IMPORTANT CHANGE TO NEWSLETTER CONTENT

The Call for Proposals and proposal-related information, such as available instruments and updates to nights available will no longer be included in the NOAO Newsletter as of this issue. All information specifically related to proposing for telescope time via the NOAO Time Allocation Process is available through the NOAO “Proposal Information” web pages and links. The NOAO website is the definitive location for the most current information available to proposers.

As this Newsletter is the transitional issue for this new policy, a change in access to the Anglo-Australian Telescope (AAT) through the CTIO exchange program will be noted here. During the current semester of 2015A, 10 classically scheduled nights on the AAT were available to the NOAO community. Beginning next year, in semester 2016A, the number will be reduced to 5 nights per semester. Please see the Call for Proposals for 2015B, ast.noao.edu/sites/default/files/cfp2015b.pdf, for more details.

Help with proposal preparation and submission is available via the Web addresses below:

- Web proposal materials and information: ast.noao.edu/observing/proposal-info
- TAC information and proposal request statistics: www.noao.edu/gateway/tac/
- Web submission form for thesis student information: www.noao.edu/noaoprop/thesis/
- Request help for proposal preparation: noaoprop-help@noao.edu
- Gemini-related questions about operations or instruments: gemini-help@noao.edu
- CTIO-specific questions related to an observing run: ctio@noao.edu
- KPNO-specific questions related to an observing run: kpno@noao.edu

A New NSF-NASA Partnership for Exoplanet Research at KPNO
Joan Najita & Lori Allen

A new partnership between NSF and NASA will advance exoplanet science through the use of the NOAO share of the WIYN 3.5-m telescope. Beginning this year, the NASA-NSF partnership for Exoplanet Observational Research (NN-EXPLORE) will establish an exoplanet-related Guest Observer (GO) research program on the WIYN telescope using existing WIYN instrumentation. NASA has issued a call for proposals to build an extreme-precision radial-velocity spectrometer that will be deployed at the WIYN telescope in mid-Fiscal Year (FY) 2018 for use by the astronomical community. The state-of-the-art instrument will be used to detect and characterize other worlds.

In support of the GO program, NOAO is requesting semester 2015B observing proposals for the WIYN telescope that are targeted to general exoplanet-related research. Follow-up observations of exoplanet-related targets from the NASA missions Kepler and K2 and observations in preparation for the future Transiting Exoplanet Survey Satellite (TESS) mission are particularly encouraged. The Kepler mission has found more than 1000 confirmed exoplanets and more than 3000 unconfirmed planet candidates to date. K2, Kepler's extended mission survey of selected fields in the ecliptic plane, is underway. The TESS mission will conduct an all-sky survey of transiting exoplanet systems around relatively bright and nearby stars.

NASA will provide limited funding support to observers that is sufficient to cover travel, modest research expenses, and publications costs. The NOAO 2015B Call for Proposals provides...
The Dark Energy Survey (DES) is a major, five-year initiative on the CTIO Blanco 4-m telescope. DES is using the Dark Energy Camera (DECam), an imager with a 2.2-degree field of view, to map 5000 square degrees (deg²) of the sky in 5 bands (g, r, i, z, and Y) and to carry out a time-domain survey over 30 deg² in griz. The DES collaboration includes 300 scientists from 25 institutions in 7 countries and is supported in the US by the Department of Energy (DOE) and NSE. The primary goal of DES is to probe the origin of the accelerated expansion of the Universe through measurements of clusters, weak lensing, galaxy clustering, and type la supernovae. The DES Project is providing the astronomical community with important capabilities and products. DECam, built by Fermilab for the DES, also is heavily used by community observers who are carrying out other surveys on the Blanco telescope. The DECam Community Pipeline (CP) enables NOAO to provide reduced data products to the general astronomical community.

The DES Collaboration has released calibrated exposures from the first year of the survey (DES-Y1), which was completed in February 2014. The DES-Y1 release consists of science observations taken between September 2013 and early February 2014. These observations cover roughly 1800 deg² of the survey footprint in the South Galactic Cap, including >160 deg² overlapping the Sloan Digital Sky Survey (SDSS) Stripe 82 and
Dark Energy Survey First Year Data Release continued

~20 visits to 10 supernovae (SNe) fields. There are already over 15,000 exposures that have been reduced and calibrated with the DES Data Management (DESDM) pipeline at the National Center for Supercomputing Applications (NCSA). The DESDM project at NCSA is supported by the NSF AST 11-38766 award. These exposures have been acquired by the NOAO Science Archive and made available to the community. (See accompanying article “Retrieving DES Year 1 Data from the NOAO Science Archive.”)

For each exposure there are three data products: the calibrated CCD images with associated data quality and weight maps. Each data product is a tile-compressed FITS multi-extension file; the same format as community data produced by the CP. The data have been flux and astometrically calibrated. The flux calibration consists of linearized (flat fielded) counts and a magnitude zero point relating the counts to flux. The astrometric calibration provides a world coordinate system function relating pixel positions to celestial coordinates. Details of these calibrations may be found at: data.darkenergysurvey.org/aux/releasenotes/DESDMrelease.html.

In the coming years the community can look forward to continued releases of calibrated exposures with improved processing and underlying calibrations. Eventually, the broader public data releases (DR) from DES will cover 5000 deg², imaged 10 times in the grizY bands along with ~100 visits to SNe fields covering 30 deg². Furthermore the DR1 and DR2 releases will contain higher level data products such as co-added images and catalogs and, of course, significant dark energy science results.

Retrieving DES Year 1 Data from the NOAO Science Archive

To retrieve data products from the Dark Energy Survey Year 1 (DES-Y1):

2. Click the “General search for NOAO data (all users)” button. This will take you to the “Simple Query Form” page (tab).
4. Click either the “Raw data” or “Reduced data” button to set up the query form to do the appropriate search (see figure below).
5. Add additional constraints as needed, such as coordinates and a search box size, an observing date, or an exposure time, and then click the “Search” button.
6. A page will display with your search results, which you can review and then stage files for download.

NOTE: At present you cannot use the “Simple Query Form” tab to search for DECam data by bandpass. However, you can do a general search and then filter or “category” the results to find data taken with a particular DECam filter. You can also search for data taken with a particular filter using the “Advanced Query Form” tab—see the last entry under “Examples” on the “Advanced Query Form” page.

From Dark Energy Survey gri -band observations centered near the cluster RXJ 2248.7-4431. The image has been cropped to emphasize the typical focal plane coverage available with individual DECam exposures obtained during the first year of the survey. (Image credit: F. Menanteau/DES/NCSA.)

Color composite of Dark Energy Survey gri-band observations centered near the cluster RXJ 2248.7-4431. The image has been cropped to emphasize the typical focal plane coverage available with individual DECam exposures obtained during the first year of the survey. (Image credit: F. Menanteau/DES/NCSA.)
Gemini’s New Fast Turnaround Initiative

The U.S. National Gemini Office (NGO) would like to draw Gemini users’ attention to a newly implemented Gemini program, the Fast Turnaround (FT) observing mode.

The first cycle of the FT pilot started in January 2015 and was limited to Gemini North. As of mid-January, the FT program is expected to award approximately three nights a month of observing time, with subsequent deadlines on the last day of each month at 23:59 Hawaiian Standard Time. The success of the FT pilot program will determine whether or not it will be extended beyond 2015A and to Gemini South.

For current information relevant to the FT program, see: www.gemini.edu/sciops/observing-gemini/observing-modes/fast-turnaround.

For further information on Gemini observing programs, feel free to contact US NGO Head Letizia Stanghellini (lstanghellini@noao.edu).

Attend the Gemini Observatory Science Meeting
Letizia Stanghellini

The US National Gemini Office (NGO) announces the upcoming Gemini meeting “Future and Science of Gemini Observatory” to be held in Toronto, Canada, 14–18 June 2015.

The focus of the meeting will be on scientific results obtained with the latest Gemini capabilities and proposal modes and on future scientific developments. The program includes science and instrumentation topics. Other events at the meeting will be: (1) Gemini partner perspective presentations, (2) a panel discussion on future plans, (3) a user-contributed mini-workshop on using current instrumentation, and (4) a discussion on complementary facilities such as LSST, ALMA, JWST, and Subaru.

Confirmed invited speakers for the science topics are Michele Bannister (University of Victoria), Geoff Clayton (Louisiana State University), Jean-Michel Desert (University of Colorado, Boulder), Wes Fraser (Herzberg Institute of Astrophysics), Avishay Gal-Yam (Weizmann Institute), Denise Goncalves (Universidade Federal do Rio de Janeiro), Mario Hamuy (Universidad de Chile), Mukremin Kilic (Oklahoma University), Myung Gyun Lee (Seoul National University), Bruce Macintosh (Stanford University), Franck Marchis (SETI Institute), Alan McConnachie (Herzberg Institute of Astrophysics), Thaisa Storchi-Bergmann (Universidade Federal do Rio Grande do Sul), Chris Tinney (University of New South Wales), Jessica Werk (University of California, Santa Cruz), and Nadia Zakamska (John Hopkins University).

The deadline for abstracts and early registration is 4 March 2015, and the regular registration deadline is 21 April 2015.

For further details, please visit the meeting page at: www.gemini.edu/fsg15/program.

If you have questions, please contact: Letizia Stanghellini (lstanghellini@noao.edu) or the conference organizers at fsg15info@gemini.edu.
Goodman vs. COSMOS
Jay Elias (SOAR), César Briceño, & Sean Points

This article is intended as a guide to help prospective observers decide whether to propose for the CTIO Ohio State Multi-Object Spectrograph (COSMOS) on the Blanco telescope or the Goodman High Throughput Spectrograph on the SOAR telescope for their science. We also offer a few words about the Kitt Peak Ohio State Multi-Object Spectrograph (KOSMOS), the Mayall telescope counterpart to COSMOS.

Scheduling
First of all, scheduling constraints may drive you to propose for Goodman rather than COSMOS. Observations at the Cassegrain focus of the Blanco requires the f/8 secondary mirror, which has significant installation overhead. Therefore, Blanco Cassegrain observations are heavily block-scheduled. In contrast, SOAR instruments are permanently mounted, so switching from one to another can be done easily. If you have a program where you need to observe one night a month, you should avoid proposing for COSMOS. SOAR can support programs that only require a half-night a month fairly easily; this is much harder on the Blanco. Constraints on the Mayall are not as severe as for the Blanco, but it is still the case that if you want some sort of regular observing cadence, Goodman may well be preferable to KOSMOS if your targets are accessible.

Commitments to the Dark Energy Survey also make the scheduling of COSMOS during the B semesters somewhat more difficult; this is not a concern during A semesters and, indeed, over-subscription of NOAO time on the Blanco may be less than on SOAR during those semesters.

Technical
In terms of overall throughput, COSMOS and Goodman are very similar over most of their wavelength range; COSMOS may be a little better, but SOAR has more collecting area. There are, however, some differences:

- Goodman throughput in the ultraviolet (UV) is better than COSMOS; if you are mainly interested in wavelengths below 4000 Å, you should propose for Goodman.
- At present, the detector available for Goodman has significant fringing in the red. However, we are procuring a second camera with a detector like that on COSMOS, so this problem has a solution. On the other hand, the new detector does not have the same blue response as the current detector. So if you care about both UV and far-red, see the “Coming Attractions” section for details.

The COSMOS optical design addresses the deviations caused by diffraction gratings by using prisms, whereas Goodman does so by physically moving the camera. As a result, COSMOS is limited to specific configurations, whereas Goodman offers the ability to adjust wavelength coverage. (Visit the relevant instrument web pages at ast.noao.edu/observing/current-telescopes-instruments for more information on the respective optical designs, should you be interested.) In addition, the maximum resolution offered by COSMOS is much lower than Goodman (about 2000 vs. up to 10,000); see the “Coming Attractions” section for details on coming improvements.

The same flexibility that offers more options with Goodman also means that it is a bit less stable than COSMOS; your observing overheads with the latter will be somewhat less. However, an observer following the recommended procedures should be able to observe efficiently with either spectrograph. We are in the process of implementing an acquisition camera for Goodman that should help bring its overheads in line with those of COSMOS.

Finally, the COSMOS field of view is larger than the Goodman field of view, 10 arcmin vs. 7 arcmin. For single objects this is immaterial, but for multiple object spectroscopy observations of large sparse fields, COSMOS will be more efficient. MOS mode is fully supported for Goodman, COSMOS, and KOSMOS, though at present the detailed procedures for designing masks differ between Goodman and the other two.

There are many programs where COSMOS and Goodman would work equally well. In these instances, proposers should still pick one, but should clearly state in the scheduling constraints and the “experimental design” section that they would accept the alternative. As an example, see the figure that shows spectra for two weak-line T-Tauri stars taken on KOSMOS and Goodman; the stars have similar spectral properties and are of nearly the same magnitude (both R ~ 15).

Coming Attractions
As noted above, a second detector is being procured for Goodman, which should be commissioned about the time proposals are due (check the website for updates). Switching between the “red” and “blue” detectors during the night will not be supported, but it should be feasible to carry out a program where you use one detector on some nights and the other on the remainder. This would be worth doing only if you are trying to get the best performance both below 4000 Å and above 7000 Å; because you need to split up your observations anyhow (remember you can only cover an octave at a time with a diffraction grating), this is feasible. But if you do not need to observe at either extreme of the wavelength range, either detector is acceptable. (Commissioning results will likely suggest one or the other, again, check the Goodman web pages for updates.)

continued
**Goodman vs. COSMOS continued**

Addition of an acquisition camera to Goodman should reduce overheads and increase stability. This addition is scheduled for midway through the current semester and will become available to observers as soon as it is commissioned.

Although Lawrence Berkeley National Laboratory (LBNL) detectors with even greater extreme-red sensitivity were purchased for COSMOS and KOSMOS, implementation of those detectors is not scheduled for any time soon, and proposers should only consider the e2v detector documented in the manuals.

The optical configuration of COSMOS limits its maximum feasible spectral resolution to about $R \sim 3000$ (with a 1-arcsec slit and realistic prism materials). We are in the process of procuring additional $R = 3000$ grisms for KOSMOS and COSMOS; please check the COSMOS/KOSMOS web pages for a status update if you might want to propose for them. The grisms should also include a lower resolution grism that provides full-octave coverage from 3700 Å to 7200 Å over a moderate-sized MOS field. Even with the new higher-resolution COSMOS/KOSMOS grisms, Goodman will be the instrument of choice for anyone requiring $R = 5000$ or higher. (Note that COSMOS will provide higher resolution with a narrow (0.6 arcsec) slit, but light losses will be significant.)

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**The Blanco Telescope Environmental Control System Upgrades**
Alistair Walker & Brooke Gregory

The Blanco Telescope Environmental Control System (ECS) includes several sub-systems designed to keep the telescope in thermal equilibrium with the nighttime observing conditions. Over the years since the telescope was built, there have been several improvements. During the 1990s, motivated by a seminal study of image quality at the Canada France Hawaii Telescope (CFHT) (Racine et al. 1991, PASP, 103, 1020), a team led by CTIO astronomer Jack Baldwin (now at Michigan State University) tackled the problem of daytime heat management in the dome by (among other things) installing a cold-air blower that cooled the primary mirror, moving offices and labs to a new off-summit building, and moving the control room to the ground floor. New installations for nighttime were lateral doors in the dome that could be opened to improve airflow, cooling the oil for the high-pressure right ascension bearing, and sucking air from the vicinity of the primary mirror. After these changes, the median image quality at the prime focus with the Mosaic imager was ~1.0 arcsec (Dey & Valdes, 2014, PASP, 126, 296).

Recently, we have been making some further improvements, together with repairs and replacement of aging hardware, motivated by the arrival of the Dark Energy Camera (DECam) for the Dark Energy Survey (DES). An important facilitator was the provision by Fermilab of a second Trane 40-ton capacity facility chiller that substantially increased our cooling capacity. A new control system, designed and built by Edison Bustos (CTIO), will help to manage and optimize system performance, using predictions of future Tololo nighttime temperatures provided by weather forecasting services.

One of the major tasks for the ECS is to try and drive the primary mirror surface to a temperature 2–3 °C cooler than the outside air temperature at the start of the night, a task made difficult by the high thermal inertia of a 15-ton piece of cervit. During the night, the ambient air temperature usually falls another 2 °C or so. If the primary is warmer than the surrounding air, even by as little as 0.5 °C, a thin highly turbulent layer of air is formed above the mirror, causing poor image quality. Temperature differentials elsewhere in the dome also can cause turbulence and degrade image quality if such air enters the light beam.

![Figure 1: Temperature of the outside air showing the diurnal cycle, the temperature inside the dome that now remains relatively constant, and the temperature at the surface of the primary mirror (pmas) that is strongly cooled during the daytime. The plot covers two nights and two days in mid-December 2014.](image-url)
The Blanco telescope has never had daytime air-conditioning of the telescope enclosure except via the chilled floor. Despite the double-skinned dome and the thermally isolated aluminum coating, the interior air can heat up by several degrees during the daytime. Large areas of surfaces of walls below the dome level can heat up as well and then radiate through the night. To improve this situation, we developed a plan to install two large air conditioners in the dome adjacent to the telescope, connected to the facility glycol chillers that are well outside the building. This additional cooling load required installing a new, parallel 2.5-inch-diameter supply and return loop for the water-glycol mix for the air-conditioning all the way up the building, an increase in the capacity of the water-glycol plant, and many other plumbing changes as well. This was a major task and took a year to complete. We began to use the new air-conditioning system on 13 August 2014.

So, how well does it all work? On the control side, we find that we have more headroom when cooling the primary mirror, and this helps to better control the surface temperature of the mirror. And, the dome environment stays quite close to the nighttime outside temperature, as shown in Figure 1. From left to right, all the temperatures are very similar during the night with the primary just cooler than the air (good!).

At dawn, the outside temperature starts rising, and the cooling systems for the dome air and the primary mirror are turned on. At 18:00 UT (3 pm), the mirror cooler is changed to sucking air rather than blowing cool air (this time is variable and depends on the temperature prediction for the subsequent night). Again, the temperatures are good through the following night. The low dome air is ~1 degree warmer than outside, this was a windy night and the lateral doors were closed and the wind blind was raised. Under those conditions, there is a lack of wind circulation at the level of the primary and below, which results in a pool of stagnant air slightly warmer than ambient. Overall, the system works well during the relatively stable weather of the Chilean spring and summer; the true test will come in wintertime, when there are larger temperature changes associated with cold fronts. These normally bring cloudy weather, but when the front passes, we hope to be able to better handle the cold but clear conditions that follow.

The primary purpose for the ECS is to optimize image quality. Figure 2 is a plot of the DECam image quality from measurement of image full width half-maximum (FWHM) but with the atmosphere contribution measured by the Differential Image Motion Monitor (DIMM) removed. The DIMM is external to the dome, so the residual FWHM in this plot are contributions from any “seeing” generated in the dome or telescope, together with the instrument contribution. The latter is dominated by diffusion in the CCDs and by the performance of the optics; from design and various measurements, it is thought to amount to a little under 0.5 arcsec. For early DES Year 1 (left-hand side of Figure 2), we had no cooling of the dome, mirror, oil, and floor, and the image quality was clearly much worse than expected due to substantial seeing generated in the dome and telescope. By contrast, the residual seeing (atmosphere subtracted) in recent months is better than the 0.63 arcsec median and closer to that expected for the instrument alone. There still may be a “gap” of ~0.1 arcsec image quality potentially able to be gained from very recent and some pending improvements to the telescope active optics control, particularly since the DIMM is expected to be slightly pessimistic compared to large telescopes (e.g., Floyd et al. 2010, PASP, 122, 731).

In conclusion, the new dome air conditioners work as designed and, as part of an actively controlled environment system, should help keep the image quality delivered by DECam closer to that expected. The delivered median point spread function for the DES wide-area rz images is 0.92 arcsec (J. Frieman), using a strategy that changes to g- and Y-band imaging, or to supernovae observations, in poor conditions. Although the wide-field survey rate of progress is within 10% of that originally simulated (and weather is the main systematic variable), it is clear that even a small systematic improvement in the delivered image quality would provide a significant increase in survey efficiency. And of course, Blanco image quality improvements benefit all users of DECam, COSMOS, ISPI, and (in 2016) TripleSpec4.
Mayall Telescope Control System Modernization Nearing Completion
David Sprayberry

The KPNO Engineering and Technical Services group (ETS-North) has been working for the last nine months or so on implementing modernized hardware and software for the Mayall telescope pointing and motion control systems. The old systems, while still performing adequately, are built from components that are more than 20 years old and have become so obsolete that replacement parts can no longer be obtained. In addition, the control tuning of the analog servo systems is difficult and provides little feedback to the engineers. Also, the servo control software is written in a legacy language (FORTH) not supported by modern hardware. Finally, the old rotary incremental encoders for the telescope drives are suspected of contributing to pointing anomalies due to wear and occasional slippage. All of these issues will be remediated when the new system is fully operational.

We have completed several aspects of the project: installation of new, high-precision tape incremental encoders on both the Hour Angle and Declination axes; assembly and installation of new, programmable, digital servo controllers based on National Instruments cRIO (compact reconfigurable input/output) architecture; and setup and installation of a new Linux-based Telescope Control System (TCS) pointing computer that runs the commercial TPOINT software pointing system (also used on Gemini and many other modern telescopes). The new equipment is based very closely on the design used by CTIO on their successful TCS upgrade for the Blanco telescope, completed just before installation of the Dark Energy Camera. Re-use of CTIO’s engineering design work allowed the project at the Mayall to proceed very quickly and with almost no surprises or missteps.

All the new hardware and software has been installed at the telescope. The full system had its first test on-sky on the night of 10 December 2014 and was finding and tracking stars successfully within an hour of startup. Daytime and nighttime testing continued in early January, though much hampered by clouds and rain, with more tuning of the servo loops and initial rough measurement of the coefficients for the pointing model. There will be further tests throughout the 2015A observing semester as more elements of the full pointing-tracking-guiding system are integrated. A special patch panel permits switching between the old and new servo systems in about 30 minutes. We still use the old system for routine operations, but we expect to be using the new system for regular observing by the end of semester 2015A.

This new system should be fully transparent to the science observers. Nothing about the ways in which the observers interact with the instruments or the telescope will change. These “under-the-hood” improvements will reduce downtime and improve pointing performance.

NOAO Data Reduction Mini-Workshop: Near-IR Data
Ken Hinkle & Letizia Stanghellini

NOAO held a mini-workshop on near-infrared (near-IR) data reduction at the January 2015 American Astronomical Society (AAS) meeting in Seattle. This workshop is intended as the first of a series of mini-workshops with topics that will focus on reducing data from NOAO and Gemini observations. The mini-workshop ran for 90 minutes on January 7 and featured two speakers. Dick Joyce (NOAO) reviewed the basics with his talk “An Introduction to Infrared Detectors.” Rachel Mason’s (Gemini) talk titled “Reducing GNIRS Cross-Dispersed Data” was on extracting spectra from data collected by the Gemini Near Infrared Spectrograph (GNIRS). The mini-workshop was filled to its seating capacity of 40. Most of those attending were students. The presentation slides for both talks will be posted on an NSSC web page of the NOAO website.

The series of workshops are intended as a target of opportunity for AAS attendees interested in expanding their knowledge of best data reduction techniques. Each topic is narrow so a single afternoon session allows participants to start working immediately with similar data from Gemini and other observatories. No special registration other than attendance at the AAS is required.

We would appreciate hearing about topics of interest to you for future workshops and/or suggestions for potential speakers. Feel free to advocate for your own data reduction software if you would like to present it to the community. We are of course especially interested in data reduction software that is applicable to data from NOAO or Gemini instruments. Email Ken Hinkle (hinkle@noao.edu) and Letizia Stanghellini (lstanghellini@noao.edu) with your workshop ideas and speaker suggestions.