- Principal Author: Kron, Richard G.
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- Institution of Principal Author: University of Chicago
- Co-Authors: GMT SAC members – Berger, E. (Harvard), Blum, R. (NOAO), Chen, H. W. (Chicago), Cochran, A. (UT Austin), Crane, J. (Carnegie), Da Costa, G. (Australian National U.), Dalcanton, J. (U. Washington), Donahue, M. (Michigan State), Eisner, J. (Arizona), Fabricant, D. (SAO), Lee, J.-J., (Korea Astronomy and Space Science Inst.), Papovich, C. (Texas A&M), Tinney, C. (U. New South Wales).
- E-mail Address: rich@oddjob.uchicago.edu

- Paper Title: The Role of GMT in the OIR System in the LSST Era

This White Paper is submitted on behalf of the Scientific Advisory Committee of the Giant Magellan Telescope community. This body represents the GMT consortium of seven US and four international educational and research institutions on scientific matters related to the GMT project and observatory. In this short communication we make the case for peer-reviewed community-wide access (hereafter open access) to a portion of the observing time on the GMT to further our goal of ensuring that the facility produces the best possible science. In the coming decade LSST and other survey instruments will provide data sets of unprecedented depth and quality. Many of the potential discoveries in the LSST, DES and other databases can only be unlocked through spectroscopy in the visible and infrared. The GMT will play a unique role in producing science from these large survey databases and open access should be a key ingredient in a complete policy statement and strategic plan for the OIR system in the coming decade.

WHITE PAPER QUESTIONS

1. What O/IR capabilities are you using, are you planning to use, and will you need through the LSST era?

Scientists at the GMT institutions have access to powerful capabilities, from sub-meter-sized dedicated time-domain telescopes through 6-8m class telescopes in Chile and the Southwestern US (Magellan, MMT, LBT, HET). The GMT partners are working to increase their capabilities through construction of the GMT and its scientific instruments, participation in the LSST consortium and science teams, and development of large survey instruments and programs, such as the Dark Energy Survey. Several of our institutions play leadership roles in the LSST and Dark Energy Surveys and our faculty have helped shape these programs. The GMT can play a key role in leveraging the power of these survey instruments through spectroscopy and imaging in the visible and infrared. The first generation of GMT instruments will provide moderate resolution spectroscopy from 0.34 - 2.5μm, high-resolution spectroscopy from 0.3 - 5μm and diffraction-limited imaging from 1-2.5μm. Focal stations can be changed rapidly to respond to targets of opportunity. Highly multiplexed spectrographs, offering both slits and fiber feeds, will allow efficient spectroscopy of faint targets in the LSST and other survey data sets.

3. Comment on the need for the U.S. community's access to non-federal O/IR facilities up to 30 meters in size.

Realization of the full potential of the LSST and forerunner survey facilities will require spectroscopy with apertures larger than 8-10 meters. The GMT and TMT (*and the European ELT*) will be well positioned to leverage the power of the LSST. History clearly shows that the

best science emerges when new and creative ideas are given the opportunity to prosper. Open peer-reviewed access to observing time on GMT and TMT would provide just such an avenue for the best programs to succeed. A well organized and properly supported community participation program for these telescopes (and the GMT in particular given its nearly co-location with the LSST) will ensure that the full US community achieves the best return on its survey investment. The core science goals for GMT defined by the SAC are well aligned with those in the LSST Science Book. Spectroscopy with the GMT could play a key role in obtaining spectra of $z > 7$ QSOs from the LSST survey, measuring redshifts and typing distant SNe, and determining the nature of new classes of transient sources. *Open access to both US ELTs should be a cornerstone of US astronomy policy in the 2020's and beyond*.

5. What is the role that a national observatory should have in an effective ground-based OIR system?

The national observatory can play a unique role in enabling, coordinating and supporting open access to large telescopes and large databases. NOAO aspires to be a central source for data intensive astronomy in the coming decade by supporting access to the Dark Energy Survey, the Dark Energy Spectroscopic Instrument, and the LSST. NOAO can further this goal by acting as the executive agency for open access to GMT, TMT, and 8m class telescopes in support of the survey programs. Gemini can play a key role by filling the space between 4m and 30m apertures in both hemispheres as part of a unified approach to the exploitation of unique opportunities provided by LSST and other survey facilities. NOAO could issue calls for proposals, run the peer review process and coordinate the scheduling of time, just as it did with the "OIR System" in the 2000s. The GMT SAC and partners expect to foster Key Projects that focus the resources of the community on problems too large for individual PI time allocations. NOAO could act as the enabling and coordinating body for community involvement in these programs.

10. What types of scientific and observing coordination among the various NSF telescopes (including Gemini and LSST) and non-federal facilities are the most important for making scientific progress in the next 10-15 years? How can such coordination best be facilitated?

As discussed above, we believe that a key part of the overall strategy for maximizing productivity of LSST and other facilities in the 2020 era is public support for, and community access to, both GMT and TMT. One way that this could be accomplished is through a revitalized version of the successful TSIP program in which new instruments, capabilities, or operations funding supported by the NSF lead to open peer-reviewed access to a number of nights on the facility. There are many other potential approaches, including NSF/DOE funding for nights on GMT for follow-up of LSST science. The LSST managing organization could issue a call for proposals and convene a peer review panel to select the best proposals based on a clearly defined set of criteria. Open access to the GMT by the LSST community could be mirrored through open access to the LSST database by scientists at GMT institutions, including our international partners.

The US community, through private and public institutions and private-public partnerships, is making an enormous investment in facilities for the coming decade. The GMT SAC believes that open access to a portion of the observing time on GMT in support of science with public facilities should be a key component of US science policy and planning for the era of the LSST.