IN MEMORIUM

Dr. Victor M. Blanco (1918–2011)

It is with profound sadness and a deep sense of loss that NOAO notes the passing of Dr. Victor Blanco, a Puerto Rican astronomer and the former director of the Cerro Tololo Inter-American Observatory (CTIO) in Chile. Dr. Blanco played a leading role in the development of US astronomical facilities in Chile and in the growth of both the Chilean and Argentinean astronomical communities through times of political unrest and upheaval. The CTIO 4-meter telescope was officially named the Victor M. Blanco Telescope in his honor on 8 September 1995.


Image credit: NOAO/AURA/NSF

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1 NOAO DIVISIONS

1.1 NOAO SOUTH

1.1.1 Cerro Tololo Inter-American Observatory

Program Highlights

During this quarter significant progress was made with the Laser Guide Star (LGS) system of the SOAR Adaptive-Optics Module (SAM). Integration, alignment, and testing of the components of the SAM LGS system were completed in the optics laboratory in the CTIO La Serena facilities, and the system was installed on the telescope at the end of January. The LGS system consists of a laser box, beam transfer optics, and a laser launch telescope (LLT). The LLT, mounted behind the SOAR secondary mirror (see Figure 1) was co-aligned with that of SOAR. In parallel, permission to launch the laser and finalize the documents on laser safety was obtained. On 15 March 2011, at 23:53 Chilean Daylight Saving Time, the SAM ultra-violet laser was propagated for the first time on the sky. The next night, March 16, the pointing of the LLT was fine tuned and the first images of laser spots produced by a laser guide star on the SAM Wave Front Sensor (see Figure 1 inset) were obtained.

At the end of this quarter, the Blanco 4-m telescope was shut down for realuminization of the primary mirror. This is the first realuminization of the mirror in more than five years. In preparation for this event, key components of the aluminization chamber were replaced using funding from the American Recovery and Reinvestment Act of 2009 (ARRA). At the beginning of the shutdown, the mirror was removed from the telescope. For the first time in the lifetime of the telescope, no broken radial supports were discovered—a demonstration that the FY 2010 project/milestone of redesigning and replacing the mirror support system has been a solid success. The newly refurbished aluminization chamber performed well, resulting in a 100-nm-thick aluminum coating as near to perfect as could be expected (optimal is between 70 and 120 nm), providing reflectivity closely matching that of pure aluminum.

Figure 1: SAM Laser Launch Telescope mounted behind the SOAR secondary. Inset: Laser spots on SAM Wave Front Sensor CCD.

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<th>Group/Program</th>
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<tr>
<td>Special Tours</td>
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<tr>
<td><strong>TOTAL</strong></td>
<td><strong>2,169</strong></td>
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Status of FY11 Milestones

- Complete commissioning of the Blanco telescope control system (TCS) upgrade, which provides for faster and more reliable operations of the telescope and allows for more effective use of all of the new instrumentation that is arriving over the next few years.

  **Status:** Development of the new Blanco TCS continued with a demonstration of the full control loop, integrating the tape encoders, motor controllers, and kernel. The slew speeds required for the Dark Energy Survey (DES) were demonstrated in practice. Work continued on bringing in the remaining subsystems, integrating the user, and establishing the software infrastructure required by the Dark Energy Camera and DES.

- Complete the infrastructure improvements necessary for installation and operations of the Dark Energy Camera (DECam), including expansion of the control and computer rooms in the Blanco building, and the upgrade and modernization of the Blanco Environmental Control System.

  **Status:** Work on the new Blanco telescope control room was completed in late February, and the new facility is in use, providing improved workspace for both observatory staff and visiting astronomers. The Blanco computer room upgrade continued through the end of March. During the March telescope shutdown (mentioned above), the air duct system for cooling the 4-m primary mirror was installed. This is the key component of the Blanco Environmental Control System. Commissioning of this air flow system is planned for the following months.

- Install the laser guide star (LGS) system on the SOAR telescope, achieve a laser guide star, and commission the LGS mode of SAM. The LGS mode is the only mode to be offered to visiting astronomers, thus, commissioning of this mode will include testing the system under a variety of observing conditions and ensuring that the user interface is ready to be used by visiting astronomers.

  **Status:** The SAM LGS system was installed on the SOAR telescope in January. The laser was first launched out of the dome on 15 March 2011, and on March 16, laser spots on the Shack-Hartmann camera of the SAM Wave Front Sensor were obtained for the first time. Testing and commissioning of the LGS system will continue through the rest of the year.

1.1.2 NOAO South Facilities Operations

1.1.2.1 Central Facilities Operations

**Program Highlights**

The highlights of this quarter were the commencement of phase 3, construction, of the dormitory (phases 1 and 2 were finished in 2010 and used ARRA funding) and dining facility on Cerro Pachón (an ARRA-funded project) and the start of site leveling at the future location of the Large Synoptic Survey Telescope (LSST).

Operations on Cerro Pachón currently rely on a 12-room dormitory and a separate temporary dining facility up near the telescope. Phase 3 of the dormitory and dining facility project focuses on providing a...
permanent kitchen and dining areas attached to the new dormitory (see Figure 2 above). Phase 3 involves the construction of a 323.76-square-meter building. Interior finish work will be carried out separately in two additional phases: building shell and terminations. Construction of the kitchen and dining facility started in January 2011 after a rather arduous agreement negotiation. If weather permits, this project will take six months to complete, not including interior terminations, which may extend to the end of the calendar year.

The other major event this quarter was the “first blast” on the future site for LSST (Figure 3). Prior to the event, contracts for the preservation of flora and fauna were executed in compliance with the environmental risk mitigation plans described in the Environmental Impact Assessment filed on behalf of LSST. Significant effort was also invested in ensuring that the blasting would not have a deleterious impact on the operations of nearby telescopes (Gemini and SOAR). On March 8, at 12:56 Chilean time the first large explosion officially marked the beginning of site leveling. The blast broke up ~320 cubic meters of material. Roughly 55 more blasts of similar size are necessary to remove the remaining material on the main summit and calibration hill and for road construction.

![Figure 3: LSST site “first blast” detonated on the El Peñón summit of Cerro Pachón on March 8, at 8:56:00 (MST). The first production blast used 60 kg of explosive to dislodge ~300 cubic meters of rock. (Image credit: Francisco Delgado, CTIO.)](image)

Status of FY11 Milestones

- Complete phase 3 of the Cerro Pachón dormitory and dining facility. This third phase includes a kitchen, dining area, and multi-purpose area that can be used for meetings as well as to meet future needs such as expanded dining facilities. This project is fully funded from ARRA funds.

  Status: As described above, the construction phase of the Cerro Pachón dormitory and dining facility was begun in January.

- Complete refurbishment of the dormitory and dining facilities on Cerro Tololo, including major repair efforts at two of the three dormitory buildings and upgrades to the third dining/dorm facility. This is an ARRA-funded project.

  Status: A contract for the sealing and repair of the roofs of the Cerro Tololo dormitory buildings was executed and completed during this quarter. This completes the first phase of the refurbishment plan to improve the condition of these key components to CTIO infrastructure.

- Remove the gasoline pump facility in La Serena; replace the gas and diesel pump station on Cerro Tololo to meet new safety and environmental regulations.

  Status: In preparation for phasing out the gasoline pump station facility in La Serena, an agreement was signed with a local gasoline station chain so that CTIO staff can fill up vehicles on their way to or from the mountains. The work on the gasoline and diesel pump station facility on Cerro Tololo was stalled due to legal and environmental regulations and the lack of a competitive contractor to complete the connections.
• Support pre-construction activities for LSST, including removal of approximately 10 meters off of the top of the site, and preparation of the site for construction.

  **Status:** The LSST site preparation contract started in January for the site leveling and platform preparation, removal of rock, and construction of summit roads for the LSST. The work is progressing on schedule, and the execution time will extend for four to six months, weather permitting.

• Begin operations of an upgraded network connection of 1 Gbps to Santiago and to the continental US network infrastructure (Internet2 and National LambdaRail systems).

  **Status:** Refer to section 1.1.2.2 for status of this milestone.

### 1.1.2.2 Computer Infrastructure Services South

**Program Highlights**

During this report period the Computer Infrastructure Services South (CISS) staff worked extensively on preparations for the Dark Energy Camera (DECam) and improvements at the Blanco 4-m telescope. CISS led the Blanco control room upgrade and installed three new workstations for the telescope operator, main observer, and secondary observer in February. The first two of these workstations support eight screens, providing enough screen real estate for the operations of the 520-megapixel DECam and its many subsystems. The components for the DECam control system (Survey Image System Process Integration-SISPI) computers arrived late in the first quarter and were assembled during this second quarter. In March, the 24 computers were installed on Cerro Tololo in racks in the new Blanco 4-m computer room. Fermilab personnel will arrive in April to start installing the camera control software.

**Status of FY11 Milestones**

• Begin operations of an upgraded network connection of 1 Gbps to Santiago and to the continental US network infrastructure (Internet2 and National LambdaRail systems).

  **Status:** Equipment was purchased and put in place for the 1-Gbps connection from La Serena to Santiago. The connection was not opened as there were problems with the intercontinental link. Specifically, the importation of equipment into Brazil for the Buenos Aires-Porte Allegre section took longer than anticipated.

### 1.1.2.3 NOAO South Safety Report

NOAO welcomed a new safety officer to NOAO South. His immediate focus for this quarter was to help staff with safety compliance during the Blanco 4-m realuminizing, which was done in preparation for the DECam installation, the Pachón dormitory construction, and LSST blasting work to prepare the LSST construction site.

The NOAO South safety officer spent considerable time with the facilities staff during the realuminizing of the Blanco primary mirror (Figure 4). He prepared a Safety, Health, and Environmental Action Plan in Spanish similar to the

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Figure 4: Primary mirror of the Blanco 4-m telescope undergoing realuminization at CTIO.
one used at Kitt Peak and introduced the Job Hazard Analysis process to help the project team prepare for installation of DECam.

Action plans were made and are being executed in preparation for installing DECam on the Blanco 4-m telescope. Those plans include housekeeping inspections and corrections, personal protective equipment (PPE) assessments of the 4-m telescope floor area, hazard awareness presentations for visitors and workers, project hazard analysis, and the development of a DECam integration safety plan based on the LSST model.

Laser safety procedures for the operation and maintenance of the SOAR SAM UV laser for when it is on the telescope were finished. Days later the SAM team initiated the laser into the night sky with no incidents. The safety document package includes: Derecho a Saber Laser, Normal Operation SAM Laser Procedure, SAM UV Laser Safety Procedure, Laser Safety Audit Form, and the Laser Hazard Evaluation Report. The Laser Safety Audit Form and the Laser Hazard Evaluation Report will be completed by members of the SAM team.

1.2 NOAO NORTH

1.2.1 Kitt Peak National Observatory

Program Highlights

Mayall Building Damage and Repair

The most dominant—and certainly out of the ordinary—activity at Kitt Peak this quarter was the repair of the Mayall 4-m telescope building. On February 5, immediately following a record freeze at the observatory that sent temperatures plummeting to -18° C, a very large crack appeared on one of the main support columns of the Mayall 4-m exoskeleton (Figure 5). The building was immediately evacuated, and thermal imaging of the columns was done by observatory staff soon after discovering the crack showed columns of ice inside four of the struts, including the one that was cracked.

Structural counsel from engineers at M3 confirmed the general stability of the Mayall exoskeletal structure, and a conservative structural model showed that the building would be safe in winds up to 120 mph, even if the cracked column were entirely removed. Following the advice and directions of M3 engineers, weep holes were drilled in the columns and warming measures were put in place to thaw the ice and drain the water so other columns would not crack. How water got into those four columns but not in the 16 other identically placed ones remains unanswered.

Detailed inspection of the crack showed it to be extensive and that it intruded into the face that is inside the building and covered in asbestos. Removal of the asbestos involved hazard mitigation and was time and effort consuming. As the full extent of the crack was revealed, the repair task became clearer: in particular, removal of the painted surfaces, welding to fill the cracks, and then
“jacketing” the length of the column over which the crack runs by welding on semicylindrical caps. To do this, the sidings that attach to the columns had to be removed and lead primer (more hazard mitigation) scraped.

Even though there was no imminent structural risk to the building, telescope operations were suspended because of dome motion-induced stresses that could widen or extend the cracks. The first steps in the welding job were to stabilize the cracks by attaching “strong-backs” — band-aid like strips — across the cracks to hold things in place before the full welding job could occur. Figure 6 shows the resulting configuration.

After installation of the strong-backs, the telescope was returned to service on March 9, while the more extensive welding repairs continued during the daytime. At the end of this quarter, the welding work was well in progress, with an anticipated completion by mid-April.

There is cause for concern that there may be water in other areas of the structure, possibly trapped in some of the cross members higher up in the structure. An extensive survey of the structure using sonographic testing will be carried out in the longer run.

**BigBOSS and the Community**

The first collaboration of the Big Baryon Oscillation Spectroscopic Survey (BigBOSS) collaboration was held at the Lawrence Berkeley Labs in February. Kitt Peak (and NOAO) was well represented. There is a clear need for NOAO to (1) increase scientific visibility of the BigBOSS instrument within the astronomical community, (2) demonstrate to our community that BigBOSS is responsive to community science, and (3) generate a report that shows the wide scientific impact and community support for BigBOSS. To this end NOAO is organizing a community workshop followed by another BigBOSS collaboration meeting in September 2011.

**Kitt Peak Visitor Center**

The table to the right summarizes the number of visitors who participated in paid groups/programs at Kitt Peak during this quarter. The total of such visitors this quarter was an almost 9% increase over the same period last year. Increases were seen in the general public tours and in the Nightly Observing Program, which had an almost 26% increase over the same period last year.

**Status of FY11 Milestones**

- Receive NEWFIRM when it returns to KPNO from CTIO. Install and re-commission it on the Mayall 4-m telescope.

  *Status:* The agreement for when NEWFIRM returns to KPNO was changed; NEWFIRM will return from CTIO in the first quarter of FY12.
1.2.2 NOAO North Facilities Operations

1.2.2.1 Central Facilities Operations

Program Highlights

During this quarter, the Central Facilities Operations (CFO) staff continued to focus their efforts on facility operational issues and the ongoing major maintenance and renovation efforts. CFO staff have been involved in overseeing the work being done by outside contractors on the projects funded by the American Reinvestment and Recovery Act of 2009 (ARRA).

The Tucson CFO staff completed their work on the interior renovations to the National Solar Observatory (NSO) basement library area and the La Quinta meeting room restroom and kitchen areas. Efforts in formalizing the contractor work for replacement of a primary building chiller also were completed with the work scheduled to start at the beginning of the third quarter of FY11.

Status of FY11 Milestones

- Pursue replacement of an approximately 30-year-old primary building chiller to reduce costs and maintain building cooling requirements.
  
  **Status:** The project was awarded to the contractor and equipment submittals were reviewed by staff. A work schedule was established and the contractor will begin initial pipe modifications and demolition at the beginning of the third quarter of FY11.

- Complete renovations to La Quinta Conference room, begun in FY10, to provide restroom and kitchen areas compliant with the Americans with Disabilities Act of 1990 (ADA).
  
  **Status:** Completed. During this quarter, minor finishing touches were completed and furniture was installed.

- Initiate a program to replace the outdated PBX phone system with a new Voice-over-IP (VoIP) telephone system.
  
  **Status:** The submitted proposals were significantly above the allocated budget. The project was placed on hold pending the final FY11 budget, and potential options for the project continue to be evaluated.

- Continue the program to update meeting spaces and video conferencing systems.
  
  **Status:** CFO staff are developing the next phase for these improvement programs. In addition, other video systems were evaluated to identify appropriate systems for consideration. Work will generally be scheduled around the current meeting space usage to minimize impact on observatory operations.

- Continue to support the implementation of the projects at KPNO and Tucson facilities funded by the American Recovery and Reinvestment Act of 2009 (ARRA).
  
  **Status:** Significant efforts were made this quarter in support of the initial work phases for the electrical renovation and computer room upgrade projects. Staff provided oversight and worked with the various contractors to schedule power outages as necessary for the work. In addition, other efforts continue to be ongoing to formalize requirements for the remaining projects and prepare the necessary bid documents.

- Continue to make targeted renovation and building modifications at NOAO North to address building and meeting space needs.
**Status:** CFO staff worked with NSO to do limited renovations of their basement library to accommodate new work stations for additional NSO staff.

### 1.2.2.2 Computer Infrastructure Services

#### Program Highlights

This quarter Computer Infrastructure Services (CIS) for NOAO North provided service upgrades at facilities on Kitt Peak and at the Tucson Headquarters. Gigabit network links were established between the Admin. Kitchen and the McMath-Pierce and SOLIS installations on Kitt Peak. New, quieter, Ethernet switches were installed in the modular structures atop the NOAO North headquarters building to provide a better working environment with no loss of performance.

A Cyber Security audit of NOAO North was arranged by AURA and took place during this quarter. Final results will be delivered early in the next quarter.

#### Status of FY11 Milestones

- Continue the effort to improve the cooling and power systems in the NOAO North computer lab.

  **Status:** The cooling system upgrades were completed. Work continues to tie the cooling system into the new, building management system. Planning for a backup power system continues.

- Upgrade the NOAO North Web server to improve speed and reliability.

  **Status:** Ongoing.

### 1.2.2.3 NOAO North Safety Report

An Independent Safety Review for the National Solar Observatory Advanced Technology Solar Telescope (ATST) project was conducted from 25–27 January 2011 at the NOAO Tucson Facilities. With administrative help from the ATST Project team, the NOAO/NSO safety manager coordinated, presented, and participated in the review. The review committee (Figure 7) consisted of a diverse group of safety professionals with extensive experience in large construction projects, scientific projects, operations, and compliance. The committee was led by Richard D. Hislop, loss prevention and safety management consultant for Hislop & Associates, Inc.; Mark J. Grushka, University of Arizona manager of biosafety and biosecurity; Joe J. Kane, safety and risk management consultant for Thunder Road Consulting, LLC; and Stephan Shimko, W. M. Keck Observatory safety, health, and environmental affairs officer.

The review committee’s charge was to assess whether risk management considerations are properly addressed given the project’s current stage of development. More specifically, the committee was to determine whether the project:

- has well-defined, prioritized, and appropriate risk management objectives;

![Figure 7: Right to left: NOAO safety manager, Grushka, Shimko, Hislop (standing), Kane, and some of the ATST project team at the Independent Safety Review for ATST.](image-url)
• is properly coordinated and in compliance with relevant regulatory agencies; and,
• has allocated appropriate risk management resources.

ATST project management presented an overview of the project, site, and safety specifications followed by the project lead engineer’s detailing progress of current contracts with focused discussions on the scope of work, design, risk assessments, and mitigations strategies. The committee provided feedback directly to presenters during each presentation.

Hazard analysis meetings continued every Wednesday with the LSST engineers. Areas covered this quarter were the mirror aluminizing procedure, coatings chamber, and the camera staging areas on the maintenance floor. SLAC camera engineers are participating with NOAO in the area in which the camera is operated and maintained.

Kitt Peak was visited by an executive loss control consultant from the Hartford insurance company representing the general liability policy on February 9. The Hartford consultant noted, “From a premises liability standpoint we focused on slip/fall prevention for those guided and non-guided visitors taking the walking tour. The paved pathways we saw were in very good condition and I didn’t see any areas needing attention. We also talked about emergency & evacuation plans, which seem well thought out. The training and orientation provided to volunteer guides is helpful in this aspect. The rescue and fire vehicles were in excellent physical condition, while the inspection/testing practices are adequate.”

An AURA insurance program presentation was made to the AURA Audit Committee on March 11. It went very well with no recommendations made during the presentation.

1.3 NOAO SYSTEM SCIENCE CENTER
The NOAO System Science Center (NSSC) is the interface between NOAO and the System, with the primary aims to strengthen the contributions of NOAO’s directly managed facilities to the System, to provide user support for System facilities not managed directly by NOAO, and to anticipate and advocate for future development of the System. NSSC consists of System User Support (SUS), Science Data Management (SDM), System Community Development (SCD), as well as the TAC Phase I process. SUS provides support for users of the currently available open-access time to facilities not managed by NOAO, which covers the entire process of proposal preparation and submission and observing and post-observing data questions. SDM supports the archiving of all raw data from NOAO facilities and pipeline processing for selected instruments, as well as the data needs and support for future projects that involve NOAO. SCD maintains a broad view of the current state of the System and how community desires and needs are best mapped into the future evolution of the System.

1.3.1 System User Support

Program Highlights
The System User Support (SUS) group aims to help users make excellent use of the optical/infrared (O/IR) system (System) capabilities to which NOAO provides access. SUS staff members advertise the System capabilities available to the US community, field technical questions and provide proposal technical reviews for the large majority of System capabilities, represent the US community through the Gemini International Time Allocation Committee, guide proposers through Gemini’s Phase II process, help users of all System facilities prepare for their observing runs, and provide support to users seeking help with their data reduction and analysis. The ultimate test of the success
of these efforts is the quality of the scientific results derived from System facility observations that appear in the published literature. The highlights of one recent result follow.

Kasliwal et al. (2011, ApJ, 730, 134) used a large number of telescopes and instruments, including the Gemini Multi Object Spectrograph (GMOS) on Gemini South, to report the discovery of a mysterious nova-like object, with a luminosity placing it in the gap between novae and supernovae, in the spiral galaxy Messier 99. The discovery is of great interest, because ideas on how to produce such luminosity “gap” events all require exotic scenarios, such as low-energy supernovae in which much of the ejecta fall back onto the stellar remnant, or accretion of critical amounts of helium in double white dwarf binary systems. The discovery is also a powerful demonstration of the ability of the System to deliver the clues needed to solve such mysteries.

The team first discovered the unusual object, dubbed PTF 10fqs, with the Palomar 48-in telescope, which is part of the Palomar Transient Factory system. Within two days of initial discovery, they obtained a spectrum with GMOS, using target-of-opportunity time granted by NOAO on Gemini South. The spectrum, which featured a narrow Hα emission line consistent with membership in M99, ruled out the possibility that PTF 10fqs was a foreground Galactic variable star, and made it unlikely that it was a young supernova, and thus probably an event in the luminosity gap. Later, additional spectral observations with the Hobby-Eberly Telescope and with Keck-I, as well as light curves from the Palomar 60-in and the PAIRITEL telescope, established a strong link between PTF 10fqs and three previously discovered unusual objects, all of which are thought to be nova-like events in the luminosity gap. Finally, comparison of archival imaging from many telescopes, including the Hubble Space Telescope (HST), with the GMOS optical image established an upper limit on the mass of the progenitor of <4 M☉ in the absence of significant dust, going some way to limiting the range of possible models. While the four known luminosity gap events remain mysterious, the fact that three of them were discovered in galaxies with unusually high supernova rates led Kasliwal et al. to suggest a link between them and supernovae, which if established could lead to an explanation for their cause.

Status of FY11 Milestones

- Expand the level of expertise and user support within NSSC/SUS for an increasingly broad and varied array of non-NOAO/non-Gemini facilities.
  
  **Status:** SUS continued to perform technical reviews for the Hale, CHARA, and Keck High Resolution Echelle Spectrometer proposals. The SUS primary Keck contact for conducted a site visit to the Keck Observatory.

- A shared mission with NSSC/SCD is to work with the user community to advertise, advocate, and advise for the continuing evolution of the System.

  **Status:** NSSC issued a formal Call for Proposals, including all NOAO and other System facilities, for the 2011B proposal cycle. SUS followed up on this call by advertising late-breaking news on the availability of Gemini instrumentation through 2012. SUS staff contributed articles to the NOAO Newsletter advertising System capabilities and providing updates on Gemini instrumentation.

- Foster close communications and a close working relationship with the Gemini Observatory as they pursue their FY11 efforts to investigate and then establish a new operations model, which is driven by the need to account for the upcoming withdrawal of the UK from the partnership.

  **Status:** The NSSC director and SUS head of program continued to communicate regularly with Gemini’s deputy director and associate director of science operations to manage the impact of the evolution of Gemini’s operations. SUS staff regularly attended the bi-weekly joint Gemini
scientific staff/National Gemini Office staff meetings, which featured discussions of Gemini operations. SUS also continued to promote Gemini site visits, which help to foster communication between NOAO and Gemini. The SUS head of program joined the Gemini Operations Working Group.

- Expand the role of NSSC/SUS in the NOAO TAC system by helping to define a more uniform and streamlined proposal and TAC process, which encompasses the entire NOAO-managed system of telescope access time.

**Status:** The NOAO Time Allocation Committee (TAC) system was folded into NSSC. As part of the streamlining process, the NSSC director issued an official Call for Proposals for 2011B and commissioned the TAC group to describe, in writing, the proposal merging process. NSSC staff also revised the grading scheme for NOAO proposals.

- Work with the community and the relevant committees in supporting the process to procure the next set of new instruments for Gemini.

**Status:** NSSC is closely monitoring the process for procuring a high-resolution optical spectrograph for Gemini and is engaged with the US Gemini Science Advisory Committee and US Gemini Science Committee members on defining a vision for Gemini’s future.

- Continue support for US Gemini programs, with the possibility that the US share of Gemini may increase in the next few years.

**Status:** SUS staff continue to provide support for US Gemini programs through proposal technical reviews, Phase II support, and Gemini HelpDesk support. US demand for Gemini time remains healthy with oversubscription factors of 3.6/2.0 (Gemini North/South) for 2011B. SUS recognizes that maintaining or improving the demand for Gemini depends on continuing to develop a strong base of users who see Gemini as critical to their research as well as providing excellent support for all users. SUS thus continues to encourage classical observing on Gemini.

### 1.3.2 Science Data Management

**Program Highlights**

All components of the End-to-End (E2E) v1.6 system were delivered to Science Data Management (SDM) Operations this quarter with many enhancements, most notably, upgrades to middleware, Simple Image Access services for the archive that are registered with the Virtual Astronomical Observatory (VAO), and a much improved user interface for the archive portal. When all components of the system were integrated together in the operational environment, it was discovered that the performance of the new retrieval process was not adequate for the NOAO archive users. The problem was quickly identified and a robust solution found, which will be implemented in the E2E v1.6.1 system that will be delivered to Operations for deployment in May.

Several members of SDM continued to participate in meetings with the Dark Energy Camera Community Pipeline and Survey Image System Process Integration (SISPI) groups as well as meetings for the ODI Pipeline, Portal, and Archive (ODI-PPA) project. The DECam Community Pipeline scientist, an SDM staff member, reviewed the results of the latest Community Pipeline Data Challenge and has been discussing his findings with the Community Pipeline group at the National Center for Supercomputing Applications (NCSA). A data handling system for the new Kitt Peak Ohio State Multi-Object Spectrograph (KOSMOS) instrument was written and integrated into the computer rack delivered to the KOSMOS group at The Ohio State University for final instrument development.
After a lengthy search, the Operations manager and SDM head of program found an excellent candidate for the senior systems administrator position who will begin his position at NOAO in mid-May.

Many milestones for the VAO grant were accomplished during this quarter. Members of SDM completed the Documentation Plan for the VAO, supported a VAO exhibit at the January 2011 AAS meeting in Seattle, designed and prototyped a continuous integration/build and testing environment for VAO software, and deployed a JIRA Help Desk and Issue Tracking system with an unlimited user license.

**Status of FY11 Milestones**

- **Continued operation of a functionally complete version of the SDM End-to-End (E2E) data management system, including data capture, transport, archiving, pipeline processing (Mosaic and NEWFIRM data), and user access.**

  **Status:** The E2E v1.5 system continues to function well. Although all components of the E2E v1.6 system were delivered to Operations on schedule, a problem was identified in the testing of the system. Deployment will be deferred until May with E2E v1.6.1, which includes a much improved user interface to the archive with a streamlined data retrieval process.

- **Purchase and deploy the DECam Community Pipeline computer system needed to incorporate and test the DECam Community Pipeline software within the E2E system.**

  **Status:** The milestones for deployment of the DECam Community Pipeline computer and software systems were re-evaluated. SDM received an initial draft of the Community Pipeline hardware requirements from the NCSA DECam Community Pipeline group in late March. SDM will work with the Community Pipeline group at NCSA to refine these requirements so that the hardware will be in place for the DES Data Challenge 6x.

- **Provide support for the SDM Data Transport System that will be used for transporting DECam data from CTIO to NCSA and Tucson.**

  **Status:** The Data Transport System (DTS) was installed at Fermi Lab and NCSA as part of the Mock Observing Run in February. Data were successfully submitted to DTS from the DECam SISPI system and transported to NCSA to simulate the observing data flow. Enhancements necessary for installing DTS at CTIO for the DECam Integration Workshop in April are underway as the last major milestone before the final deployment of the system.

- **Continue support for the current NOAO science pipelines (Mosaic and NEWFIRM). Modify the Mosaic science pipeline as needed to adapt to changes that result from the Mosaic instrument upgrade to Mosaic 1.1.**

  **Status:** A Web-based operator interface was added to the NEWFIRM Science Pipeline modeled after the Mosaic pipeline interface. The NEWFIRM pipeline was installed on the new pipeline cluster for more efficient processing of the NEWFIRM data. The 2010 NEWFIRM data are in the process of being recalibrated because of recent improvements to the pipeline code.

- **Develop a science pipeline for the WIYN One Degree Imager (ODI) to operate within the Open Grid Computing Environment (OGCE) on the Teragrid.**

  **Status:** The SDM head of program and SDM pipeline scientist continued to work with WIYN and Pervasive Technology Institute personnel to prepare for the ODI-PPA Critical Design Review. They will be participating in five ODI Use Case Workshops between early April and the end of June.
• Ingest and pipeline-process the Data Capture Initiative (DCI) backlog of raw Mosaic data (semesters 2004B–2007B) and archive the reduced data products. Develop a plan to read and recover Mosaic data from the Save-the-Bits tape holdings for archive and potential pipeline processing.

Status: All raw Mosaic data from the 2004B through 2007B semesters have been archived and ingested. Approximately a third of the data (most of 2007 data) has been pipeline-processed and is available to archive researchers from the NOAO Science Archive.

• Develop and publish the standards and guidelines for the Virtual Astronomical Observatory (VAO) software testing and documentation. Deploy an operational help desk and ticket tracking system. Work with the VAO community and members of the International Virtual Observatory Alliance (IVOA) to adopt the VOEvent 2.0 standard. (Supported by VAO grant.)

Status: An unlimited user license was purchased for the VAO JIRA system. The system was fully deployed with a help desk, product development workflows, and automated generation of ticket reports. The documentation plan was approved by management and is in the process of being implemented. A prototype continuous integration, build, and test environment was designed and deployed. Dedicated hardware was purchased for the permanent system. Members of the VAO User Support team planned an exhibition booth at the Seattle AAS meeting and supported the exhibit at the meeting in January 2011. VOEvent v2.0 was promoted to “Proposed Recommendation” status with the intent that it move through the International Virtual Observatory Alliance (IVOA) standards process during the next quarter.

1.3.3 System Community Development

Program Highlights
Following the solicitation for community partners to propose with NOAO in the next ReSTAR phase, 16 proposals were received by the February 1 deadline. These included a large variety of potential activities, including new instruments for both NOAO and other observatory telescopes, new telescope time for open access, and development of software tools and databases. A panel, which included representation from the original ReSTAR committee, the NOAO Users Committee, and the AURA Observatory Council, met on March 11 to review these proposals.

Efforts continue to implement the Optical/Infrared (O/IR) System Roadmap committee that would provide guidance for the advancement of the System. During this period, a potential chair for the committee was approached, and he provisionally agreed to take on this task. A list of possible committee members is being composed.

LSST Science

NOAO hosted the LSST Transient and Variable Stars Science Collaboration for a two-day meeting in March. The members of the collaboration interacted with LSST project scientists to begin the
process of defining protocols for transient alerts. In addition, they generated models of various transient events to be included in the LSST image simulations. NOAO scientists discussed synergies between NOAO plans for a model of the variable sky and the needs of the collaboration for developing metrics and follow-up strategies. The NOAO project to characterize the variable sky began to focus on Galactic variables. Tests of solar system models to predict distributions of objects also were successful.

**GSMT/ELT Science**

Following the release of the Astro2010 report, the NSF instructed AURA and NOAO to withdraw from any official interactions with the Giant Segmented Mirror Telescope (GSMT) projects.

**Optical Interferometry Science**

NSSC staff participated in a steering committee for and attended and contributed to the Magdalena Ridge Observatory workshop “Resolving the Future of Astronomy with Long-Baseline Interferometry” held March 28–31 in Socorro, New Mexico, on the campus of New Mexico Tech. This meeting attracted strong participation by scientists outside the interferometry community and featured discussion of future science directions and community access to facilities.

The planned announcement of access to the Navy Prototype Interferometer through the NOAO TAC, planned for March 2011, was delayed for at least six months pending review by Navy legal staff.

NSSC staff participated in the CHARA 2011 Science Review in Atlanta, 28 February–2 March 2011, which included discussion of lessons learned during the CHARA program for community access and plans to seek funding to increase the program in the future. SCD staff worked with CHARA staff in preparation of a Georgia State University proposal for participation in the NOAO ReSTAR program.

**Status of FY11 Milestones**

- Host working meetings of each of the LSST Science Collaboration groups. Help the chairs organize these meetings and ensure that results are effectively communicated to the LSST Project.

  **Status:** Completed. The LSST Transient Collaboration group met at NOAO on 21–22 March 2011. For details, see the LSST Science section above.

- Continue to develop figures of merit for evaluating the effectiveness of different observing strategies for achieving key LSST science goals. This evaluation will utilize the Operations Simulator tool and integrate merit functions into simulation reports.

  **Status:** Report formats were created for the five metric sets described as completed in previous quarterly reports. Five draft metrics to evaluate observing cadences were defined and presented at the March team meeting of the Transients and Variables Collaboration. Three of the metrics were implemented during the quarter, with the remainder under continued development. In response to requests from the Image Simulation group and the system scientist, work was begun on requirements for a new metric set to measure the uniformity of sky coverage, with the expectation of completing it during the third or fourth quarter of FY11.

- Deliver a draft LSST Cadence Requirements document.

  **Status:** Completed. A draft document was delivered this quarter.

- Form a new GSMT Science Working Group intended to provide advice and leadership on engagement with the community, TMT, and GMT. The working group should meet at least once
in person to plan its activities in response to the Astro2010 recommendations and guidance from the NSF.

**Status:** This is on indefinite hold as a result of NSF instructing AURA and NOAO to withdraw from any official interactions with the Giant Segmented Mirror Telescope (GSMT) projects.

- Participate in the Steering Committee for the Magdalena Ridge Observatory (MRO) interferometry workshop, tentatively scheduled for March 2011.

  **Status:** Completed. More than 80 scientists attended the workshop, “Resolving the Future of Astronomy with Long-Baseline Interferometry,” which was held 28–31 March 2011 in Socorro, New Mexico.

- Continue efforts to initiate development of a roadmap for the ground-based optical/infrared system with community input and participation.

  **Status:** The committee chair was identified.

- Complete the development of a proposal for Phase 2 of the NOAO program to address the recommendations of the ReSTAR committee. This will include soliciting community involvement and selecting partners for the proposal.

  **Status:** Community proposals were received and reviewed. Selected proposers will be contacted to negotiate arrangements to collaborate on a proposal for future ReSTAR funding.

### 1.4 NOAO SYSTEM TECHNOLOGY CENTER

#### 1.4.1 System Instrumentation

**Program Highlights**

In addition to the progress on milestones noted below, the System Instrumentation group (SI) also completed on-telescope integration and testing of the complete CHIRON spectrograph and detector system for the CTIO 1.5-m telescope. This project is the subject of a Major Research Instrumentation award to Dr. Debra Fischer, and the SI activities are being paid for largely under a contract with San Francisco State University, which is administering the award. The NOAO SI program is one of several subcontractors involved, and it is responsible for mechanical fabrication, supply of a detector controller, and integration of the spectrograph including the CCD and MONSOON/TORRENT controller. The completed instrument was handed over to the science team for commissioning in March 2011.

During this quarter, SI and KPNO completed plans for a consolidation of their engineering staffs in a new group to be called “Engineering & Technical Services - North” (ETS-N). The ETS-N group formally will be part of the KPNO management structure, but the personnel within the new group will continue to work on both KPNO and SI projects as before. The consolidation is intended to provide better coordination of engineering activities between the general areas of mountain support and instrument development and to enable better planning and tracking of all engineering projects.

**Status of FY11 Milestones**

- Complete on-telescope integration and testing of the entire SOAR Adaptive Optics Module (SAM) system, including the Main Module, the Laser Guide Star system, and the integrated CCD imager.
**Status:** Progress continued this quarter. The Laser Guide Star system (LGS) was fully installed on the SOAR telescope, and the Main Module was reconfigured to work with the LGS after prior commissioning in natural guide star mode was completed. Integration and testing of the complete system began during engineering nights in February 2011 and continued through the rest of this quarter. The team verified the opto-mechanical performance of the LGS, completed the process of obtaining clearance from the US Defense Department’s Laser Clearing House for launching the laser, and launched the laser into the sky for the first time in March 2011. Work will continue in the third quarter of FY11 to improve the return flux from the range-gated laser spot with the goal of closing the adaptive optics loop on the laser spot as soon as possible.

- Fabricate, test, and deliver the TORRENT version of the MONSOON controller for all ReSTAR instrument development programs and external instrument collaborators as appropriate.

**Status:** Progressing on schedule. During this quarter, the team completed testing of the modified prototypes and resolved the final issues remaining before proceeding with large-scale production. A modified prototype unit incorporating many of the final changes was delivered to The Ohio State University as a tested system (with a Dewar containing a CCD) to support the integration of the Kitt Peak Ohio State Multi-Object Spectrograph (KOSMOS) (see below). This prototype will be replaced with a final production unit before KOSMOS is delivered to KPNO. As this quarter ended, the TORRENT team was completing and reviewing the final specifications for the production-grade circuit boards in preparation for placing the large orders and beginning production next quarter.

### 1.4.2 ReSTAR Instrumentation

#### Program Highlights

In addition to the progress on milestones noted below, the NOAO System Technology Center (NSTC) participated in the first stages of development for another unsolicited proposal to the NSF for the second phase of implementing the ReSTAR committee’s recommendations. During this quarter, NOAO received proposals from community institutions interested in collaborating on the overall proposal to the NSF. The proposals were reviewed in March 2011, and recommendations were presented to the NOAO director for a coherent program aligned with the ReSTAR priorities.

**Status of FY11 Milestones**

- **KOSMOS:** Deliver the assembled instrument to KPNO and begin integration and commissioning on the Mayall 4-m telescope.
  
  **Status:** Progressing on schedule. NOAO sent the first work package of mechanical parts to The Ohio State University (OSU) in January 2011, and OSU promptly assembled and began testing the slit, filter, and disperser wheel mechanisms. OSU also completed the Instrument Electronics Box. NOAO delivered the integrated rack of control computers in March 2011, and OSU began testing the assembled mechanisms under both engineering-level and observer-level software control. NOAO also delivered an integrated detector-Dewar-controller system in March 2011 for OSU to use in overall system integration and testing. The optics fabricator received the glass blanks and began figuring the collimator and camera lenses.

- **CTIO-Hydra CCD and Controller Upgrade:** purchase a new CCD and the components for a new TORRENT controller.
  
  **Status:** The engineering-grade CCD was received from the vendor (Lawrence Berkeley National Laboratory) in March 2011. Delivery of the science-grade CCD is expected in May 2011.
• COSMOS: Complete fabrication or purchase of all components and begin assembly in The Ohio State University (OSU) instrument lab.

**Status:** Progressing on schedule. NOAO sent the first work package of mechanical parts to OSU in January 2011 (KOSMOS and COSMOS together). Assembly at OSU of COSMOS parts will occur during a lull in the integration work for KOSMOS. The optics fabricator received the glass blanks and began figuring the collimator and camera lenses.

• TripleSpec: Execute a formal partnership agreement with Cornell University for construction of TripleSpec.

**Status:** Underway. Consistent with the schedule as stated in the ReSTAR Program Execution Plan, NOAO organized its internal core team during March 2011 and made contact with Cornell at the end of March. Contract terms will be negotiated during the third quarter of FY11 with a goal of having a contract ready for formal execution by that quarter’s end.

### 1.4.3 Telescope System Instrumentation Program

**Program Highlights**

The Telescope System Instrumentation Program (TSIP) funds development of new instruments for, or operational costs of, non-federal observatories in return for US community access to observing time on those telescopes as administered by the NOAO TAC.

**Status of FY11 Milestones**

• Complete an external review of FY10 TSIP proposals and negotiate sub-awards with successful proposers.

**Status:** The external review was completed in October 2010. In December 2010, the NSF approved funding for two proposals: the continuation through detailed design of the design and development work on the Keck Cosmic Web Imager (KCWI) and the final phase of the Binospec optical multi-object spectrometer for the MMT being built by the Smithsonian Astrophysical Observatory (SAO). NOAO negotiated a Memorandum of Understanding with both SAO and Keck for these sub-awards. Contracts for both sub-awards are in the final stage of negotiation.

• Establish an oversight process for FY10 TSIP sub-awards.

**Status:** The sub-awards with Keck for KCWI and SAO for Binospec include standard provisions for NOAO oversight similar to those used in previous TSIP sub-awards. Implementation of those terms is awaiting execution of the sub-awards.

• Organize a call for proposals for FY11 and organize a review.

**Status:** As of the end of this quarter, Congress had not yet approved an FY11 budget for NSF, so the funding available for TSIP in FY11 is still unknown. No action will be taken as to a call for proposals or review process until the final TSIP funding level is identified by appropriate congressional action.

• Conclude the remaining sub-awards under the Adaptive Optics Development Program (AODP) and close out the program.

**Status:** Underway as projects are completed. Two of the three outstanding projects were completed this quarter.
1.4.4 LSST Technology Program

Program Highlights

The LSST efforts this quarter continued on all design aspects but were highlighted with milestones related to the summit and primary mirror. Design efforts focused on the interfaces between systems and the update of formalized requirements. The significant developments occurred on site with the start of the privately funded initial excavation and with the mirror as it progressed into the last stages of optical processing. The summit facility 50% design review was completed, and the next phase of that design effort was begun. The LSST Project also completed the revised Major Research Equipment and Facility Construction (MREFC) construction proposal and submitted it to the NSF Division of Astronomical Sciences (AST).

Status of FY11 Milestones

- Facility and Site: support the completion of the phase 1 summit support design effort, which is contracted with ARCADIS in Santiago.

  Status: Biweekly interface meetings continued throughout this period. The La Serena-based LSST Project architect continued to visit twice a month with the Architecture team in Santiago and included Tucson-based engineers in many of these meetings through remote connections. The Telescope team provided a written report of their 50% design package review.

- Facility and Site: complete the configuration design of the Vertical Reciprocating Lift, an 80-ton equipment lift, with support of contracted effort.

  Status: The kick-off meeting for the configuration design contract was held with project personnel, ARCADIS engineers, and the contractor, PFLOW. Design requirements were reviewed and a clear direction regarding the lift design was established for each design team.

- Facility and Site: complete the initial site leveling design and procurement package, and support any early leveling activity pursued with non-federal funds by AURA and LSST Corporation (LSSTC).

  Status: The initial site leveling effort was initiated this period with the placement of the Rocterra Ingeniería y Servicios, Ltda. contract. The final scope and technical approach were negotiated and the five-month effort was started on February 7. The pre-construction elements of flora and fauna mitigation measures were carried out by University of La Serena biologists. The support infrastructure for the contractor was completed and site monitoring equipment was put in place to monitor the activity with webcams and dust and vibration monitors. A Web site (www.ctio.noao.edu/facilities/LSST_siteprep/index.htm) was established to communicate the day-to-day plans for the work. The Rocterra team mobilized at the site, and after initial preparation activities, they set off the first production blast on March 8 at 12:56 pm local time (see Figure 3 on page 3).

- Dome Development: complete the Preliminary Design Package including a requirements document and interface details.

  Status: The Dome requirements document was revised to match current system allocations. The design also was revised to address developing building specifics and remaining conceptual design comments. Additionally, the interface requirements for the building were updated to support the facility design effort.
• Reflective Optics: collaborate with the LSST primary mirror vendor to evaluate the metrology system and ongoing polishing performance.

**Status:** Progress with the primary mirror continued and reached an important milestone this quarter. The new, active lap fabrication was completed and commissioned, and loose abrasive finishing was started. The lap will be used with successively finer grinding and polishing grit to complete the mirror in the next 18 months.

• Reflective Optics: monitor and evaluate the technical interfaces and fabrication progress of the primary mirror shipping container, which is under construction by LSST Corporation (LSSTC) with non-federal funds.

**Status:** The status of the contract remains active. The contractor was advised of the July 2012 mirror delivery schedule and is adjusting the manufacturing schedule for the shipping container accordingly.

• Wavefront Alignment and Calibration: operate LSST telescope assets to conduct calibration validation experiments.

**Status:** The Calypso Telescope was closed for operation this quarter. The appropriate equipment was winterized for protection, and periodic inspections of the telescope facility were conducted throughout the quarter.

• Wavefront Alignment and Calibration: select the calibration screen projector design through review of prototype performance results, and consult on the development and testing completed by LSST.

**Status:** Testing revealed that the available engineered diffuser limits the performance of the projector system below the required uniformity specification. A contract to design and prototype a suitable diffuser was let with RPC Photonics. A calibration system design workshop was held on March 22 in Tucson to review each of the calibration system assets assigned to the Telescope and Site team. An alternate plan to use a visible camera with a single, narrowband filter was established. An alternate design for the calibration screen projector using an integrating sphere also was identified for further analysis.

• Wavefront Alignment and Calibration: deploy the prototype active optics system (AOS) curvature algorithm pipeline for hardware testing.

**Status:** The software framework for the updated AOS pipeline was completed this period. The image preprocessing element was updated and enhanced as well as connections to Zemax for testing purposes. The optical system reconstruction element previously developed and tested was incorporated. Work continued on the wavefront determination module.

• Software and Controls: develop the OCS and Scheduler preliminary design.

**Status:** Esper Software was implemented into system middleware prototypes to assist in telemetry trending analysis and exception detection. The performance evaluation is underway on recently revised middleware data streams. The analysis code is available as open source and is getting strong consideration in that form.

• Utility Systems: finalize the preliminary design for the electrical distribution, grounding, and utility services for the summit facility.

**Status:** A significant part of the telescope utility system on telescope is the thermal monitoring system. The last parts of the telescope thermal couple system were received. The system de-
Development was non-federally funded to support the early need for calibrated thermocouples to be installed in the M1/M3 mirror. All four instruments were tested and fully accepted.

- Systems Engineering: complete the requirements modeling for the telescope and site, as well as the observation control systems.

**Status:** During this quarter, the Telescope and Site team conducted a thorough review of the LSST System Requirements (LSR) document, the Observatory System Specification (OSS) document, and the Telescope and Site requirements document. The LSR and OSS documents, which trace the science requirements down to the subsystems, are under project-wide review before being put under configuration control. In addition, the active optics, wavefront sensor, and integration test camera requirements were compiled.

- Systems Engineering: finalize the hazard analysis and risk analysis of the telescope and site system.

**Status:** Hazard and safety analysis meetings continued biweekly this period. The Telescope and Site system engineer and the NOAO safety engineer continued to have detailed reviews of specific portions of the system. The meetings include the appropriate engineers developing designs for the equipment and processes to identify specific personnel and equipment hazards. The Hazard Analysis Plan was updated to reflect the current approach and is now under review to become an LSST-wide controlled policy.

- Project Management: support the project with participation as the Deputy Project Manager and as an LSST Board member, provide oversight of the image simulation efforts, complete the 2010 inputs for the Project Management Control System, and support and participate in project-wide reviews.

**Status:** The NOAO-based Telescope and Site team, the deputy project manager, and the NOAO member of the LSST Board stayed closely engaged in the project this quarter. The MREFC proposal was finalized and submitted and “red team” reviewed by the Board. Weekly management and monthly board teleconferences continued. A biweekly Joint Oversight Group (JOG) meeting was started that also is supported. The management team supported the project efforts at the January AAS meeting in Seattle, and the LSST splinter meeting was held at the University of Washington prior to the AAS meeting. A long-range plan for image simulation was developed, and a senior managers meeting was supported at SLAC on March 17. The three subsystem managers met with the project manager to discuss preparations for the Department of Energy Directors Review and Preliminary Design Review, strategies for managing LSST, and general organizational topics. The telescope model and several outreach materials were sent to Chile to be part of an installation at the foreign ministry celebration of astronomy in Chile and to highlight the US activities in Chile for the US president’s visit in February.

- Operations Simulator: lead the operation simulation group, develop scientific metrics for analysis operation simulation output.

**Status:** The team provided simulation and metric results to the Transients and Variables Science collaboration meeting sponsored by NOAO in Tucson on March 21–22.

- Education and Public Outreach: support LSST graphic design tasks and Web site development.

**Status:** Graphic support to the production of the MREFC proposal was completed as well as many new graphics for the LSST Board meeting and Congressional Visit Day, both planned in April.
1.4.5 GSMT/ELT Technology Program

Program Highlights
As reported for the previous quarter, the NSF issued guidance to AURA stating that NSF would take direct responsibility for formal oversight of the two US-based Extremely Large Telescope (ELT) programs, Thirty Meter Telescope (TMT) and Giant Magellan Telescope (GMT). This action was taken to avoid conflicts of interest—or the appearance thereof—and to ensure that it will be possible for NOAO to have the option of participating in such an ELT project.

Although ELT-related activities will continue at a low level within NSTC, the Giant Segmented Mirror Telescope (GSMT) Program Office will be eliminated as a separate sub-division and its personnel absorbed within a more integrated design and development group during the coming quarter.

Status of FY11 Milestones

- Prepare a technology development action plan in response to Astro2010 recommendations on GSMT. This activity likely requires guidance from the NSF.

  **Status:** As indicated above, the NSF decided to assume a direct oversight role and did not ask NOAO to prepare a development plan. Consequently, no activities are expected in this area.

- Complete the close-out of the TMT/AURA site survey in Chile.

  **Status:** Maintenance of the equipment was completed. The equipment to be returned to TMT or Canada is being prepared for shipment. The shipment should take place in April, which will close out this activity.
2 NOAO-WIDE PROGRAMS

2.1 CENTRAL ADMINISTRATIVE SERVICES

Program Highlights
Central Administrative Services (CAS) focused on the calendar year-end process, which included preparing audited financial statements and tax reports for AURA, WIYN, SOAR, and LSSTC. To help handle increased workload, a vacant accountant position was filled. The accounting staff in both the North and South coordinated efforts on the upcoming software conversion as NOAO South migrates to the application used at NOAO North.

As illustrated in Figure 8 below, the average monthly exchange rate of the US dollar relative to the Chilean peso decreased during this quarter. The NOAO Annual Program Plan FY 2011 assumes an exchange rate of 500, while the average rate for the quarter was approximately 481. Below is a one-year chart showing the exchange rate trend.

![Chart showing exchange rate trend](exchange-rates.org)

Figure 8: Chart courtesy of exchange-rates.org.

Status of FY11 Milestones

- Accounting will continue working with NOAO South to help finalize the transition to their new accounting software.

  **Status:** The new accounting server was brought online and made available for testing to the accounting and procurement staff in the South. Programming for a check writing and electronic funds transfer application neared completion.

- Human Resources will undertake a review of Human Resources systems, processes, procedures, and policies.

  **Status:** In progress.

- Human Resources will develop and deliver training programs for staff and managers. It will also promote the health and welfare of the NOAO workforce and establish programs to enhance employee services.

  **Status:** A program was developed for a Leadership and Team Building training session, which is scheduled for April 2011 at NOAO South. Health and wellness programs were offered to NOAO North staff at the Tucson and Kitt Peak locations throughout the quarter and will continue during the rest of the calendar year.
• Contracts, working with NOAO South, will review and revise policies and procedures to ensure they comply with newly released AURA procurement policies.

**Status**: The senior sub-award & contracts officer and the procurement supervisor traveled to NOAO South to review policies.

### 2.2 OFFICE OF SCIENCE

**Program Highlights**

Planning continued for a community science meeting in August on DECam and the Dark Energy Survey. A new Goldberg fellow (see Status of FY11 Milestones below) was recruited this quarter. The Office of Science (OS) assisted in putting in place the NOAO Responsible Conduct in Research training program. The OS head of program visited the scientific staff at NOAO South to discuss issues related to career development, scientific environment, and research.

**Status of FY11 Milestones**

• Develop a program for staff career development.

  **Status**: OS is re-scoping the program due to limited funds. To assist with this effort, OS staff took advantage of the mentoring training program offered by Gemini to learn about mentoring strategies and techniques. Several of the NOAO South scientific staff attended the mentoring training offered in La Serena in the fall of 2010. The OS head of program attended the session in Hilo in January 2011. OS investigated the possibility of NOAO South staff joining the Gemini mentoring program.

• Recruit a Goldberg Fellow postdoc for an FY11 start.

  **Status**: Completed. The new Goldberg Fellow, Colette Salyk, will start in November 2011.

• Create a scientific visitor program.

  **Status**: Funding has been allocated. OS is hosting several scientific visitors on sabbatical this year and is developing protocols to anticipate the needs of such longer-term visitors.

• Enhance the interaction between scientific staffs at NOAO North and South.

  **Status**: Funds are available to encourage staff members who are visiting the other hemisphere for some purpose to either extend their stay in Tucson or La Serena or make a stop there in order to interact with their colleagues. The staff members are aware of these funds and have taken advantage of the program. OS is investigating other opportunities for closer interaction between the South and North science staffs.

### 2.3 EDUCATION AND PUBLIC OUTREACH

**Program Highlights**

The Education and Public Outreach (EPO) staff were very busy this quarter. The NOAO Hands-On Optics Arizona program (sponsored by Science Foundation Arizona) continued at sites around the state this quarter. Local programs were run by the EPO undergraduate outreach student cadre at the Jim and Vicki Click Boys & Girls Club in Tucson. Follow-up trainings for Boys & Girls Club leaders were held at Discovery Park (Safford) and the Yuma Boys & Girls Club. NOAO had a booth at
Ted Walker Day at Old Tucson Studios and held the annual Optics Fest at St. Michael’s School for fourth- and fifth-grade students from around Tucson. Planning began for the April 8 Yuma Star Party, which has an expected turnout of more than 500. On March 15 and 16, EPO staff conducted teacher professional development workshops in preparation for the Yuma Star Party. Over 40 fifth-grade teachers in Yuma were trained. This was every fifth-grade teacher of non-special education classrooms in all of the Yuma school districts.

The Teaching with Telescopes program organized a major Galileoscope building effort February 17 for the “Math Moves You” event in cooperation with Raytheon and the University of Arizona. NOAO staff helped 350 high school juniors build their own Galileoscopes during the event. The Teaching with Telescopes program website was updated with the 2011 Galileoscope Observing Guide as well as an updated Galileoscope Optics Activity Guide. Teaching with Telescopes kits were built for Chile as well as for the Yuma Star Party.

Over 40 (mostly local) Dark Skies education events took place this quarter. About three-fourths of the events were sessions where hands-on activities were done with students on the basics of light pollution, its mitigation, and how to measure the sky brightness. Most sessions were given with two classes each session attending the Tucson Unified School District/University of Arizona Cooper Center for Environmental Learning (CCEL) overnight. Seven of the events were presentations on dark skies education, which occurred at three AAS poster sessions, a radio show, two sessions at the National Science Teachers Association meeting (NSTA), and the Astronomical Society of the Pacific/Jet Propulsion Lab’s (ASP/JPL) Night Sky Network. Six professional development workshops on dark skies education were provided for the Arizona Science Teachers Association, the Project ASTRO teachers, CCEL teachers, Sahuaro Girl Scout Volunteers, ASP’s Astronomy From the Ground Up educators (from small museums and science and nature centers), and the Tucson Amateur Astronomy Association. Three podcasts were aired on 365DaysOfAstronomy.org featuring the Dark Skies Crusader teaching about light pollution and its effects on energy use, health, and wildlife.

For the first time, the worldwide citizen-science campaign on GLOBE at Night took place twice in a year: February 21 through March 6 and March 22 through April 6. This meant developing new materials (translations, online interactive tools, star charts, and other resources) for two new constellations. NOAO, also for the first time, started receiving all GLOBE at Night data submissions for the campaigns. A major development was the creation (in-house) of a Web application for smart mobile devices. Facebook and Twitter pages for GLOBE at Night also were introduced this quarter. The data submission, Web app, new on-line files, and new social media worked almost flawlessly. Over 13,000 measurements were contributed to the GLOBE at Night campaign by the end of the second 2011 campaign. During the seven two-week campaigns held over the last six years, over 65,000 measurements from 100 countries have been taken.

The EPO undergraduate outreach student cadre was busy during this quarter helping with half of all EPO activities. They provided 16 dark skies activity sessions at Camp Cooper (CCEL) and led eight sessions on astronomy and physics at the Jim and Vicki Click Boys & Girls Club in South Tucson. They helped with several classroom visits on careers in astronomy, four workshops, and various school star parties including a very successful one for the Tohono O’odham that took place.
on March 24 at the Baboquivari Indian Oasis Elementary School in Sells, Arizona. It focused on dark skies education activities and GLOBE at Night. The student cadre also played a key role in creating three audio podcasts on dark skies education, as well as in bringing dark skies education to the local Girl Scouts this quarter. The student cadre continually demonstrates their key role in the success of activities and events supported by EPO.

Educational opportunities to interact with the Tohono O’odham Nation this quarter were numerous. In February, NOAO hosted its first booth at the annual Tohono O’odham rodeo and fair. Over a dozen NOAO employees helped to run the booth for three days, and hundreds of members of the Nation visited, talked with the employees, and looked through solar telescopes. Other activities this quarter included school visits to the elementary school to run activities and discuss possible opportunities for teacher enhancement programs, a star party for students and parents, and a day at the Tohono O’odham Community College to help with their annual “I’m Going to College” day for sixth graders (180 students in four separate classes). These led to the groups making plans to visit Kitt Peak for Night Observing Programs and/or sleepovers as part of the Youth Group Overnight program. Plans are being made for additional activities later this spring and for a Tohono O’odham family night at Kitt Peak next October.

The 2011 CTIO Student program at NOAO South was kicked off in January with the arrival of a wide array of 25 young scientists, engineers, and vocational interns. Three undergraduate students majoring in astronomy at US universities were hosted by CTIO’s NSF-funded Research Experiences for Undergraduates (REU) program. These REU students were joined by two astronomy undergraduates enrolled at Chilean universities who came to participate in the Prácticas de Investigación en Astronomía (PIA) program, the Chilean equivalent to the REU program. The CTIO Student program was bolstered further by the participation of two Fulbright Scholars. In addition, two more senior astronomy interns were hosted: one was funded through Union College, the other was supported through his own independent internship funding. In addition to these nine astronomy students, the CTIO summer internship program attracted 16 interns in diverse vocational disciplines ranging from mechanical engineering through to food services.

Even though the REU and PIA programs have formally ended for the 2011 period, two of the REU astronomy students continue to be engaged in research activities with NOAO South and Gemini mentors. J. O’Connell (Tennessee State University) was invited to remain at CTIO for a further six weeks, working with her CTIO mentor on the “Structure and Formation of Globular Cluster Systems,” research that has already seeded a March 2011 observing proposal for four nights of Gemini exchange time on the Subaru 8-m telescope. Furthermore, through a Study Abroad program, B. Basarab (Middlebury College) will stay in La Serena until mid-July, where he will continue his research project, “Updating and Modernizing the Standardization of the Lick Spectral Indices System,” with his two mentors at Gemini Observatory.

The NOAO South Education and Public Outreach (EPO-S) team participated as trainers in the first Training in Astronomy for School Teachers organized by the Astronomy Department of the University of Chile. The course was given during the third week of January and included the participation of 40 teachers coming from all over Chile. The classes taught by the members of EPO-S were Archaeoastronomy, Dark Sky Education, and Teaching with the Galileoscope. In March, the Chilean environmental minister, along with other important regional authorities, visited the observatory in the context of announcing the revision of the new light pollution regulations. During this event, the authorities were introduced to the Dark Sky Education program developed and implemented by NOAO North and South. The EPO-S team led the promotion of the GLOBE at Night 2011 campaign in Chile, training teachers at the Centro de Apoyo a la Didáctica de la Astronomía (CADIAS) facility and promoting the light pollution measurements among students from all over the region, while also doing measurements themselves to complement the student measurements and provide more complete coverage of the of light pollution measurements around the observatory.
Media Releases

There were two releases during this time: one about Victor Blanco’s death and a tribute to his work and a second concerning the GLOBE at Night campaign for both Northern and Southern Hemispheres. NOAO is increasing its social media presence. This quarter saw the creation of an NOAO Facebook page and an NOAO Twitter feed. Facebook and Twitter will provide NOAO with new venues to share press releases, research results, and other news. NOAO is sponsoring one podcast a month for the 365 Days of Astronomy podcast. These podcasts feature interviews with NOAO scientists highlighting their research. The podcasts will continue monthly for the rest of 2011.

Status of FY11 Milestones

- Lead national efforts related to the Teaching with Telescopes professional development support program, maximizing the educational value of the Galileoscope telescope kit (with 200,000 Galileoscopes now in circulation).
  
  Status: The Teaching with Telescopes program is being used for the professional development of the teachers in Yuma, Arizona, and with the donation program for teachers who received 15,000 Galileoscopes through the AAS.

- Support a wide-ranging, dark skies awareness program for southern Arizona and Chile, with particular emphasis on the February and March GLOBE at Night campaigns.
  
  Status: The GLOBE at Night program offered numerous workshops at the Cooper Center for Environmental Learning to help Tucson teachers prepare for the GLOBE at Night campaign. The two-week campaign was expanded to encompass two campaigns offered during February and March. An active GLOBE at Night program in Chile for CTIO/CADIAS is being supported with over 100 teaching kits.

- Conduct workshops/programs in coordination with the National Science Teachers Association (NSTA), the American Astronomical Society (AAS), Astronomical Society of the Pacific (ASP), and the Association of Science-Technology Centers (ASTC).
  
  Status: NOAO was very active at this year’s national NSTA meeting in San Francisco in March. An EPO staff member made a GLOBE at Night presentation at the GLOBE partners meeting, conducted a Teaching Astronomy with Small Telescopes session at the Informal Science Education day (where Galileoscopes were built and distributed), assisted in a Galileoscope workshop with representatives from Chabot Science Center and Search for Extraterrestrial Intelligence (SETI) Institute, participated in the National Earth Science Teachers Association Share-a-Thon, presented a workshop at the NASA booth on “Infrared Radiation and the Mystery of the Leslie Cube,” gave an invited talk on “Collaborative Problem Solving with Hands-On Optics” at the Exemplary Science Programs session, and led a session titled “Easy Optics Demonstrations.”

- Assist in the support of the teacher researcher participants of the NOAO/NASA Spitzer Teacher and Student Research program and its follow-on program the NASA IPAC Teacher Archive Research Program (NITARP) and the University of California Berkeley WISE Teacher Research program.
  
  Status: EPO continues to interact with both of these programs and is working with NITARP on a possible workshop for the national NSTA meeting next year.
2.4 NOAO DIRECTOR’S OFFICE

Program Highlights

Within the program management area, NOAO Director’s Office (NDO) finished an internal analysis of FY10 planned versus achieved financial performance in order to better plan for FY11 and FY12. The NOAO Long-Range Plan (LRP) was updated and then reviewed by the AURA Observatory Council (OC). As part of the LRP revision process, updates specific to the recommendations of the Astro2010 decadal survey were incorporated. With the release of the official federal funding request in February, the NOAO FY12 program planning process began. Toward the end of this quarter, contingency plans were developed in advance of possible federal government shutdowns and likely lower-than-requested FY11 funding levels. Four candidates were interviewed for the open position of Associate Director of KPNO.

On the side of community outreach, the annual NOAO Town Hall was held at the January 2011 AAS meeting in Seattle. A presentation from the NOAO director was followed by a vigorous discussion session. The director also participated in a BigBOSS (Baryon Oscillation Spectroscopic Survey) collaboration meeting at the Lawrence Berkeley National Laboratory and visited the astronomy and physics departments at the University of Michigan.

Committee interaction this quarter included two meetings. The director attended the AURA Board meeting in Washington, D.C. The AURA Observatory Council meeting in Tucson was attended by both the director and deputy director.

The director gave the annual State of NOAO address in March. NOAO North (Tucson and Kitt Peak) and NOAO South (La Serena and Cerro Tololo) were all linked by video. The director presented NOAO science, team, and service awards and AURA service awards.

Reports produced by and submitted from NDO to NSF this quarter included three annual project reports and five scientific quarterly reports. The various reports were submitted in compliance with the terms of four cooperative support agreements and four scientific program orders. In addition to those eight reports, work on two other scientific quarterly reports was begun and, as noted above, the NOAO Long-Range Plan was updated and received an initial review by the AURA OC.

Status of FY11 Milestones

- Deliver a revised Long-Range Plan by the end of the second quarter in FY11.

  **Status:** A draft was reviewed and approved by the AURA Observatory Council in March 2011. Final delivery to NSF was delayed at their initiative to allow time for review by the NSF NOAO Program Review Panel in late April 2011.

- As necessary, prepare an action plan in response to recommendations from the Astro2010 decadal survey that affect NOAO.

  **Status:** The decadal survey report did not make NOAO-specific recommendations that require a formal response and action plan. However, several decadal survey recommendations touch on NOAO indirectly. As necessary, the NOAO Long-Range Plan (see above) was revised to cover such indirect recommendations.

- Continue, in coordination with AURA, to work on broadening participation in the NSF science enterprise by engaging individuals, institutions, and geographical areas “…that do not participate in NSF research programs at rates comparable to others.” (Quote from the Executive Summary of Broadening Participation at the National Science Foundation: A Framework for Action, August 2008).
Status: Both of the NOAO diversity co-advocates were involved with activities at the January 2011 AAS meeting: a special session was organized on “Strategies for Addressing Harassment & Prejudice” with articles on the session due to be published in the Committee on the Status of Women in Astronomy’s STATUS and Committee on the Status of Minorities in Astronomy’s Spectrum newsletters, and a poster was presented on broadening participation efforts at NOAO.

- Review family-friendly policies, particularly maternity/paternity-leave policy, and develop possible alternatives and/or modifications that also include the impacts of Chilean law.

Status: A new AURA parental leave policy became effective 1 January 2011. The parental leave benefit is available to AURA US-paid staff in the event of a birth or adoption. Notice of the policy was posted on the internal NOAO CAS Web site with a link to the AURA Personnel Policies and Procedures Web site (www.aura-astronomy.org/about/sectionB.asp) for details.

- Address NOAO-specific issues brought up in the Climate Survey (e.g., management communication and performance rewards).

Status: The NOAO diversity co-advocates (DAs) began holding discussions of ways to enhance communication (to follow up on the Climate Survey). With representatives from different departments, a list of what is working and what would be useful is being developed. The DAs implemented and encouraged scientific staff to assist in taking notes at monthly scientific staff meetings. These notes, posted on the NOAO internal Web pages, are useful for staff who missed the meeting and for fostering a more open and communicative environment with non-scientific staff.

- Work to develop internships at NOAO for minority students, with a particular emphasis on the area of engineering.

Status: Funding for this initiative has not been identified yet.

- Maintain outreach to schools and programs in southern Arizona and IV Región de Coquimbo (Chile) that serve groups whose representation in science and engineering is less than their representation in the general population, funding permitting.

Status: (See related discussion in section 2.3, Education and Public Outreach.)

- Continue to develop the Office of Compliance Web site to provide a one-stop portal for policy information and training for staff.

Status: The Office of Compliance Web site can be found at http://www.noao.edu/oc/oc-directory.php. During this quarter, a compliance directory linking appropriate NOAO and AURA staff and policies was added to the site, providing an easy link to compliance information and access to various sites including NSF.gov.

- Develop and provide policy and procedural training to NOAO and other AURA Centers in the areas of federal agency grant and agreement policies, procurement, conflict of interest, integrity in research, American Recovery and Reinvestment Act of 2009 (ARRA) and other pertinent policies or program regulations.

Status: Conflict of Interest (COI) training was provided by the NOAO chief compliance and COI officer to NOAO North, LSST, and NSO/ATST staff. Copies of the training were posted on the Office of Compliance Web site (www.noao.edu/oc/coi-dfn.php) for easy access.

- Work with the Office of Science to strengthen the Responsible Conduct in Research (RCR) training.
Status: A full NOAO RCR Training program was implemented and posted on the Office of Compliance Web site. All current undergraduates, graduates, and post-docs completed the training. Training for the new Research Experiences for Undergraduate students at NOAO North will occur upon their arrival this spring. The NOAO policy is published at http://www.noao.edu/oc/oc-rcr.php.

- With the AURA risk review manager, ensure that AURA Center procedures are in compliance with AURA and other federal policies and regulations. Work with Central Administrative Services and their affiliates to update procedures to meet new AURA and agency policies.

Status: On-going.

- Review and approve conflict-of-interest (COI) management plans as needed and implement updated AURA COI policies.

Status: The new AURA COI policy was implemented. A Web site (http://www.noao.edu/oc/oc-rcr.php) was created for staff to obtain information on conflict of interest and includes an electronic COI disclosure form. This made the annual disclosure more efficient and also provided a Spanish version for NOAO South Chilean staff.

2.5 ARRA INFRASTRUCTURE RENEWAL

Program Highlights

For Tucson and Kitt Peak, efforts have been ongoing to finalize the various bid documents on a few remaining projects. Contractors were busy during the quarter to complete the initial phases of work for the electrical and computer room renovation projects. Several power outages were required during the quarter for the electrical work and transformer changeout. In addition, the major portion of the computer room work was completed and the new units are in operation. For the remaining projects, administrative and bid preparation work continued on the building management system project, Kitt Peak water plant renovation, and instrument handling facility. These projects are targeted for startup in the next quarter as necessary approvals are obtained.

At CTIO, work progressed on the Pachón kitchen and dining facility. The Blanco control room was completed and the Blanco computer room was nearly complete. Both of these projects are in support of DECam and improved operations in general.

Status of FY11 Milestones

- Begin to perform the work required to complete the major sub-contracted projects funded by the ARRA at Cerro Tololo, Cerro Pachón, La Serena Base Facility, Kitt Peak, and Tucson Headquarters.

Status: While many projects already were completed, the following projects had activity this quarter.

CTIO Mountain Infrastructure (Cerro Tololo and Cerro Pachón)

Pachón kitchen & dining facility: A contract for phase three is underway and construction is progressing. The completion of this phase is expected to occur the end of June 2011, if the weather conditions are favorable.

Mountain road guard rail installation: With NSF approval, the funds to this account were used to repair a damaged CTIO Frequency Converter in the previous quarter and to purchase a
standby generator. The generator arrived in CTIO the last week of March 2011 and will be installed and put in operation during the next quarter.

Kitt Peak (KPNO) Infrastructure

KPNO water system renovation: Bids were obtained and a request for approval of the contract award was submitted to NSF. Prior to obtaining approval, the proposed vendor notified NOAO that they would not be able to undertake the project due to unanticipated issues. NOAO is evaluating the situation and it is possible that the project will have to be rebid.

Kitt Peak instrument handling facility: Preliminary bid documentation is still being prepared. Requests for formal approval to proceed with bid and construction efforts were submitted to NSF. Other documentation regarding the proposed construction also was provided to the Tohono O’odham Nation.

Tucson Infrastructure

Replace and renovate electrical supply/distribution equipment: The first phase of the project was completed during this quarter. The work included replacement of the motor control center, installation of new main breakers, and the replacement of the primary 1000 KVA transformer with a new 225 KVA transformer. The second phase is in progress.

Renovate computer room electrical, cooling and fire detection/suppression systems: The new computer room air conditioning units were installed and are operational. The majority of the computer room work was completed with efforts continuing on the remaining electrical and fire alarm system efforts.

Replace 15-year-old building energy management and control system: Bid documentation was prepared during this quarter and provided to the NOAO contracts office. It is anticipated that the project will be out for bid during the third quarter of FY11 and a contract awarded.

- Begin repairs and renovations at NOAO South to be completed with NOAO South labor, and which include La Serena and CTIO meeting room renovations, and the Blanco instrument handling facilities and cooling system.

Status: This quarter saw activity on the following projects.

Dormitories repair & renovations: A roof repair for the Cerro Tololo dormitories and houses was carried out and completed.

Blanco 4-m computing & console upgrade for DECam: The console room relocation, refurbishments, and upgrades were completed. The computer room is almost complete and should be operational at the beginning of next quarter.

Blanco 4-m mirror coating chamber: While this is mostly done, spares still need to be purchased and some minor repairs completed.

Blanco 4-m entrance protection: Almost 90% completed.

Blanco 4-m cooling system upgrade: A 40-ton chiller unit was purchased and shipped. It is expected to arrive in Chile by the first week of April 2011.

Cerro Tololo UPS upgrade: The new UPS (uninterruptible power supply) was installed and placed in operation. Recommended spares and a service contract still need to be purchased.
For semester 2011A, a total of 226 programs were accepted for observing at the NOAO telescopes and the System facilities granting open-access time through the NOAO TAC. The following table provides a statistical breakdown of the programs detailed in the lists below.

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### 3.1 CERRO TOLOLO INTER-AMERICAN OBSERVATORY

**CTIO Telescopes: 2011A Approved US Programs (42), and US Theses (15)**

- B. Barlow (G) (U. of North Carolina), S. Geier, U. Heber, T. Kupfer (G), L. Classen (G) (Dr. Remeis-Sternwarte Bamberg): “The MUCHFUSS Project - Searching for the Most Massive Companions to Hot Subdwarf Stars”
- M. Blake, D. Johnson (U) (University of North Alabama): “A Search for Variable Stars in Two Old Open Clusters”
- H. Bond (STScI): “A Search for Reflection Nebulae around Galactic Cepheids”
- H. Bond (STScI): “SMARTS Monitoring of the Exotic Variable Star V838 Monocerotis”
- R. Campbell, R. Students (U), R. Smith (CTIO), N. van der Bliek (NOAO): “CTIO REU/PIA Observations: Photometry of Polars”

**Telescope** | **Nights**
---|---
SOAR | 4
CT-1.0m | 7
CT-1.0m | 7
CT-1.3m | 0.85
SOAR | 3
CT-1.0m | 8

* Key: (T) = Thesis Student; (G) = Graduate; (U) = Undergraduate; (O) = Other
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CTIO Telescopes: 2011A Approved US Programs (42), and US Theses (15) *

- R. Ciardullo (Pennsylvania State U.), G. Jacoby (GMT), J. Feldmeier (Youngstown State U.), K. Herrmann (Lowell Observatory): “The Distance to the Antennae Galaxy”
- B. Cobb (George Washington U.), C. Bailyn (Yale U.), J. Bloom (UC Berkeley): “Optical/IR Follow-up of Gamma-Ray Bursts from SMARTS”
- K. Covey (Cornell U.), J. Stauffer, M. Morales-Calderon, L. Rebull (California Institute of Technology-Dept. of Astronomy), P. Plavchan (NEXScI), R. Gutermuth (U. of Massachusetts): “Spectroscopic Monitoring of Embedded Young Stars: Coordinated ANDICAM/Spitzer Light Curves”
- P. Eisenhardt (CalTech-JPL), L. Yan (IPAC), J. Wu (CalTech-JPL), C. Tsai (IPAC), D. Stern (CalTech-JPL), S. Stanford (UC Davis), S. Petty (UCLA), A. Blain (University of Leicester), R. Griffith (O) (CalTech-JPL), C. Bridge (California Institute of Technology-Dept. of Astronomy): “Spectroscopy and Imaging of a Complete Sample of WISE Hyper-Luminous Galaxy Candidates”
- C. Gelino (California Institute of Technology-Dept. of Astronomy), J. Kirkpatrick (IPAC), A. Mainzer, M. Cushing, P. Eisenhardt (CalTech-JPL), M. Skrutskie (U. of Virginia), R. Griffith (O) (CalTech-JPL): “Photometric Follow-up of WISE Brown Dwarf Candidates”
- H. Guenther (SAO): “Winds, Accretion and Activity: Deciphering the FUV Lines in TW Hya”
- C. Johnson, M. Rich (UCLA), R. de Propris (CTIO), A. Koch (University of Leicester), A. Kunder (CTIO), A. Pipino (UCLA): “Chemical Abundances and the Formation and Evolution of the Galactic Bulge”
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CTIO Telescopes: 2011A Approved US Programs (42), and US Theses (15)

J. Kleyna (U. of Hawai‘i, Manoa): “Main Belt Comet Follow-up with the SMARTS 1.3 m”


J. Lee (Carnegie Observatories), C. Ly (STScI), D. Dale (U. of Wyoming), S. Salim (Indiana U.), I. Momcheva (Carnegie Observatories), M. Ouchi (University of Tokyo), R. Finn (Siena College): “Extending Deep Wide Hα Galaxy Surveys to Higher Redshift with NEWFIRM”

K. Long (STScI), P. Rodriguez-Gil (Instituto de Astrofísica de Canarias), L. Schmidtobreick (ESO), B. Gaensicke (University of Warwick): “Fighting for Accretion: The Origin of Low States in Cataclysmic Variables”


A. Mahabal, A. Drake, S. Djorgovski (California Institute of Technology-Dept. of Astronomy), E. Christiansen (Gemini Observatory-South): “Follow-up/light-curves of transients from the Catalina Realtime Transient Survey”


T. Metcalfe (HAO), T. Henry (Georgia State U.), D. Soderblom (STScI), S. Basu (Yale U.), P. Judge, M. Knolker, M. Rempel (HAO): “Activity Cycles of Southern Asteroseismic Targets”

J. Najita (NOAO), J. Muzerolle (STScI), S. Strom, G. Doppmann (NOAO): “Transition Objects: Photoevaporation, Grain Growth, or Planet-Forming Disks?”


A. Rest (STScI), C. Badenes (Weizmann Institute of Science), M. Bergmann (NOAO), S. Blondin (ESO), A. Clocchiatti (Pontificia Universidad Católica de Chile), K. Cook (Lawrence Livermore National Laboratory), A. Filippenko (UC Berkeley), R. Foley (Harvard-Smithsonian Center for Astrophysics), M. Huber (Johns Hopkins U.), D. Kasen (UC Berkeley), T. Matheson (NOAO), P. Mazzali (Max-Planck-Institut für Astrophysik), B. McDonald (G) (McMaster University), K. Olsen (NOAO), B. Sinnott (G) (McMaster University), R. Smith (CTIO), N. Suntzeff (Texas A&M U.), D. Welch (McMaster University), M. Wood-Vasey (U. of Pittsburgh): “Echoes of Historical Supernovae in the Milky Way Galaxy”

B. Schaefer (Louisiana State U.): “Orbital Period Changes across the Recent Eruptions of Two Recurrent Novae, the Dynamical Measure of the Ejected Mass, and Whether These Will Become Type Ia Supernovae”

S. Schmidt, D. Wittman, J. Tyson (UC Davis), I. Dell’Antonio (Brown U.), R. Ryan, P. Thorman, A. Choi (G), W. Dawson (G), B. Ascaso, C. Morrison (G) (UC Davis): “A Near Infrared View of the Deep Lens Survey”
### CTIO Telescopes: 2011A Approved US Programs (42), and US Theses (15)

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### US Thesis Programs (15)

R. Asa’D (T) (U. of Cincinnati), A. Ahumada (ESO), M. Hanson (U. of Cincinnati): “Spectra of Star Clusters in the LMC as an Age Indicator.”
### CTIO Telescopes: 2011A Approved US Programs (42), and US Theses (15)

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<td>J. Bornak (T), T. Harrison (New Mexico State U.), D. Hoffman (IPAC), K. Gordon (STScI): “Getting the Windshield DIRTY: Optical/Near-IR Survey of Old Dusty Novae to Study the Assimilation of Dust into the ISM”</td>
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<td>C. Britt (T), R. Hynes (Louisiana State U.), P. Jonker (Space Research Institute), G. Nelemans (Radboud University Nijmegen), D. Steeghs (University of Warwick), T. Maccarone (University of Southampton), C. Bassa (University of Manchester), V. Mikles, L. Gossen (U), J. Clem (Louisiana State U.): “Photometric Calibration and Bright Variables in the Chandra Galactic Bulge Survey”</td>
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<td>D. Calzetti, A. Crocker, Y. Li (T) (U. of Massachusetts), C. Wilson (McMaster University), R. Kennicutt, Jr (University of Cambridge), E. Murphy (California Institute of Technology-Dept. of Astronomy): “The Golden Standard for Star Formation Rate Indicators”</td>
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<td>J. Chatelain (T), T. Henry, N. Scott (G) (Georgia State U.), R. Cartwright (G), J. Emery (U. of Tennessee): “Are the Greeks and Trojans Different? - Comparing the Brightest Objects in Jupiter’s L4 and L5 Swarms”</td>
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<td>E. Lada, K. Romita (T), P. Barnes, N. Marinas, J. Tan (U. of Florida): “A Census of Embedded Clusters in the Carina Arm”</td>
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<td>A. Moffett (T), S. Kannappan, M. Norris (U. of North Carolina), S. Khochfar (Max-Planck-Institut für extraterrestrische Physik), A. Berlind (Vanderbilt U.): “Secondary Disks and Disk Regrowth in S0 Galaxies”</td>
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<td>D. Nataf (T), A. Gould, J. Johnson (Ohio State U.), A. Udalski, R. Poleski (Warsaw University Observatory), L. Athanassoula (Laboratoire d’Astrophysique de Marseille): “Does the Milky Way Have an X-Shaped Bulge? A Dynamical Investigation”</td>
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<td>A. Pagnotta (T), B. Schaefer (Louisiana State U.): “Testing the Hibernation Hypothesis: Measuring Long-Term Brightness Changes in Southern Classical Novae”</td>
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<td>J. Winters (T), T. Henry, A. Tanner (Georgia State U.): “Finding Friends for 1200 Red Dwarfs”</td>
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<td>H. Zhang (T), D. Hunter, K. Herrmann (Lowell Observatory): “Deep JH Imaging of the LITTLE THINGS Galaxies: Stellar Mass Assembly in Dwarf Galaxies”</td>
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### CTIO Telescopes: 2011A Approved Foreign Programs (15), and Foreign Theses (3)

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<td>J. Claria (Observatorio Astronómico de Córdoba), A. Piatti (IAFE), A. Ahumada, M. Parisi (G), T. Palma (G) (Observatorio Astronómico de Córdoba): “Astrophysical Parameters of Unstudied or Poorly Studied Galactic Open Clusters: Towards a Thorough Understanding of the Formation and Evolution of the Galactic Disk”</td>
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<td>A. Day-Jones (Universidad de Chile)</td>
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<td>J. Lee (Sejong University), A. Walker (NOAO): “Ca by Photometry of Southern Globular Clusters: Now or Never”</td>
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<td>K. Muzic (University of Toronto), A. Scholz (Institute for Advanced Study), R. Jayawardhana (University of Toronto), V. Geers (ETH): “Methane-Sensitive Imaging of Substellar Objects in the Lupus Star Forming Region”</td>
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<td>J. Nemec (Camosun College), A. Walker (CTIO), Y. Jeon (KASI), A. Kunder (CTIO): “RR Lyr- rae Stars in NGC1841, Reticulum &amp; NGC1466”</td>
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<td>E. Unda-Sanzana (Universidad Catolica del Norte)</td>
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### Foreign Thesis Programs (3)

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<td>R. Leaman (T) (University of Victoria), J. Hughes (Seattle University), A. Cole (U. of Tasmania), K. Venn (University of Victoria): “Mapping the Structure and Metallicity of the RGB Population in the Dwarf Irregular NGC 6822”</td>
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<tr>
<td>L. Malo (T), R. Doyon, E. Artigau, D. Lafreniere, M. Naud (T) (University of Montreal): “Age-Dating of Low-Mass Candidate Members of Nearby Young Kinematic Groups”</td>
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<td>D. Sing, F. Pont, P. Wilson (T) (University of Exeter): “Monitoring the Stellar Activity of Transit-Hosting Stars: Supporting Exoplanet Atmosphere Observations”</td>
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* Key: (T) = Thesis Student; (G) = Graduate; (U) = Undergraduate; (O) = Other
3.2 KITT PEAK NATIONAL OBSERVATORY

**KPNO Telescopes: 2011A Approved US Programs (37), and US Theses (18)**

**Telescopes** | **Nights**
--- | ---
KP-2.1m | 5
KP-2.1m | 5
KP-4m | 4
KP-4m | 3
WIYN | 3
WIYN | 6
KP-4m | 7
KP-4m | 4
KP-4m | 3.5
WIYN | 5
WIYN | 3
WIYN | 6

W. Barkhouse, C. Rude (G), S. Corbett (U) (U. of North Dakota), M. Kim (KASI), P. Green (Harvard-Smithsonian Center for Astrophysics): “Exploring the Nature of Extended ChaMPx Sources”

H. Bond (STScI): “A Search for Reflection Nebulae around Galactic Cepheids”


E. Bubar, M. Pecaut (G), F. Moolekamp (G), E. Mamajek (U. of Rochester): “Where are the Young, Nearby, Northern Associations?”

R. Ciardullo (Pennsylvania State U.), C. Rude (G), S. Corbett (U) (U. of North Dakota), M. Kim (KASI), P. Green (Harvard-Smithsonian Center for Astrophysics): “Exploring the Nature of Extended ChaMPx Sources”

H. Bond (STScI): “A Search for Reflection Nebulae around Galactic Cepheids”


E. Bubar, M. Pecaut (G), F. Moolekamp (G), E. Mamajek (U. of Rochester): “Where are the Young, Nearby, Northern Associations?”


J. Coughlin (G) (New Mexico State U.), M. Lopez-Morales (INSTITUT DE CIÈNCIES DE L’ESPAI), T. Harrison (New Mexico State U.), R. Marzoa (G) (Instituto de Astrofísica de Canarias), N. Ule (G) (New Mexico State U.): “Radial-Velocity Measurements of Long-Period, Low-Mass Eclipsing Binaries from Kepler”

L. Deming (NASA Goddard Space Flight Center), P. Sada (Universidad de Monterrey), D. Jennings, B. Jackson (NASA Goddard Space Flight Center), C. Hamilton-Drager (Dickinson College): “A Near-Infrared Exoplanet Transit and Eclipse Survey”

P. Eisenhardt (CalTech-JPL), L. Yan (IPAC), J. Wu (CalTech-JPL), C. Tsai (IPAC), D. Stern (CalTech-JPL), S. Stanford (UC Davis), S. Petty (UCLA), A. Blain (University of Leicester), R. Griffith (O) (CalTech-JPL), C. Bridge (California Institute of Technology-Dept. of Astronomy): “Spectroscopy and Imaging of a Complete Sample of WISE Hyper-Luminous Galaxy Candidates”

J. Greene (U. of Texas, Austin), C. Peng (Herzberg Institute of Astrophysics), M. Kim (NRAO), C. Kuo (G) (U. of Virginia), J. Braatz (NRAO): “The Hosts of Megamaser Disk Galaxies”

L. Hebb, K. Stassun (Vanderbilt U.), D. Pollacco (Queen’s University Belfast), A. Collier-Cameron (University of St. Andrews), J. Barnes (University of Hertfordshire), J. Pepper (Vanderbilt U.): “Defining the M Dwarf Mass-Radius Relation as a Function of Activity and Metallicity”


K. Herrmann (Lowell Observatory), R. Ciardullo (Pennsylvania State U.): “Planetary Nebula Kinematics in M101”

S. Howell (NOAO), E. Horch (SCSU), M. Everett (PSI): “Speckle Imaging of Kepler Exoplanet Candidate Host Stars”

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* Key: TOO: Target of Opportunity scheduling; (G): Graduate; (O): Other; (T): Thesis Student; (U): Undergraduate
### KPNO Telescopes: 2011A Approved US Programs (37), and US Theses (18)*

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**B. Keeney, J. Stocke, S. Penton, J. Green (U. of Colorado), B. Savage (U. of Wisconsin Madison), M. Pieri (U. of Arizona): “Gas and Galaxies in the Cosmic Web: A Galaxy Redshift Survey around HST/COS Target Sight Lines”**

**R. Koopmann (Union College), R. Finn (Siena College), M. Odekron (Skidmore College), M. Haynes (Cornell U.), A. O’Donoghue (St. Lawrence U.), R. Olovin (St. Mary’s College of California), P. Troischt (Hartwick College), T. Balonek (Colgate U.), D. Craig (West Texas A & M University), S. Higdon (Georgia Southern U.), L. Hoffman (Lafayette College), K. Jore (University of Wisconsin, Stevens Point), H. Cutler (U) (St. Lawrence U.), H. Darling (U), A. McCann (U): “An Ht Survey of Star Formation in Undergraduate ALFALFA Team Groups and Clusters”**


**R. Mathieu, K. Millman (G), A. Geller (G), N. Gosnell (G) (U. of Wisconsin Madison): “A Study of the Binary and Anomalous Stellar Populations in Two Intermediate-Aged Open Clusters”**

**D. McIntosh, J. Nielsen (U), A. Cooper (U) (U. of Missouri, Kansas City): “Spectroscopic Confirmation of the Ongoing Assembly of Giant Ellipticals”**

**D. McIntosh, C. Walker (U), J. Mann (U) (U. of Missouri, Kansas City): “Spectroscopy of Gas-Rich Major Mergers from the SDSS”**


**S. Meibom (Harvard-Smithsonian Center for Astrophysics), S. Barnes (Lowell Observatory), A. Geller (G), R. Mathieu (U. of Wisconsin Madison), J. Hartman, M. Holman (Harvard-Smithsonian Center for Astrophysics): “The Connections between Binarity, Circumstellar Disks, and Stellar Rotation”**


**A. Saha (NOAO), R. Wade, C. Bender (Pennsylvania State U.), D. Harmer (O), D. Willmarth (O) (NOAO): “Confirming the Binarity of the RR Lyrae Star TU UMa”**

**D. Soderblom, J. Valenti, R. Osten (STScI), P. Mao (U) (Lafayette College): “The Flaring Behavior of G and K Dwarfs as Seen in the Kepler Q1 Data”**
KPNO Telescopes: 2011A Approved US Programs (37), and US Theses (18) *

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L. Strolger (Western Kentucky U.), S. Van Dyk (IPAC), S. Wolff (U), L. Campbell, S. Sadler (U), A. Pease (U) (Western Kentucky U.): “Tests of Environmental Effects on SN Ia Production”

P. Szkody, A. Mukadam (U. of Washington), S. Howell (NOAO): “Observations of Accreting White Dwarf Pulsators”


P. Thomman, D. Wittman, W. Dawson (G), S. Schmidt (UC Davis): “Medium-Band Imaging of a z = 0.53 Merging Cluster”

M. Trueblood (O) (NOAO), R. Crawford (O) (Rincon-Ranch Observatory), L. Lebofsky (PSI): “Long Term Follow-up of Near Earth Objects”

S. Williams (G), D. Gies, R. Matson (G) (Georgia State U.): “Spectroscopic Orbits for Kepler FOV Eclipsing Binaries”

P. Winkler (Middlebury College), K. Long (STScI), W. Blair (Johns Hopkins U.), P. Undergraduate (U) (Middlebury College): “Searching for Supernova Remnants in the Most Fertile Galaxy: NGC 6946”

G. Worseck (UC Santa Cruz), J. Hennawi (Max-Planck-Institut für Astronomie), A. Dall’Aglio (Astrophysical Institute Potsdam), M. McQuinn (UC Berkeley), K. Kaplan (G) (UC Santa Cruz): “A Dedicated Quasar Survey to Identify the Sources of He2 Reionization”

A. Zabludoff (U. of Arizona), Y. Yang (Max-Planck-Institut für Astronomie), D. Eisenstein, R. Dave (U. of Arizona): “Tracing the Cosmic Web with Lyman-α Blobs”

US Thesis Programs (18)

G. Bryngelson (T), M. Leising (Clemson U.), P. Milne (U. of Arizona): “Physics of Supernovae Ia at Late Epochs”

J. Ge, B. Lee, N. De Lee, S. Fleming (T), J. Wang (T), B. Ma (G), D. Nguyen (U. of Florida): “SDSS-III MARVELS Brown Dwarf and Planet Candidate RV Follow-up”


M. Jackson (T), D. Hunter (Lowell Observatory), V. Rubin (Carnegie Institution of Washington), S. Oh (University of Cape Town): “The Stellar Kinematics of Dwarf Irregular Galaxy DDO 125: Is This a Galaxy without Dark Matter?”


A. Kaur (T), D. Hartmann (Clemson U.): “Spectral Classification of Novae in M31”
**KPNO Telescopes: 2011A Approved US Programs (37), and US Theses (18)**

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S. Kulkarni (California Institute of Technology-Dept. of Astronomy), D. Fox (Pennsylvania State U.), A. Gal-Yam, I. Arcavi (T) (Weizmann Institute of Science), M. Kasliwal (T), R. Quimby, E. Ofek (California Institute of Technology-Dept. of Astronomy), T. Matheson (NOAO), P. Nugent (Lawrence Berkeley National Laboratory), B. Cenko (UC Berkeley), D. Xu, S. Ben-Ami (G), C. Badenes (Weizmann Institute of Science), A. Horesh (California Institute of Technology-Dept. of Astronomy): “Cosmic Explosions: Census, Systematics, and Beyond”


B. Ma (T), J. Ge (U. of Florida): “Detecting Rossiter-McLaughlin Effect around Two Transiting Exoplanets using EXPERT”

L. Macri, S. Hoffmann (T) (Texas A&M U.): “Cepheids and Long-Period Variables in NGC 4258”


A. Zezas (Harvard-Smithsonian Center for Astrophysics), P. Boumis, I. Leonidaki (T) (National Observatory of Athens): “Investigation of Supernova Remnants in Nearby Galaxies”


B. Zuckereman, D. Rodriguez (T) (UCLA), C. Melis (UC San Diego), I. Song (U. of Georgia): “Hunting the Coolest Substellar Dwarfs in the Northern Hemisphere”
**KPNO Telescopes: 2011A Approved Programs (4), and Foreign Theses (2)**

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<td>C. Badenes (Weizmann Institute of Science), M. Kilic (Harvard-Smithsonian Center for Astrophysics), T. Matheson (NOAO), S. Thompson, F. Mullally (NASA Ames Research Center): “Spectroscopic Follow-up of the SWARMS Survey”</td>
<td>KP-4m</td>
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<td>J. Lee (Sejong University), A. Walker (NOAO): “Ca by Photometry of Northern Globular Clusters”</td>
<td>KP-4m</td>
<td>4</td>
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<tr>
<td>M. Pena (G), A. Peimbert (Instituto de Astronomía): “Metallicity Indicators for Metal-Poor H II Regions and Blue Compact Galaxies”</td>
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<td>O. Youichi (ASIAA), T. Takagi (ISAS), S. Serjeant (Open U.), H. Matsuhara (ISAS), H. Lee (Seoul National University), M. Malkan (UCLA), T. Goto (U. of Hawai‘i), H. Hanami (Iwate University): “Optical Spectroscopy of Galaxies from the AKARI North Ecliptic Pole (NEP) Survey to z ~ 0.5”</td>
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**Foreign Thesis Programs (2)**

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<th>Program Description</th>
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<td>O. De Marco, D. Douchin (T) (Macquarie University), G. Jacoby (GMT), M. Moe (G) (U. of Colorado), T. Hillwig (Valparaiso U.), D. Frew (Macquarie University), J. Passy (T) (University of Victoria): “The Binary Fraction of Central Stars of Planetary Nebulae”</td>
<td>KP-2.1m</td>
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<td>M. Limoges (T) (University of Montreal), S. Lepine (American Museum of Natural History), P. Bergeron (University of Montreal): “A Continuing Census of White Dwarfs within 40 Parsecs of the Sun”</td>
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### 3.3 GEMINI OBSERVATORY

**Gemini Telescopes: 2011A Approved Programs for US Time (55), and Theses (21)**

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<td>D. Ardila (NASA Herschel Science Center), C. Johns-Krull (Rice U.), G. Herczeg (Max-Planck-Institut für extraterrestrische Physik), R. Mathieu (U. of Wisconsin Madison): “Accretion in Close Pre-Main-Sequence Binaries”</td>
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<td>J. Bartlett (California Institute of Technology-Dept. of Astronomy), R. Chary (IPAC), C. Lawrence, F. Marleau (CalTech-JPL), S. Mei (University of Toronto), E. Pointecouteau (CalTech-JPL), S. Stanford (UC Davis): “Planck SZ Clusters: Follow-up of the Planck Galaxy Cluster Catalog”</td>
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<td>T. Beck (STScI), R. Mann (Herzberg Institute of Astrophysics), J. Bary (Colgate U.): “Circumstellar Gas in Proto-Solar Nebula Analogs: NIFS Observations of Proplyd 253-1536”</td>
<td>GEM-NQ</td>
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* Key: TOO: Target of Opportunity scheduling; (G): Graduate; (O): Other; (T): Thesis Student; (U): Undergraduate
* Key: GEM-NQ = Gemini N Queue; GEM-SQ = Gemini S Queue; GEM-N = Gemini N classical; GEM-S = Gemini S classical; GEM-K = Gemini/Keck time exchange; GEM-Su = Gemini/Subaru time exchange; * = poor weather program; (T) = Thesis student; (G) = Graduate student; (U) = Undergraduate; (O) = Other
### Gemini Telescopes: 2011A Approved Programs for US Time (55), and Theses (21) *

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<td>S. Cenko, J. Bloom, E. Quataert, A. Miller (G), N. Butler, A. Morgan (G), L. Strubbe (G) (UC Berkeley): “Probing the Central Black Holes of Distant, Quiescent Galaxies via Tidal Disruption Flares”</td>
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<td>G. Clayton (Louisiana State U.), T. Gehalle (Gemini Observatory - North): “Z Umi: A Critical Test of the Formation Path(s) of R Coronae Borealis Stars”</td>
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<td>B. Cobb, US Lead Scientist for N. Tanvir (University of Leicester), B. Cobb (George Washington U.), A. Cucchiara (UC Berkeley), A. Levan (University of Warwick), J. Bloom, D. Perley (G) (UC Berkeley), K. Glazebrook (Swinburne University), C. Matzner (University of Toronto), J. Hjorth (University of Copenhagen), B. Cenko (UC Berkeley), A. Fruchter, J. Graham (G) (STScI), K. Wiersema (University of Leicester): “Investigating Gamma-Ray Bursts and Their Use as Cosmological Probes”</td>
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<td>A. Constantin (James Madison U.), A. Seth (Harvard-Smithsonian Center for Astrophysics), M. Cappellari (University of Oxford), J. Shields (Ohio U.): “Deciphering the Least Luminous AGN-Like LINER and Constraining the M_BH – σ* relation”</td>
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<td>J. Cook, D. Cruikshank, R. Mastrapa, D. Wooden (NASA Ames Research Center): “Icy Grain Halos: Amorphous or Crystalline Water Ice?”</td>
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<td>M. Cushing (CalTech-JPL), J. Kirkpatrick (IPAC), A. Mainzer (CalTech-JPL), C. Gelino (IPAC), M. Skrutskie (U. of Virginia), R. Griffith (CalTech-JPL): “Searching for the Coolest Brown Dwarfs in the Solar Neighborhood”</td>
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<td>P. Eisenhardt (CalTech-JPL), L. Yan (IPAC), J. Wu (CalTech-JPL), C. Tsai (IPAC), D. Stern (CalTech-JPL), S. Stanford (UC Davis), S. Petty (UCLA), A. Blain (University of Leicester), R. Griffith (O) (CalTech-JPL), C. Bridge (California Institute of Technology-Dept. of Astronomy): “Spectroscopy and Imaging of a Complete Sample of WISE Hyper-Luminous Galaxy Candidates”</td>
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<td>A. Gal-Yam (Weizmann Institute of Science), D. Leonard (San Diego State U.), D. Fox (Pennsylvania State U.), Y. Green (G) (Weizmann Institute of Science): “Identifying Progenitors of Core-Collapse Supernovae”</td>
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<td>J. Gallagher (U. of Cincinnati), G. Clayton, J. Andrews (G) (Louisiana State U.), B. Sugerman (Goucher College), M. Barlow (University College London), B. Ercolano (University of Exeter), R. Wesson, J. Fabbri (G) (University College London), M. Meixner, M. Otsuka (STScI), D. Welch (McMaster University): “A Search for Dust Formation in the CSM around SN 2010hq”</td>
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<td>J. Gizis, US Lead Scientist for R. Jayawardhana, M. Janson, M. Bonavita (University of Toronto), D. Lafreniere (University of Montreal), J. Gizis (U. of Delaware), K. Menou (Columbia U.): “Supermassive Planets or Ultralight Brown Dwarfs? A New Population of Wide Substellar Companions”</td>
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<td>J. Greene (U. of Texas, Austin), A. Shapley, K. Hainline (G) (UCLA): “Rest-Frame Optical Spectra of Narrow-Line AGNs at z ~ 2”</td>
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<td>D. Harker (UC San Diego), C. Woodward (U. of Minnesota), M. Kelley (U. of Maryland), D. Wooden (NASA Ames Research Center): “T-ReCS Comet ToO Initiative 2011A”</td>
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Gemini Telescopes: 2011A Approved Programs for US Time (55), and Theses (21)

L. Hebb, K. Stassun (Vanderbilt U.), D. Pollacco (Queen’s University Belfast), A. Collier-Cameron (University of St. Andrews), J. Barnes (University of Hertfordshire), J. Pepper (Vanderbilt U.): “Defining the M Dwarf Mass-Radius Relation as a Function of Activity and Metallicity”

T. Hillwig (Valparaiso U.), D. Gies (Georgia State U.): “Confirmation of the Mass Donor Star in the Unique Microquasar SS 433”


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Gemini Telescopes: 2011A Approved Programs for US Time (55), and Theses (21) +


- F. Marchis, J. Enriquez (SETI Institute/NASA Ames Research Center), J. Berthier, P. Descamps (IMCCE), J. Durech (Charles University, Prague), V. Lainey, F. Vachier (IMCCE): “Refining the Mutual Orbits of Known Multiple Asteroid Moonlets”

- C. Melis (UC San Diego), C. Marois (Herzberg Institute of Astrophysics), B. Macintosh (Lawrence Livermore National Laboratory): “Searching for a Solar System Analog in HD 131488”


- M. Modjaz (Columbia U.), A. Gal-Yam, I. Arcavi (G) (Weizmann Institute of Science): “Host Galaxy Spectra of Stripped SN from the Palomar Transient Factory: SN Progenitor Diagnostics and the SN-GRB Connection”

- J. Mulchaey, US Lead Scientist for M. Balogh (University of Waterloo), S. McGee (University of Durham), L. Parker (McMaster University), R. Bower (University of Durham), J. Mulchaey (Carnegie Observatories), A. Finoguenov, D. Wilman, J. Connelly (G) (Max-Planck-Institut für extraterrestrische Physik): “The Transition of Galaxy Groups from an Invigorating Environment to a Suffocating One”


- T. Oka (U. of Chicago), T. Geballe (Gemini Observatory - North), N. Indriolo (G), B. McCall (U. of Illinois Urbana-Champaign), M. Goto (Max-Planck-Institut für Astronomie), T. Usuda (Subaru Telescope): “Continued Exploration of the Galactic Center’s Central Molecular Zone by H3+ Spectroscopy”

- M. Pereira (U. of Arizona), M. Lerchster, A. Finoguenov (Max-Planck-Institut für extraterrestrische Physik), E. Egami (U. of Arizona): “RCSJ1419.2+5326: Kinematics of an Assembling Cluster at z ~ 0.6”

- P. Pessev (Gemini Observatory - South), R. de Propris (CTIO): “Do Galaxies Care about AGB Stars?”


- B. Rothberg, J. Fischer (Naval Research Laboratory), C. Hayward (G), L. Hernquist, P. Jonsson (Harvard U.), T. Cox (Carnegie Observatories), G. Snyder (G), P. Torrey (G) (Harvard U.): “Unveiling the Young Central Stellar Disk in the Advanced Luminous Infrared Galaxy Arp 193”

- K. Sahu, H. Bond, J. Anderson (STScI), M. Dominik (University of St. Andrews), A. Udalski (Warsaw University Observatory), M. Albjorn (University of Canterbury): “Detecting Isolated Black Holes through Astrometric Microlensing”

- D. Sand (UC Santa Barbara), B. Willman (Haverford College): “Diagnosing Youth: Gemini Spectroscopy to Verify the Young Stellar Populations in Leo IV and Canes Venatici I”
Gemini Telescopes: 2011A Approved Programs for US Time (55), and Theses (21)

  - GEM-S 2

- D. Trilling (Northern Arizona U.), J. Spencer (Southwest Research Institute), S. Sheppard (Carnegie Institution of Washington), D. Tholen (U. of Hawa’i), J. Kavelaars (Herzberg Institute of Astrophysics), M. Holman (Harvard-Smithsonian Center for Astrophysics), R. Binzel (MIT), A. Stern, M. Buie (Southwest Research Institute), C. Fuentes (Northern Arizona U.): “A Deep Search for Further New Horizons Targets”
  - GEM-Su 1

- D. Trilling, C. Thomas (Northern Arizona U.), J. Hora (Harvard-Smithsonian Center for Astrophysics), B. Penprase (Pomona College), J. Emery (U. of Tennessee), J. Kistler (G) (Northern Arizona U.), T. Spahr (Harvard-Smithsonian Center for Astrophysics), M. Holman (Harvard-Smithsonian Center for Astrophysics), R. Binzel (MIT), A. Stern, M. Buie (Southwest Research Institute), C. Fuentes (Northern Arizona U.): “Resolving the Infrared [Fe II] Emission in Circumstellar LBV Shells with NICI”
  - GEM-S 2

  - GEM-SQ 0.9

- S. Vrtilek (SAO), D. Steeghs (O) (University of Warwick), D. Calvelo (G) (University of Southampton): “Modulation Tomography of the Black Hole Source GRS 1716-249”
  - GEM-SQ 0.4

- G. Worseck (UC Santa Cruz), J. O’Meara (Saint Michael’s College), S. Ellison (University of Victoria), A. Meiksin (University of Edinburgh), J. Prochaska (University of California Observatories), S. Lopez (Universidad de Chile), M. Murphy (Swinburne University), G. Becker (University of Cambridge), B. Menard (University of Toronto), F. Hamann (U. of Florida): “Surveying the Post-Reionization Universe with Quasar Spectroscopy III”
  - GEM-NQ 1.5

- G. Worseck (UC Santa Cruz), J. O’Meara (Saint Michael’s College), S. Ellison (University of Victoria), A. Meiksin (University of Edinburgh), J. Prochaska (University of California Observatories), S. Lopez (Universidad de Chile), M. Murphy (Swinburne University), G. Becker (University of Cambridge), B. Menard (University of Toronto), F. Hamann (U. of Florida): “Surveying the Post-Reionization Universe with Quasar Spectroscopy III”
  - GEM-NQ 2

Thesis Programs (21)

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Gemini Telescopes: 2011A Approved Programs for US Time (55), and Theses (21)

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F. Bian (T), X. Fan (U. of Arizona), A. Dey (NOAO), R. Green, L. Jiang (U. of Arizona), F. Walter (Max-Planck-Institut für Astronomie), R. Maiolino (INAF), I. McGreer (U. of Arizona): “Probing the Most Luminous Lyman Break Galaxies at z ~ 3”


B. Cobb (George Washington U.), N. Tanvir (University of Leicester), D. Berzier (Liverpool John Moores University), J. Bloom (UC Berkeley), A. Bunker (University of Oxford), N. Butler, B. Cenko (UC Berkeley), H. Chen (U. of Chicago), A. Cuccina (UC Berkeley), A. Frucher (STScI), K. Glazebrook (Swinburne University), J. Grant (T) (STScI), J. Greiner (Max-Planck-Institut für extraterrestrische Physik), J. hjorth (University of Copenhagen), P. Jakobsson (University of Iceland), A. Levan (University of Warwick), S. Lopez (Universidad de Chile), C. Matzner (University of Toronto), A. Morgan (UC Berkeley), P. O’Brien (University of Leicester), D. Perley (UC Berkeley), M. Pettini (University of Cambridge), J. prochaska, E. ramirez-Ruiz (UC Santa Cruz), D. Rechert (U. of North Carolina), J. Rhodes (Arizona State U.), R. Sterling, K. Wiersema (University of Leicester): “Exceptional Swift and Fermi GRBs: Gemini South Targets of Opportunity”

S. Dieterich (T), T. Henry, W. Jao, A. Riedel (G), A. Tanner (Georgia State U.): “Probing Stellar Physics at the Bottom of the Main Sequence: Continuing the Pursuit of Dynamical Masses”

D. Fox (Pennsylvania State U.), E. Berger (Harvard-Smithsonian Center for Astrophysics), S. Kulkarni (California Institute of Technology-Dept. of Astronomy), K. Roth (Gemini Observatory - North), R. Rutledge (McGill University), P. Podsiadlowski (University of Oxford), W. Fong (T), T. Laskar (T), R. Chornock, A. Soderberg (Harvard-Smithsonian Center for Astrophysics), C. Wolf (University of Oxford), B. Penprase (Pomona College), R. Foley (Harvard-Smithsonian Center for Astrophysics): “Gamma-Ray Bursts: From Progenitors to Probes”

D. Fox (Pennsylvania State U.), E. Berger (Harvard-Smithsonian Center for Astrophysics), S. Kulkarni (California Institute of Technology-Dept. of Astronomy), K. Roth (Gemini Observatory - North), R. Rutledge (McGill University), P. Podsiadlowski (University of Oxford), W. Fong (T), T. Laskar (T), R. Chornock, A. Soderberg (Harvard-Smithsonian Center for Astrophysics), A. Gai-Yam (Weizmann Institute of Science), C. Wolf (University of Oxford), B. Penprase (Pomona College), R. Foley (Harvard-Smithsonian Center for Astrophysics): “Gamma-Ray Bursts: From Progenitors to Probes”

T. Geballe, US Lead Scientist for P. Najarro (Consejo Superior de Investigaciones Científicas), D. Figer (Rochester Institute of Technology), T. Geballe (Gemini Observatory - North), A. Fuentes (T) (Consejo Superior de Investigaciones Científicas): “Metallicity in the Quintuplet Cluster and the Galactic Center: Evidence for a Top-Heavy Star Formation History?”
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<td>M. Gladders, M. Bayliss (T) (U. of Chicago), J. Hennawi (Max-Planck-Institut für Astronomie), E. Wuyts (T), K. Sharon (U. of Chicago), J. Rigby (NASA Goddard Space Flight Center), B. Koester (U. of Chicago), H. Dahle (University of Oslo), M. Oguri (NAOJ): “Spectroscopy of a Complete Sample of SDSS Lenses”</td>
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<td>W. Grundy, H. Roe (Lowell Observatory), C. Trujillo (Gemini Observatory - North), S. Porter (T) (Arizona State U.), K. Noll (STScI): “Mutual Orbits and Masses of Kuiper Belt Binaries and Multiple Systems”</td>
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<td>G. Hallinan (UC Berkeley), S. Littlefair (University of Sheffield), R. Butler (NUI), G. Doyle (Armagh Observatory), M. Rupen (NRAO), L. Harding (T), A. Golden (NUI): “Confirming Auroral Emissions on an Ultracool Dwarf”</td>
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<td>D. Howell, US Lead Scientist for M. Sullivan (University of Oxford), P. Nugent (Lawrence Berkeley National Laboratory), I. Hook, S. Blake (T), K. Maguire, Y. Pan (T) (University of Oxford): “The Host Galaxies of Local PTF Type Ia Supernovae”</td>
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<td>J. Khargharia (T), C. Froning (U. of Colorado), E. Robinson (U. of Texas, Austin), D. Gelino (NEXScI): “The Mass of the Black Hole in XTE J1118+480”</td>
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<td>K. Leighly, US Lead Scientist for S. Gallagher (University of Western Ontario), K. Leighly (U. of Oklahoma), M. Dietrich (Ohio State U.), S. Barber (T) (U. of Oklahoma): “Probing Quasar Outflows with GNIRS HeI* Spectroscopy”</td>
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<td>B. Macintosh, US Lead Scientist for M. Naud (T), E. Artigau (O), L. Malo (T), R. Doyon (O), D. Lafreniere (O) (University of Montreal), C. Marois (O) (Herzberg Institute of Astrophysics), B. Macintosh (O) (Lawrence Livermore National Laboratory), T. Barman (O) (Lowell Observatory), J. Patience (O) (University of Exeter): “A Planet Search around Young-Associations M Dwarfs (PSYM Survey)”</td>
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<td>O. Shemmer (U. of North Texas), S. Anderson (U. of Washington), N. Brandt (Pennsylvania State U.), A. Diamond-Stanic (G), X. Fan (U. of Arizona), P. Hall (York University), R. Lane (T) (U. of North Texas), P. Lira (Universidad de Chile), H. Netzer (Tel Aviv University), R. Plotkin (University of Amsterdam), G. Richards (Drexel U.), D. Schneider (Pennsylvania State U.), M. Strauss (Princeton U.), B. Trakhtenbrot (G) (Tel Aviv University): “Weak Line Quasars at High Redshift: Extremely High Accretion Rates or Anemic Broad-Line Regions?”</td>
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Gemini Telescopes: 2011A Approved Programs for US Time (55), and Theses (21) *


3.4 COMMUNITY ACCESS TO PRIVATE TELESCOPES

3.4.1 Center for High Angular Resolution Astronomy

CHARA Telescope: 2011A Approved US Programs (3)

E. Baines (Naval Research Laboratory), M. Dollinger (Max-Planck-Institut für Astronomie), A. Hatzes, E. Guenther, M. Hrudkovu (Thüringer Landessternwarte Tautenburg): “Measuring K Giant Star Fundamental Parameters Using the CHARA Array”


M. Simon (SUNY, Stony Brook), G. Schaefer (The CHARA Array of Georgia State University): “Stellar Diameters in the Beta Pic Moving Group”

3.4.2 Keck Observatory

Keck Telescopes: 2011A Approved US Programs (9), and US Theses (1) *

M. Auger, T. Treu (UC Santa Barbara), P. Marshall (University of Oxford), B. Brewer (UC Santa Barbara): “Mining Red Nuggets by Snigling for EELs”


T. Dupuy (Harvard-Smithsonian Center for Astrophysics), M. Liu (U. of Hawai’i): “Resolving the Atmospheres of Substellar Mass Benchmark Binaries at the L/T Dwarf Transition”

M. Kilic (SAO), P. Dufour (University of Montreal): “The Chemical Composition of an Extrasolar Dwarf Planet”

D. Marchesini (Tufts U.), P. Van Dokkum (Yale U.), I. Labbe (Carnegie Observatories), E. Dare (G) (Tufts U.): “Spectroscopic Confirmation of Monster Galaxies at 3 < z < 4 with Keck-NIRSPEC”

Telescopes Nights

- GEM-SQ 1
- CHARA 0.5
- CHARA 2.5
- CHARA 2
- Keck-II 1
- Keck-I 0.5
- Keck-II 1
- Keck-II 1
- Keck-I 0.5
- Keck-II 2

* Key: (G) = Graduate; (O) = Other; (T) = Thesis Student; (U) = Undergraduate
**Keck Telescopes: 2011A Approved US Programs (9), and US Theses (1)**

<table>
<thead>
<tr>
<th>Telescope</th>
<th>Nights</th>
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<tbody>
<tr>
<td>Keck-I</td>
<td>1</td>
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<tr>
<td>Keck-I</td>
<td>0.5</td>
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<tr>
<td>Keck-II</td>
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</table>

**V. Smith, K. Cunha (NOAO), L. Ghezzi (Observatorio Nacional Brazil), S. Schuler (NOAO):**
“Characterizing the Stellar-Metallicity versus Planet-Size Relation for Planet-Hosting Stars in the Kepler Data Release”

**K. Stassun (Vanderbilt U.), S. Mohanty (Imperial College London):**
“Calibration of Spectral Modeling Techniques for Determining Fundamental Properties of Young Brown Dwarfs”

**M. Womack (St. Cloud State U.), L. Deming, A. Mandell (NASA Goddard Space Flight Center):**
“Search for Water Vapor in a Super-Earth Exoplanet”

**Keck Telescopes: 2011A Approved Foreign Thesis Programs (1)**

<table>
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<th>Nights</th>
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<tbody>
<tr>
<td>Keck-I</td>
<td>2</td>
</tr>
</tbody>
</table>

**M. Pettini (University of Cambridge), R. Cooke (T) (Institute of Astronomy):**
“Probing Population III Nucleosynthesis with Carbon-Enhanced DLAs”

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### 3.4.3 Las Campanas Observatory

**Magellan Telescopes: 2011A Approved US Programs (4)**

<table>
<thead>
<tr>
<th>Telescope</th>
<th>Nights</th>
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<tbody>
<tr>
<td>Magellan-I</td>
<td>1</td>
</tr>
<tr>
<td>Magellan-II</td>
<td>1</td>
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</table>

**M. Barsony (San Francisco State U.), K. Haisch (UVU), C. McCarthy (San Francisco State U.), A. Burgasser (UC San Diego):**
“Young Planetary Mass Objects in the Ophiuchi Cloud Core”

**C. Gelino (California Institute of Technology-Dept. of Astronomy), J. Kirkpatrick (IPAC), A. Mainzer, M. Cushing, P. Eisenhardt (CalTech-JPL), M. Skrutskie (U. of Virginia), R. Griffith (O) (CalTech-JPL):**
“Photometric Follow-up of WISE Brown Dwarf Candidates”

**K. Luhman, J. Bochanski (Pennsylvania State U.):**
“Searching for the Bottom of the Initial Mass Function”

**J. O’Meara (Saint Michael’s College), J. Prochaska (UC Santa Cruz):**
“The Optical Depth of the Universe and the Search for Missing Metals at 2.5 < z < 3.4”

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### 3.4.4 MMT Observatory

**MMT Telescope: 2011A Approved US Programs (1), and US Theses (2)**

<table>
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<tr>
<th>Telescope</th>
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</thead>
<tbody>
<tr>
<td>MMT</td>
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**A. Brown (U. of Colorado), L. Walkowicz (UC Berkeley), S. Hawley, A. Kowalski (G) (U. of Washington), L. Ramsey (Pennsylvania State U.), S. Saar, G. Furesz (Harvard-Smithsonian Center for Astrophysics):**
“MMT Hectochelle Spectral Variability Study of Active Late-Type Stars in the Kepler Field”

---

* Key: (G) = Graduate; (O) = Other; (T) = Thesis Student; (U) = Undergraduate
MMT Telescope: 2011A Approved US Programs (1), and US Theses (2)  

US Thesis Programs (2)

J. Cummings (T) (Indiana U.), A. Szentgyorgyi (Harvard-Smithsonian Center for Astrophysics), C. Deliyannis (Indiana U.): “Initial Lithium of Metal-Poor Young Open Clusters and Its Connection To Primordial Lithium”  

R. Maderak (T), C. Deliyannis (Indiana U.), A. Szentgyorgyi (Harvard-Smithsonian Center for Astrophysics): “Testing the Oxygen vs. Age Relationship in Old Open Clusters: M67 and NGC 188”

3.4.5 Palomar Observatory

Hale Telescope: 2011A Approved US Programs (3)

S. Howell (NOAO), M. Still (NASA Ames Research Center), S. Seebode (O) (San Mateo High School), M. Wood (Florida Institute of Technology), J. Cannizzo (NASA Goddard Space Flight Center): “Spectral Characterization of Cataclysmic Variables within the Kepler Field of View”

H. Marion (Harvard-Smithsonian Center for Astrophysics), K. Krisciunas (Texas A&M U.), P. Garnavich (U. of Notre Dame), R. Foley, R. Kirshner (Harvard-Smithsonian Center for Astrophysics): “Late Time Near-Infrared Spectra from Type Ia Supernovae”


Hale Telescope: 2011A Approved Foreign Thesis Programs (1)

M. Pettini (University of Cambridge), R. Cooke (T) (Institute of Astronomy): “A Search for Carbon-Enhanced Metal-Poor DLAs: Probing Population III Nucleosynthesis”
4 USAGE OF ARCHIVED DATA

The first two tables below illustrate access to and usage of reduced data in the NOAO Science Archive (R2) from NOAO Survey programs. The table on the left shows the data download volume in gigabytes, the number of files retrieved, and the number of unique visitors (for that month) who downloaded archive data through the ftp site. The table on the right shows the Web activity logged from the NOAO Science Archive Web site. It includes users (visitors) collecting additional information before or after downloading data, as well as visualization of the data online.

<table>
<thead>
<tr>
<th>Date</th>
<th>Archive Data Retrieval Activity (ftp)</th>
<th>NOAO Science Archive Web Site Activity</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Retrieved (GB)</td>
<td>Files Retrieved</td>
</tr>
<tr>
<td>Jan 2011</td>
<td>20.43</td>
<td>787</td>
</tr>
<tr>
<td>Feb 2011</td>
<td>83.31</td>
<td>2,005</td>
</tr>
<tr>
<td>Mar 2011</td>
<td>88.08</td>
<td>4,203</td>
</tr>
<tr>
<td>Total:</td>
<td>191.82</td>
<td>6,995</td>
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</table>

The NOAO SkyNode provides access to catalogs and is complementary to the NOAO Science Archive, which provides access to images. SkyNode receives a simple SQL query and passes it to a backend database engine. The result is then passed back through the Web server. The most important number in the table below is “Unique Visitors.”

<table>
<thead>
<tr>
<th>Date</th>
<th>Tucson NOAO SkyNode</th>
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</thead>
<tbody>
<tr>
<td></td>
<td>Bandwidth (MB)</td>
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<tr>
<td>Jan 2011</td>
<td>18.52</td>
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<tr>
<td>Feb 2011</td>
<td>15.36</td>
</tr>
<tr>
<td>Mar 2011</td>
<td>30.12</td>
</tr>
<tr>
<td>Total:</td>
<td>64.00</td>
</tr>
</tbody>
</table>

The NOAO Portal provides principal investigators (PIs) access to their raw data from all instruments and to pipeline-reduced products from the Mosaic instruments at the CTIO and KPNO 4-m telescopes and the NEWFIRM instrument. The metadata are stored in a searchable Archive, which allows discovery and retrieval from the NOAO Portal (portal-nvo.noao.edu). After the requisite proprietary period (usually 18 months), the data become accessible to the general public.
5 GRANTS

During this quarter, there were no new grants received by NOAO staff from non-NSF agencies.