Spring 2009 Report of the Users' Committee of the National Solar Observatory (NSO) 20 June 2009

To: Dr. Stephen L. Keil, Director National Solar Observatory

The NSO Users' Committee met 7-8 May 2009, at NSO in beautiful Sunspot, NM. We enjoyed the warm hospitality of the residents and staff, vistas that the site provides, and an informative tour of NSO/SPO facilities.

Committee members present: Leka (*chair*), Pier (*ex officio*), Basu, Choudhary, Jennings, Rabin, Radick, Reinard, Seykora, Tomczyk.

Representing NSO: Keil (Director), Eliason, Giampapa, Hill, Hunter, Penn, Piano, Rimmele, Streander, with scientific talks presented by Tritschler, Pevtsov, Howard.

First, the members of the committee would like to thank Dr. Thomas Barnes of the NSF for his participation and help over the last few years as the NSO's program director at the NSF and Users' Committee *ex officio* member. We welcome Dr. Jeffrey Pier, who will take over that position in August 2009; due to a scheduling conflict, Dr. Barnes was unable to attend but the committee was able to have an early introduction to Dr. Pier who attended in his stead.

Second, the members of the committee join with NSO in mourning the loss of Dr. Cliff Toner, a scientist with the NSO/GONG program. Cliff was a friend to many and a colleague to many more; he is sorely missed.

We report below on the status of various programs at the NSO, recognizing significant progress in several areas and highlighting recommended priorities for attention by the Director. The committee recognizes the delicate and challenging task of addressing the full range of priorities in light of an essentially flat budget.

Advanced Technology Solar Telescope (ATST)

The ATST project has progressed significantly. The Environmental Impact Study is nearing its final determination, and the Final Design Review occurred in May 2009. There is every reason to believe that this project will be successfully brought out of the planning stage and into construction within calendar year 2009. The committee looks forward to this smooth transition within the NSF, and salutes the thorough and diligent work performed thus far by NSO staff and collaborators.

The data policy for ATST was discussed. Based on favorable experience with both ground- and spacebased facilities, the Users' Committee generally favors an open data policy. We recognize that this could place a burden on the NSO with regards to the costs of archiving data. The Director is being proactive in this regard, with proposed budget items to support the archiving effort.

We also recognize that there will be instances that may require special treatment, such as data gathered during engineering tests, data that are central to a student's PhD thesis work, and partner-specific

arrangements. We urge the NSO to minimize such restrictions.

Global Oscillations Network Group (GONG)

In accordance with the NSF Senior Review Report, GONG personnel have been working to find non-NSF sources of funding. We laud GONG's success in securing collaboration and funding from the US Air Force (AF Research Laboratory and AF Weather Agency). GONG will install H α capability to the GONG instrument suite, for which the Air Force will provide about \$650K and (most importantly) a fraction of the GONG annual operating costs. The committee lauds the effort and notes this success in addressing the request for securing external funding. As GONG adds capabilities focused on space weather monitoring to its presently-available helioseismic data and line-of-sight magnetograms, the program provides data of excellent quality that has extremely good coverage, a large user base, and long-term impact for basic solar physics. The community urges the GONG program to persevere in the full range of its efforts.

Synoptic Optical Long-term Investigations of the Sun (SOLIS)

Since the last meeting of the Users' Committee, the SOLIS team has made impressive progress on hardware, software, and management elements of the project, for which the SOLIS team and NSO are to be congratulated. The Vector Solar Magnetograph (VSM), the centerpiece of SOLIS, is now producing full-disk vector magnetograms available through the Virtual Solar Observatory. However, VSM data are still not of the quality and consistency required for user-community science and for effective support of the Helioseismic and Magnetic Imager (HMI) on the Solar Dynamics Observatory (SDO), presently scheduled to launch in late 2009. The committee is concerned that, if SOLIS does not support SDO/HMI during its commissioning phase, and a large user community adopts HMI data to the exclusion of SOLIS data, *SOLIS is at risk of "mission failure" within the next year*. It must be emphasized that SDO has a five-year design lifetime: it may last 15 years, or 4 years (as did the Hubble Advanced Camera for Surveys). *Synoptic full-disk vector magnetograms should be a core part of the NSO portfolio, now and in the ATST era*. SOLIS also offers unique data products, such as full-disk chromospheric magnetograms, for which there are no alternative sources now or planned.

The committee recommends that NSO devote sufficient resources to ensure that the VSM can support SDO/HMI during its commissioning phase. Fortunately NSO has, on staff, leading experts in the design and calibration of solar polarimetric instrumentation and data. Recognizing that these staff members are already heavily committed, the committee nonetheless recommends that NSO immediately make available enough of their time to work closely with the current SOLIS team to ensure that science-quality vector magnetograms are produced consistently within six months of this report. Filling the currently-advertised SOLIS positions should remain a high priority; given the time lag before new hires can contribute effectively, however, hiring is not a substitute for immediate contributions from current staff.

Sacramento Peak Instrumentation

The committee commends the Sac Peak instrumentation program, and its collaborative efforts with other institutions, for the impressive array of new instruments now on line. These include the Spectro-Polarimeter for Infrared and Optical Regions (SPINOR), the Diffraction-Limited Spectro-Polarimeter (DLSP), the Interferometric Bidimensional Spectrometer (IBIS), the Rapid Oscillations in the Solar Atmosphere (ROSA) instrument, the Facility Infrared Spectro-Polarimeter (FIRS), and the Prominence Magnetometer (ProMag).

The new operational adaptive optics (AO) systems at the Dunn Solar Telescope (DST), and advances

toward the final deployment of a multi-conjugate AO are realized as crucial both for DST and ATST. This instrumentation development is now forming the strong bridge to the planned first-light instrumentation for ATST. The committee finds that the push for multi-instrument observing capability, while impressive and a model for eventual ATST observing modes, stresses the observing staff beyond reasonable expectations; concerns were expressed that the resulting missteps and inefficiency reduce the effectiveness of this new-found capability at the DST. Filling the presently-advertised DST electrical engineer position will alleviate some stress; freezing the present instrument suite may also help in this regard, and the committee would support such a decision. Still, the present situation should be seen as a telling indicator of the resources that will be needed for NSO to operate ATST in a multiple-instrument mode as desired by the solar physics research community. If current staff are not able to support the enhanced capabilities at the DST during the transition to ATST (during which time the demand for these state-of-the-art instruments will peak in concert with solar activity), a unique opportunity to gain experience in the operation of an ATST-like facility will be lost.

Kitt Peak Instrumentation

Fourier Transform Spectrometer (FTS)

The committee recognizes the strenuous efforts by minimal staff to return the FTS to productivity. While some instrumentation remains fragile, the FTS is now recording atmospheric spectra and the program is supporting laboratory users. While the visitor program is externally funded, we encourage NSO to advertise the renewed capabilities of the facility to the potential visitor community, beginning with a letter to former users and subsequently a notice in community publications such as *EOS* and *SolarNews*.

McMath-Pierce Main

The program at the McMath-Pierce continues to strengthen, with the now routine operation of the NSO Array Camera (NAC), the new kinematic mounting of the low-order AO system, and the improvements to the telescope control system afforded by (finally, and successfully) replacing the PDP-11 computer. The support at the McMath-Pierce continues to be excellent in quality, but it is at a critically low level; further reductions, due to ATST commitments or attrition, would unavoidably and negatively impact the quality of user science. Relatively few scientists in the solar physics community are familiar with the improved McMath capabilities. In preparation for taking advantage of the unique infrared capabilities of the ATST and recognizing the potential for major scientific discoveries in the upcoming solar cycle as ATST is under construction, we recommend that NSO actively court an increased user base for the McMath-Pierce and increase in-house scientific output with a postdoctoral research position concentrating on infrared solar physics.

Virtual Solar Observatory (VSO)

The Virtual Solar Observatory is a pioneering model for the concept of Virtual Observatories, of which there are now quite a few. Providing an access point for the retrieval of multiple diverse data sets makes the tedious effort of obtaining data more efficient, thus increasing the time available for analysis. Pioneering can be lonely, however: the committee believes that the VSO is underutilized, a situation that should be ameliorated naturally as more data sets become available and the community recognizes the potential of the powerful VSO search features. At this time, all support for the VSO comes from NASA, although many supported data sets originated with funding from other agencies. We urge NSF to provide support for this important venture, particularly for linking NSF-sponsored data (including those to come from ATST) to the VSO and thus to the broad research and education community.

Other Topics

US Air Force Participation in NSO

There has been an historic relationship between the Air Force and the NSO, namely, an Air Force Research Laboratory (AFRL) detachment located at Sac Peak, using the facilities there and contributing to the operation of that site. The prototype Improved Solar Observing Optical Network (ISOON) instrument at AFRL/Sac Peak as a "research and development" instrument, is now proven to be a superb solar spectral imaging system, providing high-cadence full-disk images in H α (line center and offband), true continuum, and He 10830. AFRL distributes these data to the community, presently via the NSO Web site. Very recently, the Air Force Weather Agency (AFWA) decided to resume deployment of the ISOON network. Current plans include moving the existing ISOON unit to Kirtland AFB in 2010, and to deploy four additional ISOON units as a world-wide AFWA operational network. AFRL will retain access to all ISOON data, and plans are to make them available to the non-AF research community. The prospective departure of ISOON from Sac Peak, the ongoing consolidation of AFRL from Hanscom AFB to Kirtland AFB (in consequence of Base Realignment and Closure process scheduled for completion in late 2011), the AFWA and AFRL involvement in GONG, and the eventual consolidation and relocation of the NSO itself, all imply that the present relationship model between the Air Force and the NSO will soon be obsolete. As they evolve individually, both NSO and AFRL also need to preserve and enhance their historic and productive partnership in solar physics.

Diversity

The committee heard presentations on NSO's efforts toward increasing diversity amongst its staff. Two areas targeted for improvement are 1) mentorship of young scientists and engineers, and 2) career development opportunities. NSO recognizes these issues and is putting programs in place to address them. We believe that NSO's recent and continuing efforts such as placing advertisements in the publications of minority-focused professional societies, and recruiting summer-program students from minority-focused colleges, are efforts well-positioned for success.

Communication

At several points above, the committee has identified a gap in the information flow between NSO's capabilities and programs, and those who need to know about the recent advances in instrumentation and data access. Periodic announcements in community publications are suggested. Updating the facility Web sites is also suggested (e.g., there is no information in the Kitt Peak/McMath-Pierce Web sites regarding the NSO Array Camera and the AO as of this writing). Augmenting postdoctoral positions to better equalize Sac Peak/Kitt Peak facilities in this manner is also suggested.

NSO's Transition

Times they are a-changing! There are extraordinary transitions ahead for the NSO, both in preparation for and during ATST construction and in the consolidation of facilities and potential move of NSO headquarters. Two committee members described large-scale transitions within the US Air Force Research Laboratories and NASA that parallel the NSO situation in many ways. The committee listened with great interest to descriptions of the consequences for their operations and the institutionalized efforts that those organizations are making in order to mitigate the impact. The present staffing at the NSO is critically low due to flat budgets over the past years; the solar activity cycle (and the interest it provokes within much of the solar observing community) is due to start. Significantly higher-than-normal attrition is expected during the transition years, yet maintaining the strength of the scientific and technical staff is crucial. The committee suggests that the model in place for the AFRL relocation, one based on *increased* transition staffing, is a more effective model than the simple wedge; similarly, NASA is increasing

scientific hiring in many areas, even with flat overall science budget, in order to mitigate the loss of expertise due to an anticipated wave of retirements. The committee suggests that a detailed transition plan be developed which gleans from the experiences of others and continues the productive operation of present facilities until the functional existence of the ATST. The NSO should be afforded the resources needed to reach the ATST/Synoptic Era with a staff qualified and ready to support these world-class facilities.

Respectfully submitted,

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- Dr. Debi Prasad Choudhary (California State University Northridge)
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- Dr. Donald E. Jennings (NASA Goddard Space Flight Center)
- Dr. Douglas M. Rabin (NASA Goddard Space Flight Center)
- Dr. Richard R. Radick (Air Force Research Laboratory)
- Dr. Alysha Reinard (NOAA Space Weather Prediction Center)
- Dr. Edward J. Seykora (East Carolina University)
- Dr. Steven Tomczyk (NCAR High Altitude Observatory)