that make it a high priority for the US community, but the Hale telescope offers an aperture advantage. Continuing access to Hale will also ensure continuity for the US community, which has been using the facility with good success.

Recommendation 2.1
The UC recommends that TripleSpec be placed at SOAR, but NOAO should pay close attention to the relative demand for SOAR and Blanco time requests. When the SOAR partnership is renegotiated in 2014, NOAO should try to acquire a higher share of SOAR time for the US if the oversubscription rate consistently rises above 3.

Recommendation 2.2
The UC recommends that NOAO consider time exchanges between the Blanco and the international SOAR partners should the need arise to balance demand at both telescopes.

Recommendation 2.3
The UC recommends that NOAO proceed with the Phase 2 proposal as planned. While the Palomar and ARC facilities include some overlapping capabilities, each facility offers other compelling reasons for NOAO participation.

3 BigBOSS

BigBOSS has been selected as a large scale program to be implemented at the Mayall 4m at KPNO. We continue to view the large scale programs as important in the revitalization of KPNO and as a positive opportunity for the user community to obtain access to a cutting-edge instrument on the Mayall 4m circa 2015. The proposed BigBoss spectrograph represents a large jump in spectroscopic multiplexing capability and will enable a new class of survey projects. While we are concerned that the planned instrument and ensuing survey will displace a wider range of opportunities that may better serve the diverse user community of NOAO, the UC also recognizes that the high impact science potential of a large project such as BigBOSS may be important to the long term health of KPNO.

NOAO is proceeding reasonably with reviewing the large program proposal, BigBOSS. We encourage NOAO to work closely with the BigBOSS team to develop an MOU (assuming that their proposal is officially accepted after the next review in fall 2011) which will result in an instrument that may be used by the NOAO community to carry out a large range

of scientific programs. For example, the blue arm of the planned spectrograph may not be strictly necessary for the BigBOSS dark energy experiment, but it would greatly enhance the suitability of the instrument for the general US community. Moreover, we encourage NOAO to consult the user community on proposed terms of a Memorandum of Understanding with the BigBOSS team before it is finalized.

The UC believes that the request from BigBOSS to have 100% of the dark time at the Mayall 4m telescope during the years of their survey should not be accepted by NOAO, and that some reasonable fraction of the dark time needs to be preserved for use by the overall community.

The UC recognizes that the data products generated by the BigBOSS program will be useful for a variety of non-DE science, and encourages NOAO to make sure that adequate plans are included in the MOU so that these datasets will be readily accessible to the community. The UC suggests that NOAO consider including a scientist from outside of BigBOSS and NOAO in the planning process.

Recommendation 3.1
We recommend that the MOU for BigBOSS include the blue arm for the spectrograph.

Recommendation 3.2
We encourage NOAO to consult the user community on proposed terms of a Memorandum of Understanding with the BigBOSS team before it is finalized.

Recommendation 3.3
We recommend that NOAO retain $\sim 25\%$ of dark time on the Mayall during the BigBOSS survey.

Recommendation 3.4
We recommend that steps be taken to ensure that data products generated by BigBOSS are readily accessible by the community.

Recommendation 3.5
We recommend that NOAO consider including a scientist from outside of BigBOSS and NOAO in the planning process.

4 Gemini

With respect to the Gemini observatory, NOAO should continue to advocate aggressively in the interests of the US community, which are still not being met. The UC feels that substantial redirection of the current operating model of Gemini is required in order to bring Gemini into alignment with needs of its majority user community, and especially to send a message to the US community that positive changes are afoot and that the observatory is likely to succeed. This may help to garner much needed US community support for possible continued future involvement in the observatory.

While progress on maximizing the scientific output of the smaller telescopes operated directly by NOAO has been extremely impressive (see § 1 and 2 above), the UC continues to be deeply concerned about the scientific productivity of the US investment in the Gemini

Observatory and the degree to which it meets the US community needs for 8-m class telescope access. For example, the impact of all US Gemini usage is apparently out performed (using different metrics: proposal pressure, publications, citation impact) in science per unit dollar by just a single 4-m class telescope in the US system. This signals that the Gemini Observatory may need to implement profound and radical changes in its operation in order to engage the US user community. While the UC feels that NOAO has advocated for various changes in Gemini operations on behalf of the US community, the response of the international Gemini Observatory has seemed less enthusiastic or apparent to US users. New instruments that are coming to Gemini-S will probably help, but the problem of Gemini not being in line with the needs of the US community and not being utilized productively by the US community is a deeper and more systemic problem that needs to be fixed. However, the UC is hopeful that the new directorship combined with progress on new instrumentation and an increased US share in the observatory may send a message to the US community that even more significant change might be forthcoming in the future.

4.1 Observing Modes

Classical observing: This is a relatively easy way to bring Gemini closer to its user base, and the UC endorses the continuation of NOAO's initiatives to promote classical Gemini observing. It is not clear that this will solve the issues surrounding publication of Gemini results, but examples set by other large telescopes that out-perform Gemini with a smaller user community suggest that it cannot hurt to have more classical observing. Enabling more classical observing has been a very positive initiative and must continue. Furthermore, it should be clear to proposers that classical observing is not discouraged by the observatory.

Remote observing: Unfortunately, classical observing is not the best mode for all observers/programs. Remote observing options are needed and would be particularly useful for very short observing programs. US users have repeatedly expressed the desire to have more input in the observations. Beyond classical observing, users also consistently express the desire to have remote observing capability (on smaller NOAO telescopes as well as Gemini), and/or the opportunity to have input to the observations via "eavesdropping". Remote observing will allow observers to monitor data quality, make real time adjustments, prioritize target and calibration data accordingly during the program – while still preserving many of the benefits of a queue (i.e. flexible scheduling for small requests or multiple partial nights, significant savings of travel time for observers, etc). It does not preserve the optimization of the queue, but other benefits listed above tend to outweigh this consideration. Connecting scientists more directly to their data can improve the data quality, will allow observers to prioritize in real time when conditions are suboptimal, and is likely to foster a closer connection to the data (perhaps resulting in more complete and more timely publication of Gemini data). This is seen to be even more necessary in a model where Gemini transitions away from PhD astronomers running the queue. The observatory should work toward enabling remote observations unless a there is a compelling scientific reason not to do it.

Phase II improvements: Possible improvements may include not requiring phase II in classical runs, in addition to offering more extensive libraries of standard *working* phase II templates. It will also be beneficial to have a stronger link between phase I and phase II, where for example, the proposer is sent a "skeleton" of a basic working phase II generated from information in their Phase I proposal. In addition to streamlining the Phase I to phase II connection, a closer connection between phase II and data products might help enable better publication results, i.e. observing logs that are clearer, and perhaps even simple pipeline reductions that will work for phase II templates.

4.2 Instruments

The UC is extremely pleased that Gemini has finally taken steps to procure a high resolution optical spectrograph. After that, an X-shooter clone for GS is highly desired as a future capability for spectroscopic followup in the era of LSST, although budgetary restrictions may force a less multiplexed option such as using a copy of TripleSpec for near-IR and GMOS II for optical spectroscopy. Another high priority expressed by US users is a high resolution near-IR spectrograph. Wide field imaging capability may be better sought on other large telescopes with time trades.

Eventually, more tailored roles for the two telescopes will be desirable. In particular Gemini-S can be geared toward supporting LSST, while any niche capabilities would be located in the north. Overall, Gemini should concentrate on supporting community needs for basic workhorse capabilities - mainly spectroscopy.

An upgrade for NIRI (NIRI II) or development of GLAO capability are lower priority for US Gemini users, but they are attractive options to pursue if future budgetary projections become more favorable. Near-IR imaging capability is widely available on other telescopes in the US system, and the enhancement of capability provided by GLAO is less attractive than the need for basic spectroscopic access on large telescopes to the US community as evidenced by the ALTAIR report.

Recommendation 4.1
We urge NOAO to advocate for and help development of a remote observing system at Gemini akin to those available at e.g., IRTF, Keck, WIYN, etc.

Recommendation 4.2
We recommend NOAO continues to facilitate classical observing for the US community.

Recommendation 4.3
We recommend NOAO advocate for implementing ways to improve Phase II of the proposal process.

Recommendation 4.4
We recommend NOAO advocate for the acquisition of an X-Shooter clone for the Gemini telescopes.

5 LSST

NOAO has been making in-roads in connecting the user community to LSST. The UC is pleased that a new LSST collaboration was formed in late 2009, and that 20 new scientists joined the science collaborations. This has, no doubt, been facilitated by the NOAO-hosted workshops for several of the science collaborations. We encourage more such workshops to be held in the future.

Las Cumbres network of small telescopes should be useful for followup of LSST discoveries and NOAO participation in developing this network is encouraged as funding allows.

Developing general purpose optical and NIR spectroscopic capabilities at CTIO is desirable for enabling LSST followup. The UC recognizes that NOAO has already started work on the optical spectrograph COSMOS, as part of ReSTAR, which will be useful in this regard. We would like to encourage NOAO to begin work on the copy of Triplespec if and when funding becomes available so that the community has a NIR spectroscopic instrument to use on a moderate-size telescope for LSST followup of brighter transient sources.

The UC believes that the efforts of the LSST Science Working Group at NOAO to develop a prototype of a system that would function as an event handler/clearinghouse for the community are worthwhile and should proceed.

Recommendation 5.1
We recommend that NOAO continue to facilitate the addition of new members to existing LSST science collaborations and the formation of new ones.

Recommendation 5.2
We recommend that NOAO continue to host LSST science collaboration meetings and workshops.

Recommendation 5.3
We recommend that efforts be made to make the LSST simulator more accessible to the general astronomical community.

6 Overall Balance

The overall balance of NOAO activities seems ideal for achieving the needs of its user community, modulo a few specific concerns that we detail below. The UC is very pleased to see how well NOAO has listened to the community and adapted to provide what is needed. Since the Senior Review in 2005-2006, NOAO has revived the US O-IR system, responding to and serving the needs of the US community.

One aspect of the ReSTAR report that has received little attention is the recommendation for further investment in remote observing with smaller telescopes (see § 2). Previously the UC has expressed its pleasure with the remote observing option offered at the SOAR telescope. Development of remote observing capabilities for small telescopes should go hand-in-hand with the applying the same to Gemini (see § 4.1). It would be highly advantageous to users to have the same basic system/software/interface used for all facilities (aside from differing instruments, obviously). We reiterate that NOAO should investigate and implement

remote observing. Enabling remote observing (i.e. from home/office like IRTF, ARC 3.5m, Keck) is STILL an extremely high priority for US community. In particular, investigating how these existing remote observing programs are implemented should be high priority. Comments from the US user community indicates a level of comfort and experience with internet-based communications that lead us to believe the time is ripe.

Feedback received by members of the UC, as well as their own experiences, suggest that the US comminuty is generally happy with the current plans for future access to instruments. NOAO does an excellent job of managing those facilities for which it is directly responsible and has made very good progress on implementing ReSTAR recommendations. We still have some concerns about the large aperture end of the system. ALTAIR implementation has not been as successful as that for ReSTAR. In particular, Gemini (especially G-South) appears to be significantly less productive than Mayall for instance. However, we are aware that some of the problems with implementing ALTAIR recommendations result from the international governance structure at Gemini. We are happy to see that within the US, Gemini is being integrated into the system by e.g. merging the Gemini Science Advisory Committee into the broader NOAO Users Committee.

As Gemini agreements are renegotiated we hope that the governance can be restructured to give NOAO a more direct line to working with Gemini, and that this would facilitate implementing ALTAIR recommendation.

The UC continues to endorse NOAO's philosophy of viewing all U.S. O/IR facilities as a System. We are pleased to see that proposers are now able to propose back-up instrument choices in case their proposal grade is insufficient to schedule it on their first-choice instrument. We are also pleased to see improved visibility for the Instrument Capabilities search page.

Recommendation 6.1
We recommend that NOAO continue its rough balance of current activities and attempt to protect each of its core missions despite the current fiscal challenges.

Recommendation 6.2
We strongly recommend that NOAO pursue remote observing options for both Gemini and smaller telescopes in the system.

Recommendation 6.3
We recommend that NOAO plan a fact-finding mission and visit IRTF to investigate their remote observing model.

Recommendation 6.4
We recommend that NOAO run a pilot remote observing program extending the WIYN and SOAR remote observing options beyond the partner institutions to the wider NOAO community.

Recommendation 6.5
We continue to endorse pursuing more partnerships, while also reiterating our strong belief that NOAO facilities should remain available for open access for the great majority of the time.

Recommendation 6.6
We continue to encourage NOAO to cooperate with the efforts to develop a funding source to ground-based observational studies and remove the necessity to apply for telescope time and data analysis funding separately.

7 ODI

ODI continues to be a flagship instrument for both WIYN and NOAO, with capabilities that will make it a world-leading facility. Given this and the results of the ReSTAR report, ODI continues to occupy a critical role in the instrumentation plans for the US O/IR system, even more so in light of the conditional plans for BigBOSS on the Mayall. We are encouraged by the level of effort and attention given by NOAO to attempt to set ODI on the proper path to completion.

The UC recognizes that the reorganization of the ODI project, and particularly the appointment of Todd Boroson as project PI, has greatly improved the transparency of development within the project. There has been significant progress in the last 6 months.

The plan to complete the project via a two-stage process, commissioning a partial focal plane first while populating the second silicon carbide backplane, appears to be a very good path to an eventual completion of the instrument.

The schedule presented for the commissioning of the instrument is probably optimistic, given the uncertainty about the detectors and likely funding. However, a working ODI is a facility that will be scientifically innovative beyond 2020.

The plan for partnership with Indiana for the PPA seems to be progressing, and has hope of providing the computing resources to extract science from ODI, but it is not clear to us how it will be funded.

Recommendation 7.1
We recommend that NOAO continue working with WIYN and leading the effort to ensure that this capability is deployed.

Recommendation 7.2
We recommend that NOAO staff continue working with Indiana/PPA to develop the pipeline and archive architecture for ODI.