NOAO NEWSLETTER

Issue 111, March 2015

Job Opening for Associate Director of NSSDC

NOAO seeks an Associate Director for its new NOAO System Science and Data Center (NSSDC) to harness the talents and interests of an experienced team of 30 scientists and software engineers to shape the future of NOAO data and user services.

The fundamental mission of NOAO is to enable scientific discovery by a global scientific research community. That mission is fulfilled through the acquisition, manipulation, visualization, and analysis of measurements of hundreds to hundreds of millions of celestial objects. Those measurements are extracted from gigabytes to terabytes of raw data obtained every night by world-class telescopes operated in Arizona, Hawaii, and Chile by NOAO and its partners. By deploying excellent data and user support services, the NSSDC team will enable scientific leadership at the frontiers of modern astronomy and astrophysics.

NOAO will begin reviewing applications on 3 April 2015. For more details about this leadership position, its requirements, and the application process, go to tinyurl.com/k36ujua.

On the Cover

Tales of the Modern Astronomer
First Bytes: Dawn of the Data

NOAO unveiled the first chapter of its graphic novel, "Tales of the Modern Astronomer: ANTARES Rising," at the January 2014 American Astronomical Association (AAS) meeting to highlight the ANTARES project (see the article in the September 2014 *Newsletter*.) The novel tells the story of NOAO's path to serve the community in the recognition of important time-domain phenomena and the processing of big data sets in the Large Synoptic Survey Telescope (LSST) Era. The cover image for this *Newsletter* issue is the first panel of the graphic novel's second chapter, "First Bytes: Dawn of the Data." The story line for this new chapter was presented as the backdrop of the NOAO booth at the January 2015 AAS meeting. In chapter two (which begins on page 24), the astronomer first introduced in chapter one has become facile in the analysis of big data sets and reminisces on the past experiences that prepared her for these new challenges. For details about NOAO's presence at the January 2015 AAS meeting, see the article "NOAO at the Seattle 2015 AAS Meeting" in this issue. (Cover image credit: Pete Marenfeld/NOAO/AURA/NSF.)

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NOAO Director's Corner

David Silva

The level of intellectual energy and excitement at NOAO has increased markedly in the last few months. Everywhere you turn in Arizona and Chile, new projects and ideas are blossoming, creating new research opportunities and capabilities for our user community now and in the near future. Engaging with these new projects and the associated collaborations, hosting national centers, and sponsoring federal agencies has brought new thinking and ideas to NOAO, challenging us to raise our game. March 2015 is a particularly busy period. What's all the excitement about?

Dark Energy Camera (DECam) at the CTIO Blanco 4-m telescope continues to be a huge success. The second year of Dark Energy Survey (DES) observations has been completed with mean image quality and higher observing efficiency than the first year; raw and processed images from the first year of DES observations are now available through the NOAO Science Archive (see two related articles in this issue). DES object catalogs will become publicly available in mid 2017. Meanwhile, the community–at-large is using DECam for a wide range of research projects from characterizing the low end of the Near-Earth Object size distribution to determining mass distribution maps for high-mass galaxy clusters at intermediate redshift. Particularly noteworthy, the DECam Legacy Survey (DECaLS) is creating a major public data set by imaging the entire Sloan Digital Sky Survey (SDSS) footprint south of the 30-degree declination in *grz* at least two magnitudes deeper than SDSS. The first release of DECaLS processing images and object catalogs is planned for March 2015. None of these projects would have been possible just a few years ago (before DECam). To help maximize the impact of this magnificent instrument, NOAO is holding a community workshop, "DECam Community Science Workshop," on March 11–13, to showcase early science results and to enable communication and cross-fertilization within the DECam user community.

Just providing processed images and catalogs, however, is no longer enough. Our user community expects to have better tools for data exploration, visualization, and manipulation. Therefore, a new project known as the NOAO Data Lab has been launched. The Data Lab project strives to allow users of large NOAO-hosted data sets (yes, NOAO's archive has reached the petascale) to explore imaging and spectral data sets with their associated catalogs, experiment with and conduct complex workflows applied to those data sets, and allow collaborators to see and share all steps of that analysis. The goal is not to reinvent existing tools and systems but to adapt and deploy them for use by the NOAO community in collaboration with other groups. A Conceptual Design Review is scheduled for mid-March. If all goes well, the initial public release will occur by mid 2017 to correspond to the first public release of the DES catalogs. To further educate ourselves and our community about the challenges of conducting research with large astronomical data sets, NOAO is holding a workshop, "Tools for Astronomical Big Data," on March 9–11, to survey the present state of the art in addressing the challenges of conducting research with large astronomical data sets.

Also in March, Cornell University will deliver TripleSpec4 to the CTIO Blanco 4-m telescope. A cross-dispersed near-IR spectrometer, TripleSpec4 will cover 0.8–2.45 µm simultaneously at R ~ 3200. If all goes well, this instrument will be available to the community for the 2016A observing semester. The arrival of TripleSpec4 closely follows the release of the new, multi-mode optical spectrometer COSMOS (CTIO Ohio State Multi-Object Spectrometer) at the Blanco. The Blanco instrument suite (DECam, COSMOS, TripleSpec4) has been completely renewed to a world-class state and lays the foundation for Blanco-based research in the era of the Large Synoptic Survey Telescope (LSST).

Another exciting development is the advent of the NASA-NSF Exoplanet Observational Research program (NN-EXPLORE). At the heart of this program will be the deployment of an extreme precision Doppler spectrometer (EPDS) at the WIYN 3.5-m telescope on Kitt Peak. NASA has recently issued a request for EPDS proposals. A pre-proposal meeting will be held in March. NOAO will be deeply involved in integrating this instrument into the WIYN facility and operating it.

Meanwhile, the Dark Energy Spectroscopic Instrument (DESI) project continues to make good progress, including a successful Critical Decision 1 (CD-1) review by the Department of Energy in late 2014. Currently, all major optical elements (six of them) of the prime focus corrector are in fabrication. Components of the prototype spectrograph (a three-arm design) will be delivered during 2015, and preparations for a prototype system to test the fiber positioners and acquisition camera (protoDESI) are being made. Analogous to DECam, NOAO is responsible for preparing the Mayall facility on Kitt Peak for DESI installation, after which NOAO will be deeply involved in the installation, commissioning, and operation of DESI.

The construction start for LSST also has also injected new energy into NOAO. The LSST Project Office team is moving into office spaces renovated for them at NOAO's sites in Arizona and Chile, strengthening the bridge between the NOAO and LSST teams. Furthermore, site preparation work is moving at a high tempo on Cerro Pachón in Chile. Because the Data Lab is in many ways a pathfinder project for working with LSST-scale data sets, there is growing LSST/NOAO synergy in that arena, as well.

Looking further into the future at the Thirty Meter Telescope (TMT), the NOAO TMT Liaison Office is working with community scientists to provide input into a federal participation plan being developed by the TMT Project team within the framework of a cooperative agreement between NSF and TMT. That plan will include the scientific justification for TMT from the perspective of the US community, the TMT technical capability and operational requirements that flow from that justification, and how federal participation in TMT can address broader impacts in the areas of workforce development, education, and public outreach.

New collaborations, new major instruments and data sets, new data services under development, continued involvement in LSST, renewed connections to TMT are all signs of a healthy, vigorous NOAO program—a program that will enable excellent community-based research into the mid 2020s and beyond.

Massive Galaxy Clusters as Test Bed for the Dark Energy Survey

Peter Melchior (Ohio State University/CCAPP) for the DES collaboration

Peter Melchior (OSU/CCAPP) and a large team of Dark Energy Survey (DES) collaborators used the Dark Energy Camera (DECam) on the CTIO 4-m telescope to study four massive galaxy clusters. The targeted clusters were well known so that the findings from DECam could be cross-checked with existing results. The team chose to validate the demanding technique of weak gravitational lensing to infer integrated cluster masses and two-dimensional mass distributions. This presented a formidable challenge because weak lensing has stringent requirements on image quality as well as astrometric accuracy and photometric uniformity. Because weak lensing is encoded in imperceptibly small changes in galaxy sizes and ellipticities, the first test for any successful analysis is how well the telescope's point spread function (PSF) can be modeled. While stellar ellipticities could be modeled accurately, getting the stellar sizes correct proved to be a harder problem. The bulk of all stars appeared to be ~1% smaller than the model that was built from them. This mismatch is due to the thick, fully depleted CCDs used in DECam, which have a mild flux-dependent registration of charges, the so-called "brighter-fatter" effect. The few very bright stars, which dominate the PSF model, create so many charges in the central pixels that newly incoming charges get slightly repelled by the charges already present, causing the PSF to be broader than that measured from faint stars. Thus, to build precise PSFs, the brightest stars had to be rejected.

Combining weak-lensing measurements with photometric redshift (photo-z) values for the background galaxies, one can infer the mass of the cluster that acts as lens. Figure 1 shows the mean tangential ellipticity, the primary weak-lensing signal, as a function of separation from the Brightest Cluster Galaxy (BCG) of the cluster RXC J2248.7-4431 (z = 0.348). Also shown are 100 Markov chain Monte Carlo (MCMC) samples of Navarro-Frenk-White (NFW) profile fits to the data, a standard choice to describe the radial profile of dark matter haloes. The parameters of this model are the mass M_{200c} enclosed in a given aperture (the sphere that contains 200× the critical density of the universe at the cluster redshift) and the concentration c_{200c} that describes the slope of the profile within the same aperture. The resulting fit yields a cluster mass in good agreement with previously published results. Moreover, the team could show that the cluster mass estimates remained unchanged when the weak-lensing measurements were done in any of the *riz* filters, demonstrating that the team accounted for all relevant instrumental effects.

Figure 1 also demonstrates that the NFW profile is often not a good fit to individual clusters, whose mass distributions may deviate from any spherical model. Indeed, the contours in the left panel of Figure 2 show the 2-D mass distribution as inferred from weak lensing (a so-called aperture-mass M_{ap} map in units of its dispersion) in an area of 30' × 30', revealing a strongly elongated cluster. Also shown (as black dots) are red-sequence galaxies at the redshift of the cluster, identified by the REDMAPPER code (Rykoff et al. 2014). Their redshift estimates from five-band *grizY* imaging of DES are found to exhibit a scatter of only 0.015, significantly more precise than the typical DES photo-z scatter of ~0.1. As another confirmation of a successful lensing analysis, the mass distribution of the cluster is tightly traced by its red-sequence galaxy distribution. With the accuracy of the red-sequence redshifts, the DES data allowed the team to connect the central cluster region to its larger-scale environment, literally by following a string of galaxies. The right panel in Figure 2 shows the same red-sequence galaxies as the central panel, in a narrow redshift slice, for an area of 90' × 90'. It became evident that this massive cluster is embedded in a filamentary structure that spans about 12 Mpc toward another, less massive cluster (red diamond). The Bullet Cluster, the other very massive and actively merging cluster in the sample, showed a similarly rich environment. That filaments connect clusters, particularly the very massive ones, is not news: it had been predicted from simulations and observed spectroscopically. But, being able to map out the cluster environment without spectroscopy bears truly exciting prospects for large-scale structure studies in the 5000 square degrees of DES.

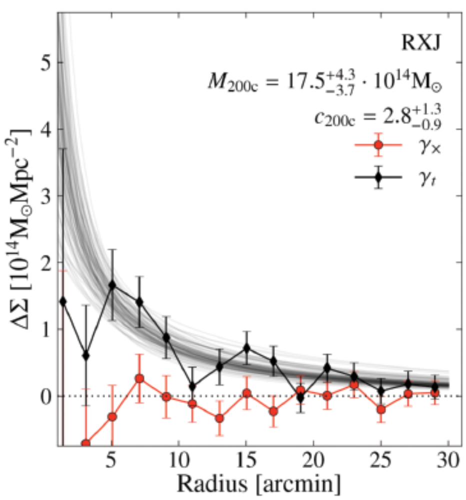


Figure 1: Mean ellipticity γ_t (black) in the tangential direction (with respect to the cluster center) in terms of excess surface mass density ΔΣ as a function of the distance from the brightest cluster galaxy (BCG) of the cluster RXC J2248.7-4431. Also shown are the B-mode $\gamma_\times$ (red) and 100 MCMC samples of NFW fits to the data. The B-mode $\gamma_\times$ cannot be generated by gravitational lensing and thus serves as a null test. The mean and 68% confidence intervals for the integrated mass M_{200c} and halo concentration c_{200c} for the NFW model (listed in the upper right corner) are in good agreement with previously published results for this cluster.

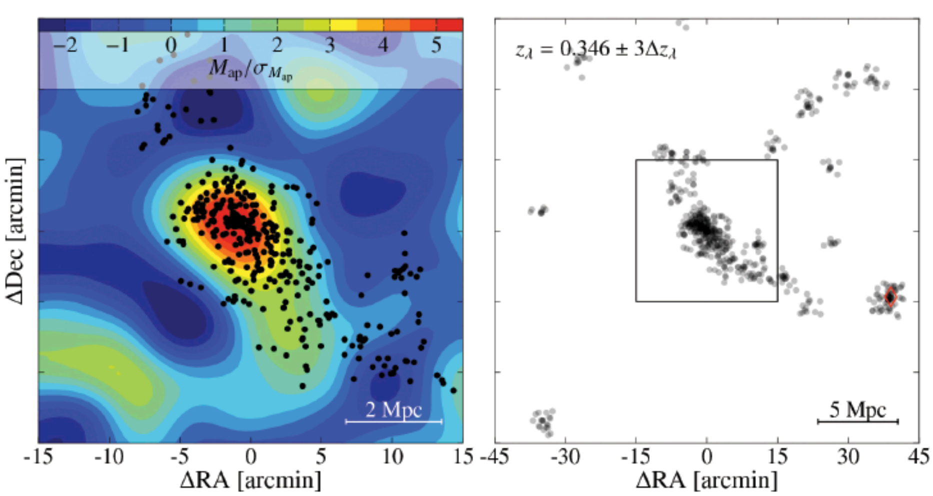


Figure 2: (Left:) Weak-lensing mass map of the inner 30' × 30' (contours), overlaid with red-sequence galaxies (black dots) in REDMAPPER-detected groups of at least five members in a narrow redshift slice around the cluster RXC J2248.7-4431. (Right:) The same REDMAPPER galaxies but for the entire useable field of view of 90' × 90'. The panels are centered on the BCG; the size of the left panel is indicated by a black box on the right.

Connecting the Dots with KOSMOS

Alec S. Hirschauer (Indiana University)

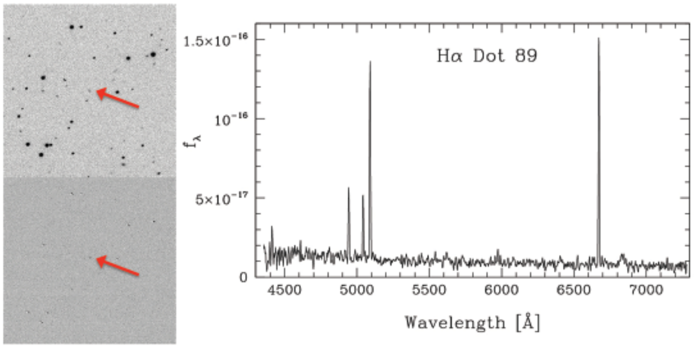


Figure 1: Example images of an Hα-selected Hα Dot: R-band continuum and continuum-subtracted Hα image taken with the WIYN 0.9-m telescope, with a quick-look spectrum taken using the 9.2-m Hobby Eberly Telescope. Hα Dots are serendipitously detected in continuum-subtracted narrowband Hα images taken for the ALFALFA Hα survey. Emission for these objects corresponds to Hα in a similar velocity range to the original target galaxy, but these objects are independent systems.

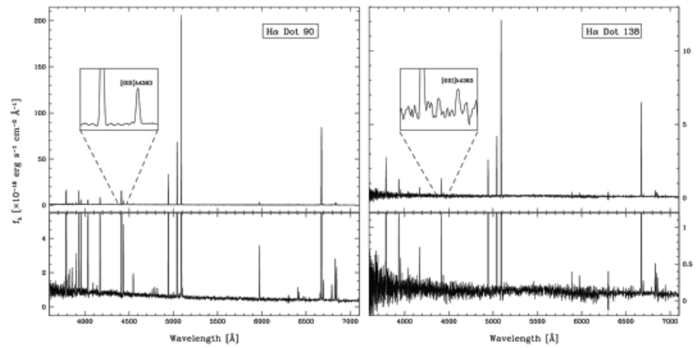


Figure 2: Optical spectra of Hα Dots 90 and 138 observed using KOSMOS. Inset boxes show [O III] λ4363 Å for determinations of T_e abundances. While Hα Dot 90 is relatively bright, Hα Dot 138 is among the lowest-luminosity targets in this sample.

Alec S. Hirschauer and John J. Salzer (Indiana University) used the new KPNO Ohio State Multi-Object Spectrograph (KOSMOS) on the Mayall 4-m telescope to observe a set of fifteen Hα "Dots." These objects are serendipitously detected in continuum-subtracted narrowband Hα images taken for the ALFALFA Hα survey (Van Sistine et al. 2015; based in part on the NOAO Survey Program "Making Hay with ALFALFA").

Point-like emission falling within the survey's narrowband filter that is not obviously associated with the target ALFALFA galaxy is designated as an Hα Dot, typically falling into one of three categories (Figure 1): (1) Hα-detected low-redshift dwarf star-forming galaxies, (2) intermediate-redshift [O III]-selected star-forming galaxies and Seyfert 2s, or (3) high-redshift quasi-stellar objects (QSOs). The subset of Hα-selected Hα Dots includes some of the lowest-luminosity star-forming galaxies in the local Universe; all fifteen Hα Dots observed for this study belong to this group. Observational work on such objects offers a unique opportunity to study the physics of star formation at extremely low luminosities.

To study the chemical enrichment of low-luminosity star-forming systems, fifteen Hα Dots were observed using KOSMOS in long-slit mode. These targets were selected because they possessed strong enough [O III] λ5007 Å in quick-look spectra that the temperature-sensitive auroral [O III] λ4363 Å line should be detectable. This line is necessary for electron temperature (T_e) direct-method determination of the abundance of the nebular gas. These galaxies exhibit a range of *R*-band apparent magnitudes between 17.3 and 21.0, and are at distances between 65 and 100 Mpc. Observations were made using both the Blue grism (2500–6200 Å) and Red grism (5000–9000 Å). The resulting nebular spectra are of exceptional quality (Figure 2).

Figure 3 shows the placement of the emission line flux ratio data onto a standard line-diagnostic diagram (Baldwin, Phillips, & Terlevich 1981). The solid line is a star-formation sequence for high-excitation objects from Dopita & Evans (1986), while the dashed line represents an empirically derived demarcation between star-forming galaxies and active galactic nuclei (AGN) from Kauffmann et al. (2003). The location of the Hα Dots on this plot confirms the nature of these targets as fairly high-excitation, low-abundance star-forming systems. Those points with a black ring represent targets for which [O III] λ4363 Å was measured, enabling a determination of the electron temperature. Oxygen abundances have been calculated for all eleven Hα Dots with detected [O III] λ4363 Å, falling into the range of $7.74 < 12+\log(O/H) < 8.17$.

With robust oxygen abundance measurements made for 11 systems, this sample of Hα Dots may then be used to study dwarf star-forming galaxy metallicity relations on the low-luminosity end. The relationship between a galaxy's chemical enrichment and its stellar content has been known for several decades (e.g., Lequeux et al. 1979); however,

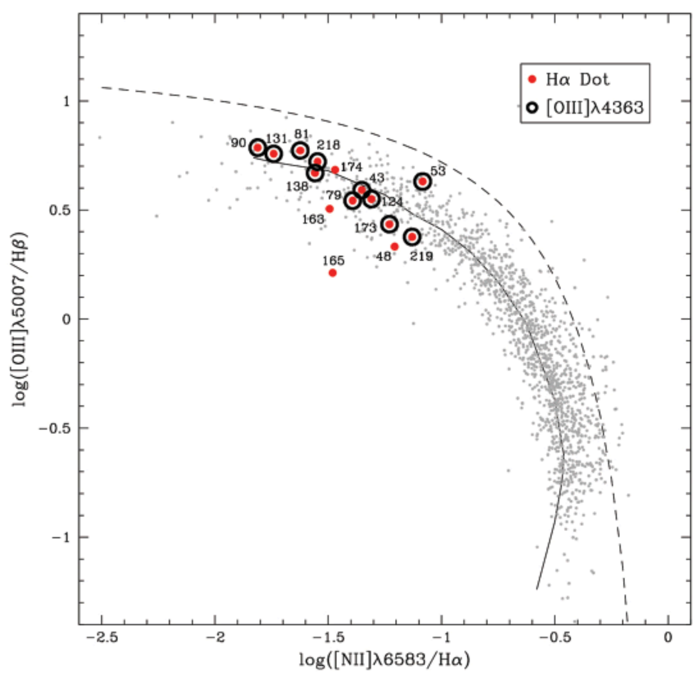
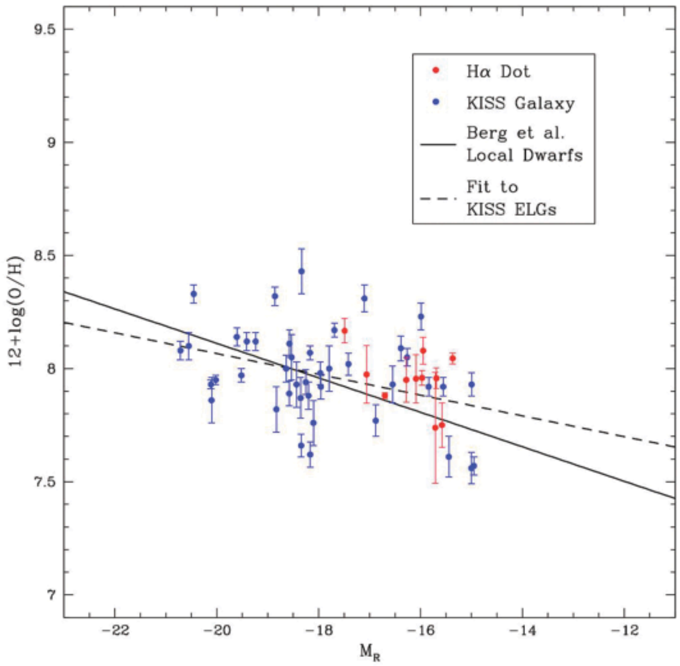


Figure 3: Diagnostic diagram showing location of 15 Hα Dots observed using KOSMOS (red) with those for which we measured [O III] λ4363 Å (black rings). Gray points represent star-forming galaxies from the KPNO International Spectroscopic Survey (KISS) (Salzer et al. 2000).

continued

Connecting the Dots with KOSMOS continued



observational data points with robust metallicity calculations on the faint end are comparatively scarce. The luminosity-metallicity (L-Z) diagram of Figure 4 illustrates the location of the Hα Dots from this study (red) against star-forming galaxies with T_e abundances from the KISS survey (blue), which are detected using similar methods. On this plot, the solid line represents an L-Z fit to local dwarf galaxies converted to *R*-band luminosities from Berg et al. (2012), while the dashed line represents a direct fit to the KISS galaxies. The new KOSMOS spectra have added several data points to the faint end of the L-Z relation. These preliminary results are just a small taste of the future promise of this program. A sample of Hα Dots for the spring includes many more compact star-forming objects at even lower luminosities than were observed last fall.

Figure 4: *R*-band luminosity-metallicity (L-Z) relation diagram with star-forming galaxies from KISS (blue) and Hα Dots (red). The solid line represents an L-Z fit to local dwarf galaxies converted to *R*-band luminosities from Berg et al. (2012), while the dashed line represents a direct fit to the KISS galaxies.

Water at the Center of a Transitional Protoplanetary Disk – Where It Shouldn't Be!

Colette Salyk (NOAO)

The Texas Echelon Cross Echelle Spectrograph (TEXES) visitor instrument (PI: J. Lacy) on Gemini North was used by a US-based observing team, led by Colette Salyk (NOAO), to detect water vapor in the inner region of a type of protoplanetary disk known as a "transition disk." Transition disks have inner regions depleted of small dust grains, as detected with spectral energy distributions and millimeter-wave interferometric images. The depleted regions in many transition disks are due likely to dynamical interactions with one or more planets, which tidally clear the disk material in their vicinity. However, the inner regions of transition disks display a diversity of both physical and chemical properties, and it is not yet understood exactly how the growing planets interact with and affect their environment.

An interesting potential tracer of this inner disk region is water vapor. This molecule is easily dissociated in the presence of ultraviolet (UV) radiation and so depends on dust shielding and high densities (which allow for fast chemical formation) to survive. While a high percentage of protoplanetary disks harbor water vapor in their inner disk, nearly all transition disks have dry inner regions, in spite of retaining some CO gas. Therefore, for these transition disks, the formation of planets and the subsequent removal of disk material has created an environment hostile for the survival of water vapor, and radically changed the local chemistry.

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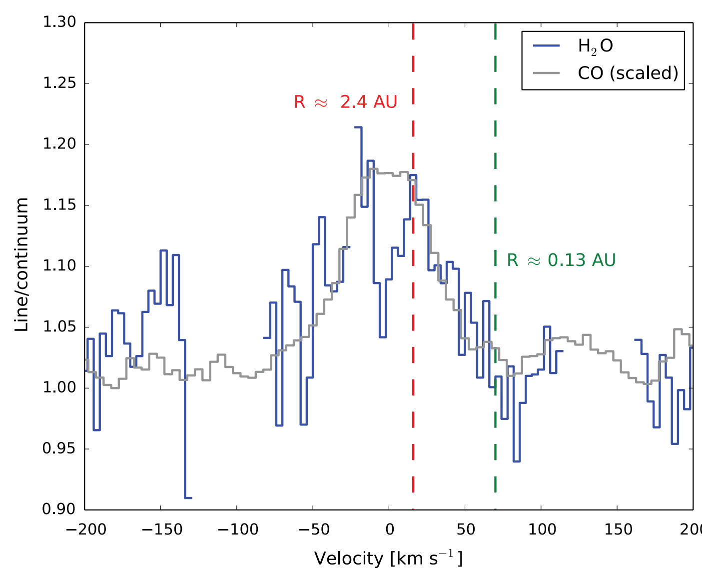


Binned composite emission lines for water vapor (with TEXES; blue) and CO (with NIRSPEC; gray) confirm that the inner, depleted region of the DoAr 44 disk actually contains both CO and water vapor. TEXES is the only instrument able to provide these water vapor observations, thanks to its extremely high spectral resolution and mid-infrared capabilities.

Water at the Center of a Transitional Protoplanetary Disk continued

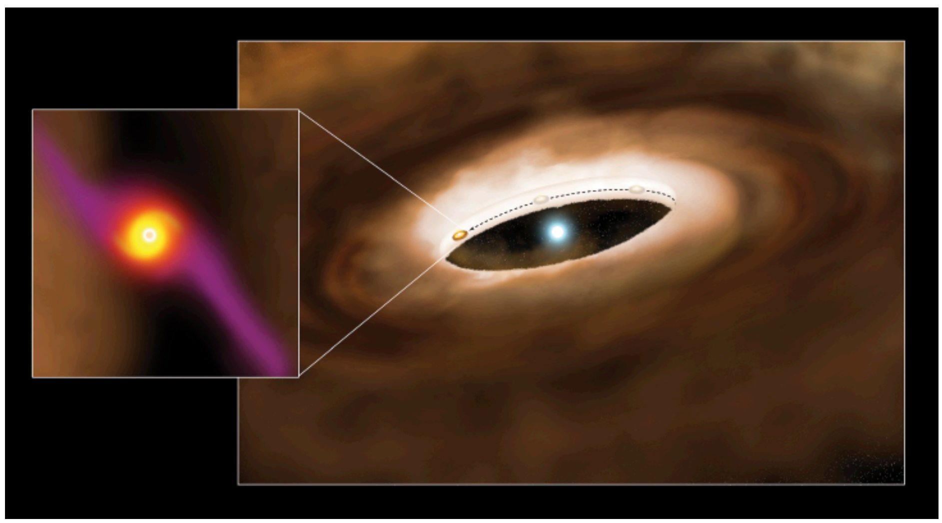
The target of this work is one exception to this rule. DoAr 44—a young K-type star in the approximately 3-Myr-old Ophiuchus star forming region—is surrounded by a transition disk that shows, using the Spitzer-Infrared Spectrogram (Spitzer-IRS), a spectrum rich with warm water vapor. However, with the spectrally and spatially unresolved Spitzer-IRS spectrum alone, we cannot definitively say whether the water vapor arises in the inner, planet-forming region of the disk. TEXES is unique in providing high spectral resolution (up to R ~ 100,000) at mid-infrared wavelengths, where water vapor emits strongly. With TEXES, we detected spectrally-resolved emission lines from DoAr 44 and used the kinematic information to determine that the water vapor originates in the inner disk—likely interior to where any giant planets have formed.

Future work will determine the gas/dust and water/CO ratios in this region and provide an understanding of why this transition disk has remained water vapor rich, while others are depleted of their water vapor. In particular, we suspect that the planets in this disk have allowed a gas and dust-rich ring of material to remain in the inner disk, perhaps due to the particular configuration or masses of the young planets. In addition, these results could have interesting implications for the formation of terrestrial planets, as they suggest that the chemical environment in which the terrestrial planets form depends sensitively on the influence of faster-forming giant planets.

A Forming Planet and Its Circumplanetary Disk

Joan Najita (NOAO)

Planets are found to occur commonly around low-mass stars, but little is known observationally about how planets form. Only a few candidate-forming planets have been identified to date. In a recent paper (Brittain et al. 2014, ApJ, 791, 136), we reported possible evidence for a forming planet, surrounded by a circumplanetary disk, that orbits the young Herbig Be star HD100546. The results provide, perhaps, the first evidence that planets are surrounded by a circumplanetary disk at birth.



An artist's conception of the young massive star HD100546 and its surrounding disk. A planet forming in the disk has cleared the disk within 13 AU of the star. Gas and dust that flow from the circumstellar disk to the planet surrounds the planet as a circumplanetary disk (inset). Circumplanetary disks are believed to be the birthplaces of planetary moons, such as the Galilean moons that orbit Jupiter. While they are theoretically predicted to surround giant planets at birth, there has been little observational evidence to date for circumplanetary disks outside the solar system. Observations over 10 years trace the orbit of the forming planet from behind the near side of the circumstellar disk in 2003 to the far side of the disk in 2013. These observations provide a new way to study how planets form. (Image credit: Pete Marenfeld/NOAO/AURA/NSF.)

By analyzing multiple epochs of high resolution 5 µm CO spectroscopy of HD100546, obtained over 10 years, we identified the spectroastrometric signature of a component of hot CO emission that orbits the star at a radius of ~13 AU and has the expected emitting area of a circumplanetary disk. HD100546 is a B9e star, 3–10 Myr old, at a distance of ~97 pc.

Circumplanetary disks are believed to be the birthplaces of planetary moons, such as the Galilean moons that orbit Jupiter. They also may play an important role in our understanding of how planets accumulate their masses. While they are theoretically predicted to surround giant planets at birth, there has been little observational evidence to date for circumplanetary disks outside the solar system.

The candidate planet was discovered serendipitously through the analysis of archival data taken with the Phoenix spectrograph on the Gemini South telescope (Hinkle et al. 2003, Proc. SPIE, 4834, 353). The signature of the candidate planet was confirmed with subsequent spectroscopy obtained with CRIRES, the cryogenic high-resolution infrared echelle spectrograph on the Very Large Telescope.

The spectroastrometric technique measures the center of the point spread function (PSF) of a spectrum as a function of wavelength (e.g., Bailey et al. 1998, MNRAS, 301, 161). Because the PSF center can be measured to a much higher accuracy than the diffraction limit of an instrument, spectroastrometry can provide valuable spatial information on small spatial scales when applied to systems with simple velocity fields.

The Brittain et al. study illustrates how spectroastrometry of orbiting gas (e.g., in a circumplanetary disk) may be an alternative way to identify and study forming planets. Other candidate-forming planets identified to date have been identified primarily through direct imaging studies.

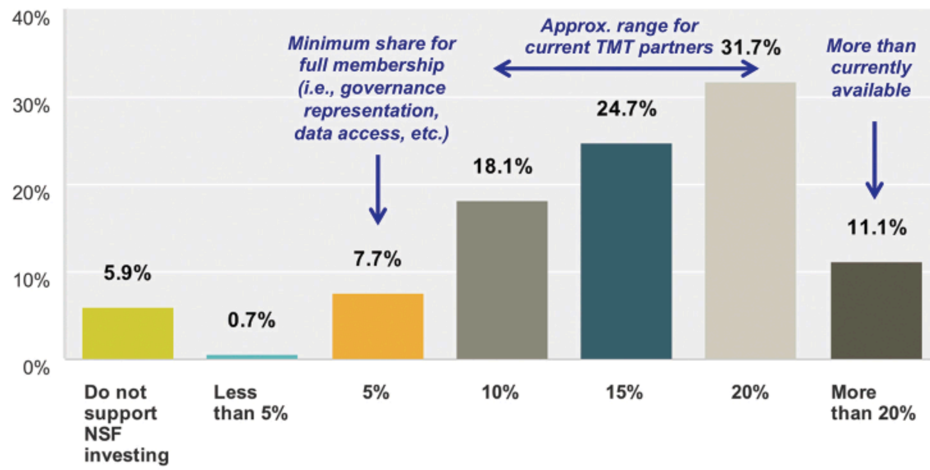
Recent Developments with the Thirty Meter Telescope

Mark Dickinson

The Thirty Meter Telescope (TMT) continues to move forward in its construction phase. Final legal permission to proceed with construction on Mauna Kea was secured in July 2014. The telescope and its many subsystems are approaching the "build stage," with a series of final design reviews planned in 2015. Production of blanks for the 492 1.44-m hexagonal mirror segments is well underway in Japan, and institutes in the US, Japan, China, and India are preparing to carry out segment polishing. Development of the first-generation instruments and adaptive optics system is progressing on many fronts. In December, the government of India signed financial agreements, and that country is now a full member in the TMT International Observatory (TIO), joining China, Japan, Caltech, and the University of California, which have also committed funding. Canada is a TIO Associate, awaiting funding decisions at the government level, and AURA is also a TIO Associate, with NOAO carrying out AURA's responsibilities and participation activities.

As part of a cooperative agreement with the National Science Foundation, TMT and NOAO have been engaging with the US astronomical community to understand its aspirations and priorities and to develop a model for potential US federal partnership in TMT. The US TMT Science Working Group (SWG), formed by NOAO, is helping to develop this participation plan, which will be submitted to NSF in 2015. The SWG consists of 13 astronomers from US institutions outside the current TMT partnership (see *ast.noao.edu/system/us-tmt-liaison#SWG*).

During September–October 2014, the SWG surveyed the astronomical community to gather information for the SWG's report to NSF. The online survey asked about priorities for TMT instrumentation, operations issues such as classical vs. flexible/queue scheduling, data management and archiving, and how to maximize the scientific return from a US national share of TMT observing time. Nearly 80% of the 467 people who responded to the survey were US astronomers outside the TMT partner institutions. Of those responding, 140 people contributed short "essays" with examples of TMT science programs that they might carry out, and there were hundreds of articulate comments related to the various survey topics.



Distribution of responses to the TMT US Community Survey question: "In your opinion, what minimum partner share in TMT does the US community (outside the current partners) need in order to conduct globally competitive science programs?"

One survey question asked: "In your opinion, what minimum partner share in TMT does the US community (outside the current partners) need in order to conduct globally competitive science programs?" This question was accompanied by links to information about the costs and benefits of TMT membership and about the partner shares of the other TIO members. The graph above shows the distribution of responses to this question. Although about 6% of respondents did not favor US national partnership in TMT, those who did generally supported investment at a level similar to that of the other TIO members (approximately 10 to 20%). Sixty-eight percent favored participation at a level of 15% or more, which is roughly the share of TMT that is unsubscribed by the current partners. There were 166 respondents who offered thoughtful comments on this question, in many cases, providing justification for their recommended level of participation. Some wrote that participation at a level comparable to other partners was essential for the US community as a whole to aspire to a role of leadership in the 2020s, when three giant telescopes (TMT, Giant Magellan Telescope, and the European Extremely Large Telescope) will come on line. Others worried about the value of a relatively modest share of TMT time (15% would correspond to about 45 observing nights per year) for a large US community, or about the impact of TMT investment on NSF funding for other open-access observatories in the current budgetary climate. The SWG will take these comments into account in its report to NSF.

At the January American Astronomical Society (AAS) meeting in Seattle, TMT held an early evening open house with refreshments that was attended by about 350 people. Michael Bolte (University of California, Santa Cruz) gave a short update on the TMT project status, and Mark Dickinson (NOAO) discussed the community liaison activities of the US TMT SWG and NOAO, including results from the community survey. (The presentation is available at *ast.noao.edu/system/us-tmt-liaison*.) After an open microphone question and answer period, participants at the open house broke up into several discussion groups that were organized by SWG members and TMT staff astronomers to talk about instrumentation, operations, data management, the role of TMT in the US optical/infrared system, and other topics.

During the coming months, the US TMT SWG will continue its dialogue with the astronomical community and develop its report for the NSF. The third annual TMT Science Forum (see associated article "Upcoming 2015 TMT Science Forum" in this issue) is an important opportunity for astronomers to get involved with TMT.

Resources for additional information:

NOAO TMT liaison activities:
ast.noao.edu/system/us-tmt-liaison

TMT information and FAQs:
ast.noao.edu/system/us-tmt-liaison/survey-faq

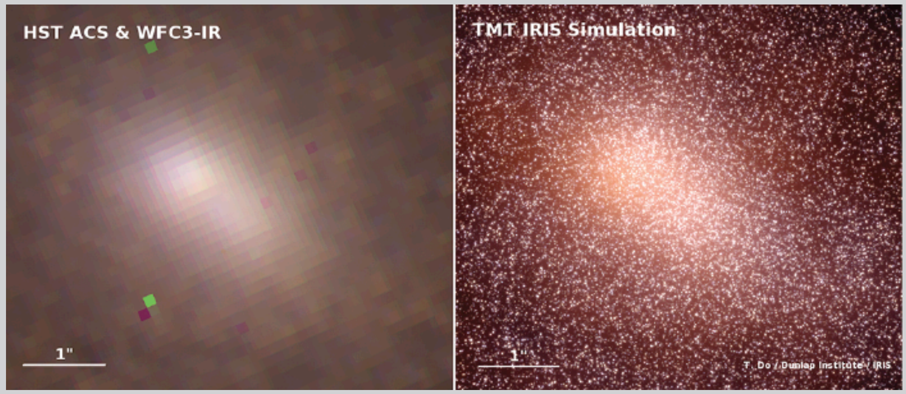
US TMT SWG on Facebook:
www.facebook.com/USTMTSWG

Upcoming 2015 TMT Science Forum

Mark Dickinson

The TMT Science Forum is an annual opportunity for astronomers from the international TMT community to meet, collaborate, and plan for future TMT science programs. Attending the Forum is the best way to become informed about the status of the observatory, its instrumentation and adaptive optics system, and to get involved in shaping the future of TMT.

The 2015 TMT Science Forum will be held on 23–25 June 2015 at the headquarters of the American Association for the Advancement of Science (AAAS) in Washington, D.C. The meeting theme is "Maximizing Transformative Science with TMT." The registration deadline is 15 May 2015.



Diffraction-limited imaging and integral field spectroscopy from TMT's first-light instrument IRIS (Infrared Imaging Spectrograph) and the NFIRAOS (Narrow Field Infrared Adaptive Optics System) will resolve stars at the center of M31, measuring proper motions within the sphere of influence of the central, supermassive black hole as well as dynamics and stellar population properties. Left: A three-color image using the HST Advanced Camera for Surveys (F814W) and Wide Field Camera 3 (F110W, F160W). Right: A three-color image (*J*, *H*, and *K* bands) using TMT IRIS. The diffraction limited point spread function has full width half-maximum equal to 0.017 arcseconds at a wavelength of 2 microns. (Image credit: Dr. Tuan Do and the IRIS Science Team.)

With nine times more collecting area than a Keck telescope and 12 times better angular resolution than the Hubble Space Telescope (HST) in the near-infrared, TMT will enable amazing new science (see figure). The 2015 Forum is an opportunity to think about how to maximize the scientific return from TMT through innovative collaborations, telescope operations, data management, and instrumentation development. The meeting will feature presentations about truly transformative science that will be possible with TMT and focus on *how* best to accomplish that science. There will be working sessions devoted to planning for possible TMT key programs that could span the international TMT partnership as a way to carry out projects that might exceed the capacity of individual scientists and teams within any single partner. The implications of such programs for TMT operations and the evolution of its instrumentation suite will all be discussed.

The NSF-TMT cooperative agreement provides generous funding for members of the US community to attend the TMT Science Forum. Write to *tmt@noao.edu* for more information, and watch the Forum website (*conference.ipac.caltech.edu/tmtsf2015*), the NOAO *Currents* electronic newsletter, and the US TMT SWG Facebook page for more information.

The 2014 NOAO and LSST Observing Cadences Workshop

Knut Olsen & Steve Ridgway

NOAO and the Large Synoptic Survey Telescope Project Office (LSSTPO) co-hosted a workshop on the LSST observing cadence during the week of 11–14 August 2014, in Phoenix, Arizona, in parallel with the larger LSST Project and Community Workshop. The cadence workshop drew more than 100 registrants, which included an even mix of Project people, non-Project scientists involved in LSST Science Collaborations, and people new to LSST.

As described by LSST Director Steve Kahn in his introductory presentation, LSST is fundamentally a time domain facility, with a telescope, camera, and data management system designed to visit most of the southern sky one thousand times over the course of 10 years. However, the order of those visits—the cadence—has not yet been finalized; this represents an important opportunity for involvement by the open scientific community in the design of the LSST survey.

The freedom to customize the cadence is constrained, however, by the need to serve a broad and ambitious science case. The scientific goals of LSST include identifying moving solar system objects, mapping the structure of the Milky Way, probing cosmology through multiple means, and characterizing the variable optical sky. Each of these science themes contains a large number of specific science cases, each case with potential desires for an optimal cadence. Optimizing the LSST cadence for these specific science cases, while ensuring that the broad

continued

The 2014 NOAO and LSST Observing Cadences Workshop continued

The participants of the NOAO and LSST Observing Cadences Workshop gathered on the first day of the meeting in Phoenix, Arizona. For additional information about the workshop, visit project.lsst.org/meetings/ocw/.

goals of LSST are achieved, will require experimentation and quantitative analysis, for which the LSST Operations Simulator (OpSim) software will be a critical tool.

In this inaugural cadence workshop, our primary goal was to establish basic quantitative input for specific science cases in the form of metrics that measure how well a given LSST cadence performs for that science. With such metrics in hand for all science cases, we can in the future compare the results of OpSim simulations employing different cadence logic and focus on those strategies that have the greatest benefit for the broadest and most compelling science. A secondary goal of the workshop was to identify promising avenues of future cadence strategy exploration.

After a pre-workshop tutorial session on the Metrics Analysis Framework (MAF), a software package written to make it straightforward to code metrics and to apply them to OpSim simulation output, the workshop opened with a plenary session to provide background on the LSST

continued

Project and cadence. The subjects of these presentations included the process by which LSST will be scheduled, how LSST cadence simulations are performed, descriptions of key hardware and scientific constraints on the cadence, and the tradeoffs involved in choosing a cadence strategy.

The workshop proceeded with a series of breakout group discussions on a variety of scientific topics, typically led by pairs of leaders. The bulk of the workshop activity occurred in these groups, which made excellent progress in generating ideas for useful metrics for compelling LSST science cases, identifying the ingredients of those metrics, and in several cases coding them using MAF. The groups also identified work that needs to be done by the LSST Project and the science community to make an optimized LSST cadence a reality. The groups contributed to a report of the workshop outcome, which can be seen at: *project.lsst.org/meetings/ocw/*.

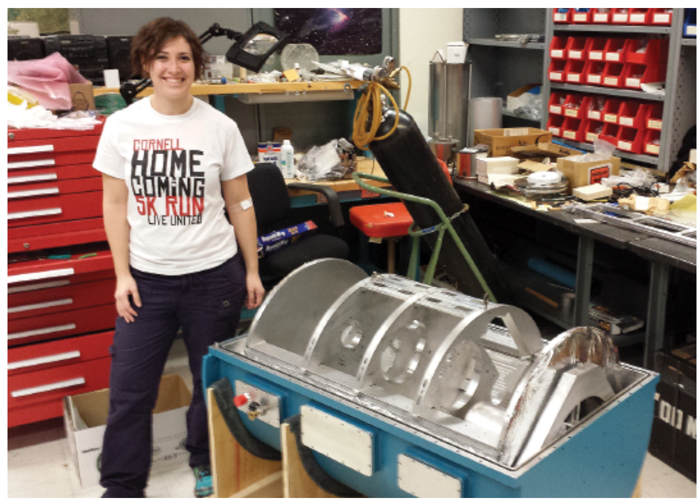
Stay tuned for news on the second Observing Cadences Workshop!

TripleSpec4 Commissioning Planned for Semester 2015A

David Sprayberry

TripleSpec4 will be the last new instrument built under the Renewing Small Telescopes for Astronomical Research (ReSTAR) award for NOAO. Construction of TripleSpec4 is a partnership between Cornell University (PI: Dr. Terry Herter) and NOAO; Cornell has engaged Dr. John Wilson (University of Virginia) to support the project. TripleSpec4 will be a moderate-resolution, single-object infrared spectrograph designed to support a broad range of science with a simple format, operational robustness, and the following principal features:

- Simultaneous wavelength coverage of 0.8–2.4 µm
- Reimaging fore-optics to match the telescope *f*-ratio to the instrument
- Single, fixed collimator-disperser-camera unit (no moving parts)
- Resolution of $R \sim 3000$
- Slit width of ~1 arcsec, slit length of 37 arcsec
- Pixel sampling of 1 arcsec = 2.4 pixels
- Integrated infrared slit viewer/guider with a field of view of approximately 4 × 4 arcmin



TripleSpec4 Dewar (blue shell) and optical support structures (aluminum bulkhead walls) undergoing test-fit in the lab at Cornell prior to painting and final assembly. Saramoira Shields, a Cornell undergraduate assisting with the assembly work, stands next to the Dewar.

The name of the instrument comes from the fact that three versions were planned originally. Two are in use: one on the Palomar Observatory 200-inch Hale Telescope and a second on the Astronomy Research Consortium (ARC) 3.5-m telescope. The third is under construction at the California Institute of Technology (PI: Keith Matthews) for use on the Keck II telescope. The one for NOAO will be the fourth version, and it will be installed at the Cassegrain focus on the Blanco 4-m telescope at CTIO.

TripleSpec4 is now in the final integration and testing phase at Cornell. The accompanying picture shows the Dewar and optical support structures during a test-fit prior to painting in early December 2014. Assembly work continued throughout January 2015, with optics installation during the second half of that month. NOAO staff in Chile, having completed the testing and optimization of the detector-controller subsystems, visited Cornell in early February to support the integration of the detectors into the nearly complete instrument and stayed for the first round of full-system cool-down and performance tests. Everything currently remains on schedule for delivery to CTIO in March 2015, with first on-sky testing planned for April 1.

Because the first commissioning run will occur after the deadline for 2015B observing proposals, there will be no demonstrated on-sky performance information available to potential proposers. Therefore, the instrument will not be available for regular science proposals during 2015B, but should be available for 2016A. Depending on the progress of commissioning, there may be a special call for limited science verification proposals in 2015B at the discretion of the associate director for CTIO.

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:

Proposal Preparation and Submission Help

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* *ast.noao.edu/nssc/sus*
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.

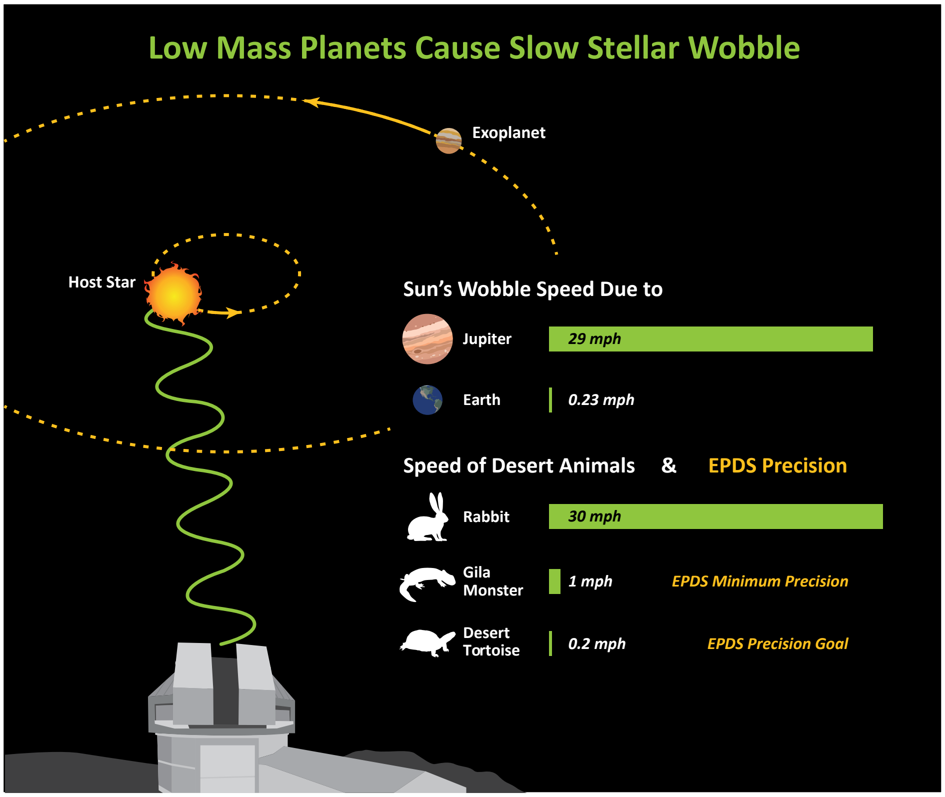
NASA will provide limited funding support to observers that is sufficient to cover travel, modest research expenses, and publications costs. The NOAO 2015B Call for Proposals provides

continued

A New NSF-NASA Partnership for Exoplanet Research at KPNO continued

further details at: *ast.noao.edu/observing/proposal-info*.

The 2015B semester kicks off the GO program with existing WIYN instrumentation, but the program will be expanded in the FY 2018 timeframe to include a new NASA-funded instrument for the WIYN telescope. NASA issued a request on 22 January 2015 for proposals to build an Extreme Precision Doppler Spectrometer (EPDS) for use by the astronomical community. The spectrometer will measure stellar radial velocities with a precision sufficient to characterize Jupiter- and Neptune-sized gas giant planets as well as super-Earth and Earth-sized rocky planets.



The new spectrometer will be a world-class precision radial velocity instrument with a minimum velocity precision of better than 0.5 m/s and a goal of 0.1 m/s. Such extreme precision is needed to measure the mass of an orbiting planet through the slight motion that the planet induces in the star. As a planet orbits a star, it causes the star to move, or wobble, as the objects orbit their gravitational center of mass. Lower mass planets induce subtler motions in the star, and correspondingly higher velocity precision is needed to characterize them. Jupiter causes a 13 m/s amplitude wobble in the Sun, whereas Earth induces a much smaller wobble (about 0.1 m/s). As a result, extreme precision is needed to characterize rocky Earth-sized planets.

The GO program is expected to play a critical role in characterizing high-priority exoplanet targets identified by current and future NASA missions, in particular Kepler, K2, and TESS. High-resolution imaging and spectroscopy are used to rule out astronomical false positives. Precise radial velocity measurements are needed to confirm the planetary nature of the companions and to measure their masses. The measurement of a planet's mass, when combined with a measurement of its size from transit observations, can be used to infer whether the planet is rocky like the Earth or gaseous like Jupiter. NASA has established an aggressive development schedule for the new spectrometer so the instrument will be available for use by the astronomical community on a timescale relevant to the availability of data from the TESS mission (mid-FY 2018).

Dark Energy Survey First Year Data Release

DES Project

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 (deg^2) of the sky in 5 bands (*g*, *r*, *i*, *z*, and *Y*) and to carry out a time-domain survey over 30 deg^2 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 NSF. 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 Ia supernovae. The DES Project is providing the astronomical community with important capabilities and products.

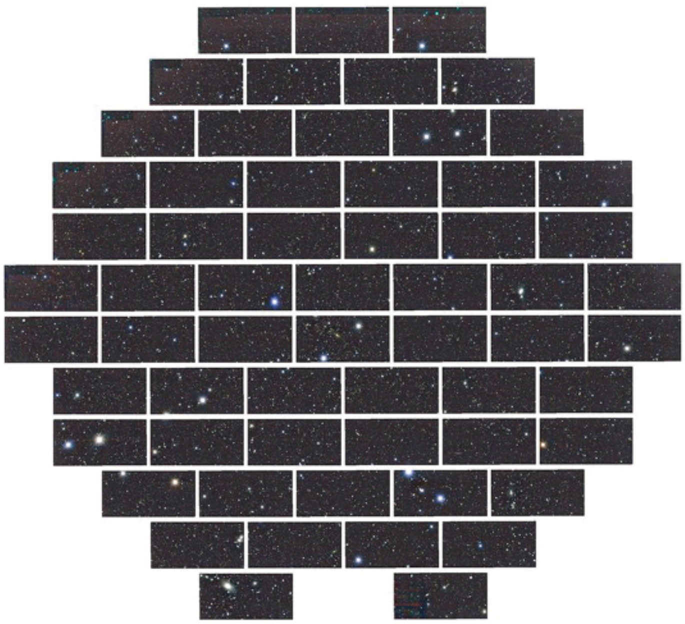
DECam, built by Fermilab for the DES, also is heavily used by community observers who are carrying out other surveys on the Blanco telescope. The DECam Community Pipeline (CP) enables NOAO to provide reduced data products to the general astronomical community.

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 deg^2 of the survey footprint in the South Galactic Cap, including >160 deg^2 overlapping the Sloan Digital Sky Survey (SDSS) Stripe 82 and

continued

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.")



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.)

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 astrometrically 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*.

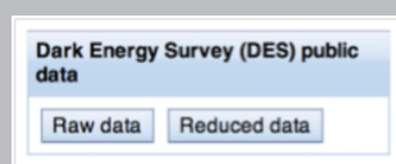
In the coming years the community can look forward to continued releases of calibrated exposures with improved processing and underlying calibrations. Eventually, the broader public data releases (DR) from DES will cover 5000 deg^2, imaged 10 times in the *grizY* bands along with ~100 visits to SNe fields covering 30 deg^2. 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):

1. Go the NOAO Science Archive at: *portal-nvo.noao.edu*.
2. Click the "General search for NOAO data (all users)" button. This will take you to the "Simple Query Form" page (tab).
3. Find the box labeled "Dark Energy Survey (DES) public data" in the "Data Products" pane on the right.
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 "categorize" 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.



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 Gyoon 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:

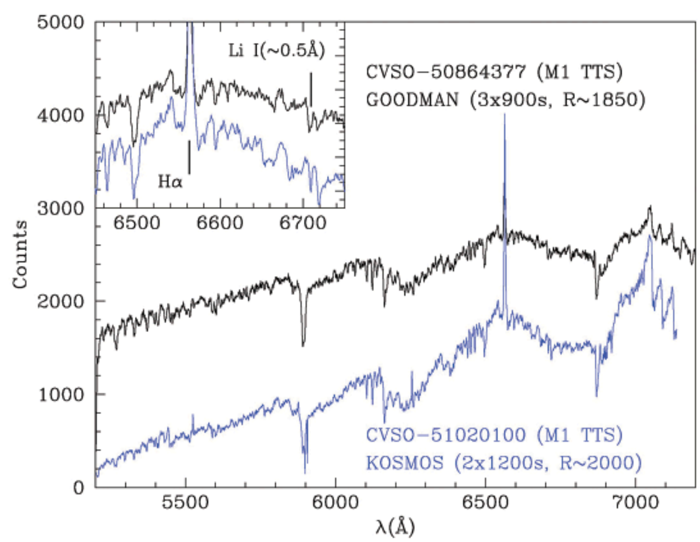
- Goodman throughput in the ultraviolet (UV) is better than COSMOS; if you are mainly interested in wavelengths below 4000 Å, you should propose for Goodman.
- At present, the detector available for Goodman has significant fringing in the red. However, we are procuring a second camera with a detector 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).



Goodman spectrum (blue) and KOSMOS spectrum (black) of two similar weak-line T-Tauri stars. The inset shows an expanded view of the region covering the Hα and Li I 6708 Å lines.

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 ~ 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.)

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).

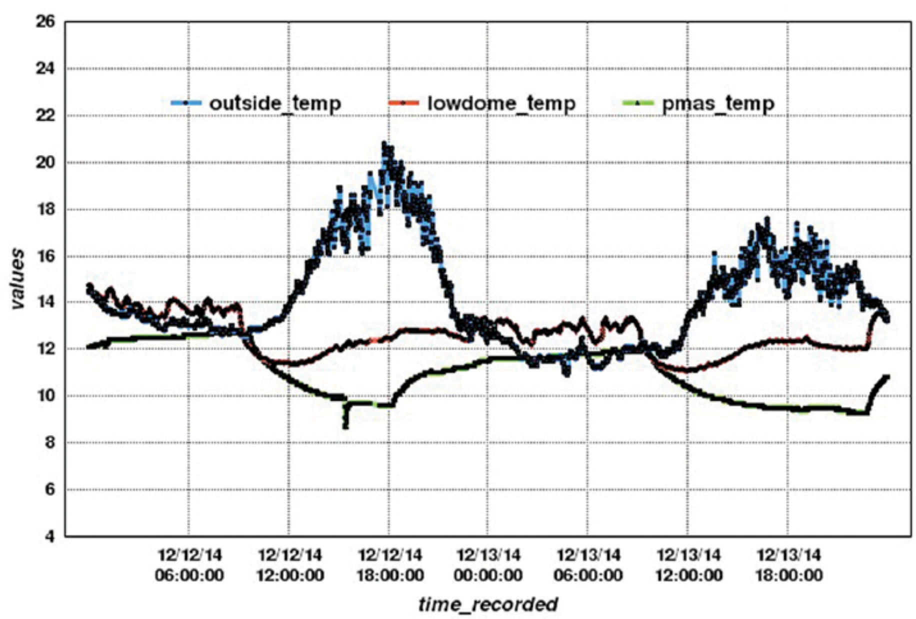


Figure 1: Temperature of the outside air showing the diurnal cycle, the temperature inside the dome that now remains relatively constant, and the temperature at the surface of the primary mirror (pmas) that is strongly cooled during the daytime. The plot covers two nights and two days in mid-December 2014.

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.

continued

The Blanco Telescope Environmental Control System Upgrades continued

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.

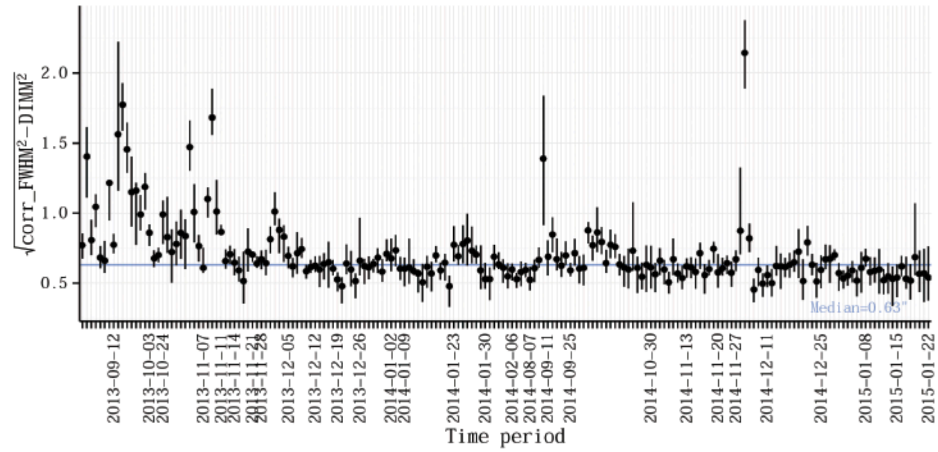


Figure 2: DES Year 1 (August 2013–February 2014) and Year 2 so-far (August 2014–January 2015) showing the non-atmospheric contribution to the DECam FWHM. DECam observations are corrected for wavelength response and to the zenith, and the atmospheric contribution measured by the DIMM is subtracted in quadrature. (Image credit: DES and Eric Neilson, Fermilab.)

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 *riz* 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.

Dr. Matt Mountain Is the New AURA President

Stephen Pompea & David Silva

Image credit: Coyle Studio

Dr. Matt Mountain succeeds Dr. William Smith as AURA President effective 1 March 2015. The AURA Board selected Dr. Mountain for this position from a field of over 20 highly qualified candidates. In accepting this appointment, Dr. Mountain said, "I am looking forward to working with the Board and our impressive Centers on the many challenging, yet exciting, opportunities for astronomy, our community, and AURA in the coming years. I believe AURA has a great future, and I feel especially privileged to be chosen to help craft that future in partnership with the AURA Board."

The Association of Universities for Research in Astronomy (AURA) is a consortium of 40 US institutions and 6 international affiliates that operates world-class astronomical observatories, including the National Optical Astronomy Observatory, operated under a cooperative agreement with the National Science Foundation. AURA establishes, nurtures, and promotes public observatories and facilities that advance innovative astronomical research.

Immediately prior to becoming the AURA president, Dr. Mountain was the director of Space Telescope Science Institute (STScI), whose staff of 600 handles the science operations for the Hubble Space Telescope and is preparing for the science operations of the James Webb Space Telescope (JWST). Previous to his tenure at STScI, Dr. Mountain served as the Gemini Observatory director from 1999 to 2005, where he focused on the construction and delivery of the Gemini telescopes within a tightly constrained budget.

When the appointment was announced by Dr. Richard Green, Chair of the AURA Board of Directors, NOAO Director Dr. David Silva expressed his pleasure: "Matt has a deep understanding of AURA and the needs and talents of its members. He understands the scientific aspirations of the 21st century community of astronomers and how AURA observatories can and will evolve to fulfill those aspirations."

Dr. Mountain is also the telescope scientist for JWST, a member of the JWST Science Working Group, a professor in the Department of Physics and Astronomy at the Johns Hopkins University, and a Fellow of the Royal Astronomical Society and the American Association for the Advancement of Science.

Dr. William Smith Steps Down as AURA President

Tod Lauer & David Silva

Dr. William S. Smith stepped down on 1 March 2015 as president of the Association of Universities for Research in Astronomy (AURA), the organization that operates NOAO under a cooperative agreement with the National Science Foundation (NSF). Dr. Smith announced his intent to pass on the leadership of AURA in December 2013. Dr. Matt Mountain, director of the Space Telescope Science Institute, was selected to serve as the next president of AURA (see "Dr. Matt Mountain Is the New AURA President" above).

Dr. Smith, a chemist by training, received his PhD from Texas A&M University in 1974. He first joined AURA in 1998 as vice president for programs, becoming president in 2000. His service with AURA was preceded by a distinguished career with the Federal Aviation Administration, followed by over a decade of work in support of the activities of the US House of Representatives Subcommittee on Space and the Committee on Science, Space, and Technology.

Dr. Smith's tenure with AURA was marked with the expansion and continued vitality of the diverse astronomical research organizations operated by AURA. At the start of his tenure, AURA was selected by NSF to continue operat-

continued

Dr. William Smith Steps Down as AURA President continued

ing NOAO, following the re-competition of its management cooperative agreement. Positioning NOAO for successful transitions through the subsequent Senior and Portfolio reviews followed, culminating with the development of a new proposal for continued management of NOAO in response to the most recent re-competition (results of which are pending). Under Dr. Smith's leadership, AURA was selected to operate LSST as a new Center, Gemini Observatory began operations, Space Telescope Science Institute was selected to operate the James Webb Space Telescope, the Dark Energy Camera was added to the Blanco 4-m telescope, and NSO is directing development of the Daniel K. Inouye Solar Telescope. The robust program of astronomical research enabled by AURA institutions is a credit to Dr. Smith's leadership. NOAO thanks him for his service and wishes him well for the next phase of his career.

The International Year of Light 2015 Has Begun!

Stephen Pompea

Figure 1: The opening ceremonies at UNESCO were translated into multiple languages and featured outstanding talks by US National Science Foundation Director France Córdova and Nobel prize winners Steven Chu (Stanford University) and William Phillips (National Institute of Standards and Technology). (Image credit: Dan Curticapean, University of Offenburg.)

The 2015 International Year of Light (IYL) and Light-Based Technologies held its opening ceremonies at the United Nations Educational, Scientific and Cultural Organization (UNESCO) building in Paris, January 19–20 (see Figure 1). Three NOAO astronomers, Malcolm Smith, Connie Walker, and Stephen Pompea, attended under the sponsorship of the International Astronomical Union (IAU). The three are also members of the IAU Executive Working Group for the IYL.

The IYL began as an idea generated by a number of scientific societies in 2009. It has now become a global collaboration to increase the awareness of how light science and technology can be used effectively for addressing key world issues. The role of photonics in the areas of renewable energy, agriculture, health, and sustainable development was highlighted in particular. Keynote speakers for the event included Nobel laureates Steven Chu (who spoke passionately on solar energy), William

continued

The International Year of Light 2015 Has Begun! continued

Phillips (who gave a brilliant talk highlighting the practical importance of research in low energy physics), Ahmed Zewail, Zhores Alferov, and Serge Haroche. Some of the more interesting talks or roundtables addressed the needs of developing countries for better light or vision. These projects included the Liter of Light (*aliteroflight.org*), OneDollarGlasses (*onedollarglasses.org*), and the SunnyMoney (*sunnymoney.org/*) projects.

The astronomical community, led by the IAU, encouraged the development of educational projects for IYL 2015 that highlight the role of light in astronomy. There are currently three major IYL 2015 projects, which were chosen through a competitive process: Cosmic Light Awareness; Light: Beyond the Bulb image exhibition; and the Galileoscope. The Cosmic Light Awareness project includes the Globe at Night project developed at NOAO and the Quality Lighting Teaching Kits under development at NOAO with its partners SPIE-the International Society for Optics and Photonics, CIE-The International Commission on Illumination, OSA-The Optical Society, and the International Dark-Sky Association.

Figure 2: The Galileoscope and the Galileoscope kit were demonstrated at UNESCO by Stephen Pompea and attracted special attention from both attendees and UNESCO employees working in Africa, where telescope kits are difficult to buy. The Galileoscope is a cornerstone project for IYL 2015. (Image credit: Dan Curticapean, University of Offenburg.)

The NOAO Quality Lighting Teaching Kits will teach problem-based learning and creative problem solving to high-school students in dozens of countries served by the partners. The students design ways to illuminate future cities taking into account light trespass, glare, health and safety issues, energy conservation, the effect of light on wildlife, and the importance of the night sky as a human resource.

At the meeting, the Galileoscope and a prototype Quality Lighting Teaching Kit (see Figures 2 and 3, respectively) were demonstrated, and both were received with great enthusiasm. The Beyond the Bulb project was demonstrated at the January 2015 American Astronomical Society meeting in Seattle. The International Year of Light and Light-Based Technologies festivities also included programs on light and art (including a special outdoor lighting of UNESCO) and on light and music.

Figure 3: The NOAO-developed Quality Lighting Teaching Kit was reviewed in the exhibition area at UNESCO. The kit emphasizes creative approaches to illumination in future cities. (Image credit: Connie Walker/NOAO/AURA/NSF.) NL

CTIO Summer Student Program for 2015

Catherine Kaleida

It is summer in the Southern Hemisphere and the CTIO Summer Students have arrived and are already impressing their mentors with their research prowess! During the 10-week CTIO summer student programs, US and Chilean students live and work at the CTIO compound in La Serena. All students conduct research projects with CTIO, SOAR, or Gemini staff, as well as observing at Cerro Tololo and attending seminars geared toward the undergraduate level. The students will participate in field trips to various observatories, while sampling the social and cultural life in Chile during their time here. In the first weeks of the program, the students will tour the CTIO La Serena facilities and the telescopes on Cerro Tololo and Cerro Pachón, all while hard at work on their research.

Six US students are part of the CTIO Summer Student Program through their participation in the NSF-funded CTIO Research Experiences for Undergraduates (REU) program. The 2015 REU students are Scott Carlsten (Rice University), Samuel Castle (Davidson College), Alexander Gagliano (Virginia Polytechnic Institute and State University), Brittany Howard (University of Michigan-Dearborn), Tanveer Karim (University

continued

CTIO Summer Student Program for 2015 continued

of Rochester), and Cherish Prickett (Georgia Perimeter College). Two Chilean students, Tomás Cassanelli Espejo (Universidad de La Frontera) and Pamela Soto Pinto (Universidad de Concepción), participate through the Práctica en Investigación en Astronomía (PIA) program, which is funded by CTIO.

We wish them an enjoyable stay in La Serena "y buena suerte en todo."

Mentors for the students are an integral part of the program. We would like to thank CTIO staff Tim Abbott, Kathy Vivas, César Briceño, and Alfredo Zenteno; SOAR staff David Sanmartim; and Gemini staff Bryan Miller and Juan Madrid for contributing their time to advise students in the 2015 program.

The CTIO REU and PIA students with La Serena and Coquimbo in the background. From left to right: Alex Gagliano (REU), Brittany Howard (REU), Cherish Prickett (REU), Scott Carlsten (REU), Samuel Castle (REU), Pamela Soto (PIA), Tanveer Karim (REU), and Tomás Cassanelli (PIA). (Image credit: Catherine Kaleida/NOAO/AURA/NSF.)

NOAO at the Seattle 2015 AAS Meeting

Ken Hinkle

NOAO hosted several activities at the 225th American Astronomical Society (AAS) meeting in Seattle, Washington. A town hall with a presentation by Dave Silva on "Transforming NOAO – A Status Report" was held on Tuesday, January 6. A data reduction mini-workshop was held on Wednesday, January 7 (see "NOAO Data Reduction Mini-Workshop: Near-IR Data" article in this issue). NOAO also was a participant in the Thirty Meter Telescope Open House on Monday, January 5, with Mark Dickinson talking about US community liaison activities.

The base for NOAO activity at the meeting was our booth in the exhibit area. The booth backdrop was a graphic novel theme featuring the second chapter of a story started on the 2014 booth backdrop. In chapter 1, "ANTARES Rising," the young astronomer heroine is able to find a rare astronomical event in Large Synoptic Survey Telescope (LSST) data by using software under development in the collaborative University of Arizona and NOAO program named Arizona-NOAO Temporal Analysis and Response to Events System (ANTARES). In chapter 2, "Dawn of the Data," NOAO graphical designer Pete Marenfeld continued the story using input from NOAO staff members. The astronomer, who has now become facile in the analysis of big data sets, reminisces on her past experiences that prepared her for these new challenges. The illustrations of many characters are based on NOAO staff members. NOAO part-time employee Rebecca Levy, an astronomy major at the University of Arizona, was again the lead character. See if you can find Emily Acosta, David Atlee, Mark Everett, Jeyhan Kartaltepe, Dara Norman, Colette Salyk, and Daniel Tellez in the current installment.

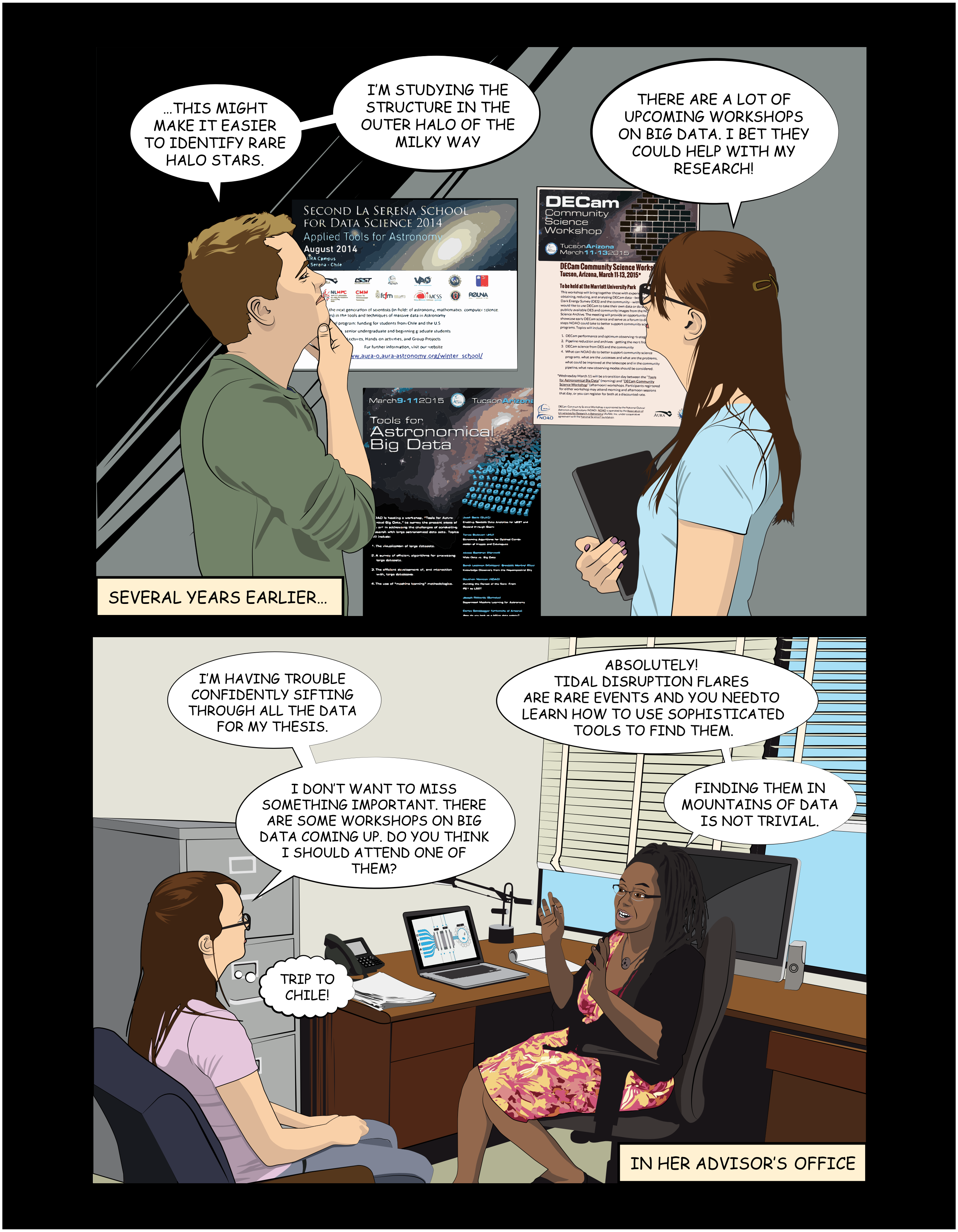
NOAO scientific staff members were present at the booth throughout the meeting. The staff had varied goals for the meeting, which included discussing the NOAO Research Experiences for Undergraduates program with undergraduates, interacting with students and teachers, discussing new NOAO projects, as well as answering questions about the ongoing NOAO mission. NOAO Director Dave Silva, Deputy Director Bob Blum, and Associate Director for KPNO Lori Allen were available every day to talk with users. A highlight occurred on Tuesday when the NOAO booth was a stop on the AAS exhibit hall tour by secondary students. The photomontage accompanying this article shows various staff members interacting with astronomers from the community.

Stop by the NOAO booth at the Honolulu IAU General Assembly in August and/or at the January 2016 AAS meeting in Kissimmee, Florida.

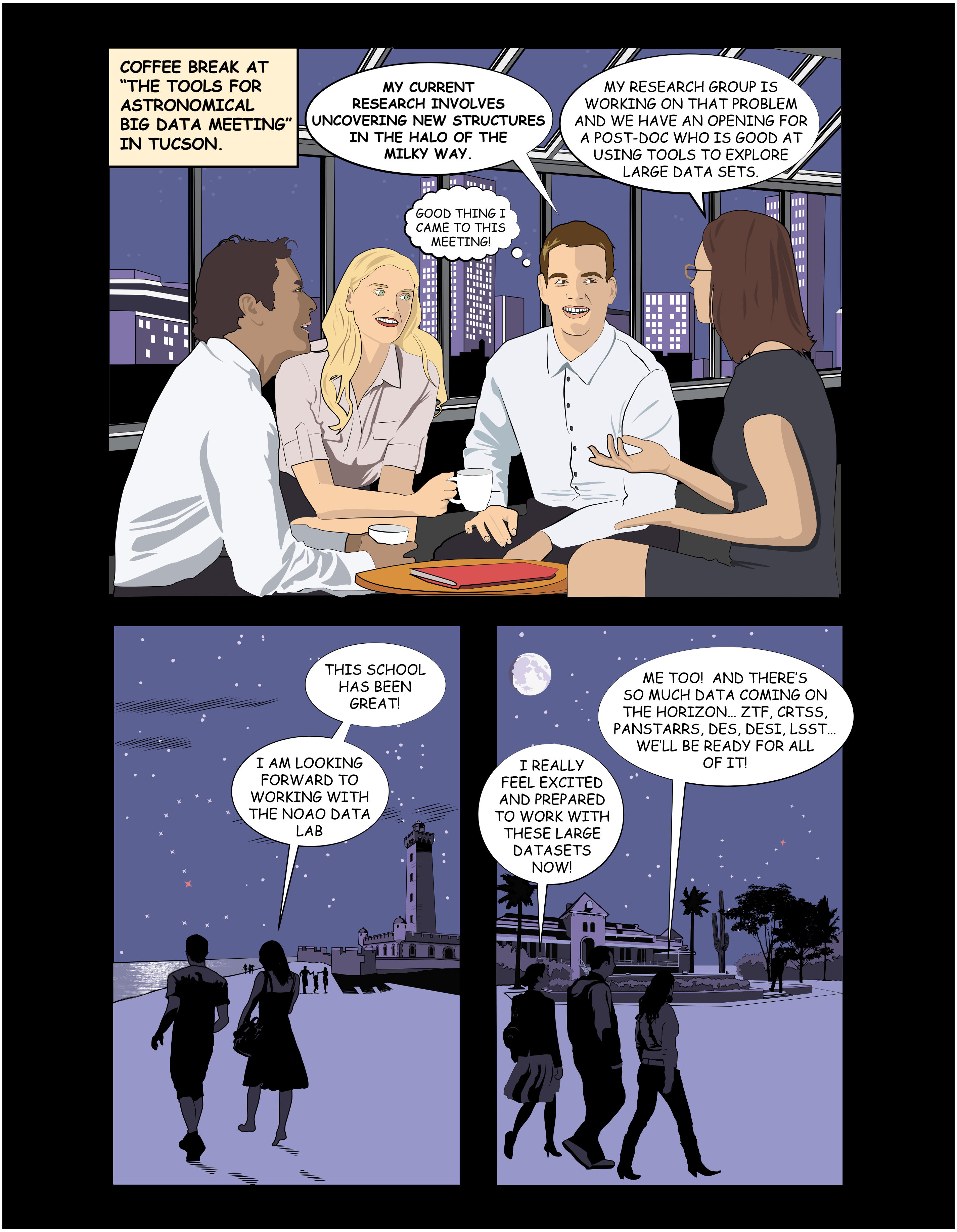
continued

NOAO at the Seattle 2015 AAS Meeting continued


NOAO
NATIONAL OPTICAL ASTRONOMY OBSERVATORY
$2.50 US AAS Meeting 2
APPROVED BY THE COMICS CODE AUTHORITY
Tales of the Modern Astronomer
FIRST BYTES: DAWN OF THE DATA
FINDING THAT FIRST TIDAL DISRUPTION FLARE WAS SO INTEGRAL TO EVERYTHING I'VE DONE SINCE!
PREPARING FOR THE FUTURE OF ASTRONOMY
NOW I HAVE SO MUCH DATA...LEARNING TO WORK EFFICIENTLY WITH LARGE DATA SETS HAS BEEN CRUCIAL!
AT THE AAS MEETING


SEVERAL YEARS EARLIER...
THERE ARE A LOT OF UPCOMING WORKSHOPS ON BIG DATA. I BET THEY COULD HELP WITH MY RESEARCH!
I'M STUDYING THE STRUCTURE IN THE OUTER HALO OF THE MILKY WAY
...THIS MIGHT MAKE IT EASIER TO IDENTIFY RARE HALO STARS.
Second La Serena School for Data Science 2014
Applied Tools for Astronomy
August 2014
DECam Community Science Workshop
Tucson Arizona March 11-13 2015
March 9-11 2015 Tucson Arizona
Tools for Astronomical Big Data
IN HER ADVISOR'S OFFICE
I'M HAVING TROUBLE CONFIDENTLY SIFTING THROUGH ALL THE DATA FOR MY THESIS.
I DON'T WANT TO MISS SOMETHING IMPORTANT. THERE ARE SOME WORKSHOPS ON BIG DATA COMING UP. DO YOU THINK I SHOULD ATTEND ONE OF THEM?
TRIP TO CHILE!
ABSOLUTELY! TIDAL DISRUPTION FLARES ARE RARE EVENTS AND YOU NEEDTO LEARN HOW TO USE SOPHISTICATED TOOLS TO FIND THEM.
FINDING THEM IN MOUNTAINS OF DATA IS NOT TRIVIAL.


FINALLY I'LL GET SOME GOOD MEXICAN FOOOD
YEAH! NO SNOW HERE IN MARCH!
TUCSON
WHY CAN'T I BRING SUNFLOWER SEEDS INTO THE COUNTRY?
OOOHH... LOOK AT THE MAGELLANIC CLOUDS!
ALL THE CONSTELLATIONS ARE UPSIDE DOWN!
AT THE LA SERENA SCHOOL FOR DATA SCIENCE IN CHILE
Achieving Low False Positive Transient Alert Rates
Ingredients to a Complex Query
• Which attributes?
• Which tables?
• How do I constrain to a circle on the sky?
• How do I "join" the results?
• How do I handle "null values"
IT'S NOT ABOUT THE PIXELS, IT'S ABOUT THE CATALOG
@astronomyblog
Bob Bloblaw
Getting the hang of Table Joins!
#LaSerenaDataSchool
GalaxyGal
@galaxygal
I'm learning about complex database queries!
#LaSerenaDataSchool


COFFEE BREAK AT "THE TOOLS FOR ASTRONOMICAL BIG DATA MEETING" IN TUCSON.
MY CURRENT RESEARCH INVOLVES UNCOVERING NEW STRUCTURES IN THE HALO OF THE MILKY WAY.
MY RESEARCH GROUP IS WORKING ON THAT PROBLEM AND WE HAVE AN OPENING FOR A POST-DOC WHO IS GOOD AT USING TOOLS TO EXPLORE LARGE DATA SETS.
GOOD THING I CAME TO THIS MEETING!
THIS SCHOOL HAS BEEN GREAT!
I AM LOOKING FORWARD TO WORKING WITH THE NOAO DATA LAB
ME TOO! AND THERE'S SO MUCH DATA COMING ON THE HORIZON... ZTF, CRTSS, PANSTARRS, DES, DESI, LSST... WE'LL BE READY FOR ALL OF IT!
I REALLY FEEL EXCITED AND PREPARED TO WORK WITH THESE LARGE DATASETS NOW!


WE NEED TO BE ABLE TO RUN EXPERIMENTS ON BILLION-OBJECT CATALOGS WITHOUT TRANSFERRING EVERYTHING OVER THE NET
YES, AND WE NEED TO LET TEAMS COORDINATE THOSE EXPERIMENTS.
VISUALIZATION TOOLS ARE KEY.
CHECK OUT THIS INTERACTIVE TOOL I JUST DEVELOPED FOR SMASH—WE'VE ALREADY FOUND A NEW STREAM!
MEANWHILE AT NOAO, THE DATA LAB IS BEING FORMED.
I LEARNED A LOT AT THE LA SERENA SCHOOL FOR DATA SCIENCE. IT PUT ME ON THE RIGHT PATH. I USE THE TECHNIQUES I LEARNED THERE ALMOST EVERY DAY.
I FOUND A POST-DOC AFTER THE NOAO BIG DATA WORKSHOP. IT REALLY HELPED LAUNCH MY CAREER! AND THERE IS SO MUCH DATA TO EXPLORE NOW.
BACK AT THE AAS MEETING

Howard University ADVANCE-IT Program Selects Dara Norman as the 2015 Faculty Fellow

(This text is based on an article that first appeared at *huadvanceit.howard.edu/2014/11/hu-advance-it-selects-2015-faculty-fellow/* and is used with permission from Howard University.)

The Howard University ADVANCE-IT program has welcomed Dr. Dara Norman as its 2015 Faculty Fellow to Howard University for the spring 2015 semester! Dr. Norman is a phenomenal researcher, scholar, and African-American Astronomer who has also made significant contributions to the education of the next generation of scientists. She is currently an Associate Scientist at NOAO. As an observatory scientist, her duties include support of observers using multiple large telescopes and state-of-the-art instrumentation. She also devotes time in the summers to work with students on research projects through the NSF-funded Research Experiences for Undergraduates (REU) program.

Dr. Norman is interested in spending a semester at Howard University in order to devote dedicated time working with students on a number of research projects using data from the telescopes, instruments, and archives that she supports. These projects will use Active Galactic Nuclei (AGN) observations taken with the Gemini Multi-Object Spectrograph (GMOS) on telescopes in Chile and Hawaii, and they will identify quasar candidates in weak lensing clusters from images taken with the Dark Energy Camera (DECam) at NOAO in Chile.

Dr. Norman anticipates that Howard students interested in astronomy and astrophysics will benefit substantially from the opportunity to work with her on these multifaceted projects. As Co-chair of the National Society for Black Physicists Astronomy section and Diversity Advocate at NOAO, she has a strong and proven interest in supporting students who are underrepresented in the science, technology, engineering, and math fields by offering them opportunities to participate in novel research early in their careers.

ADANCE-IT (ADVANCE-Institutional Transformation) is an NSF grant program for institutions for the purpose of increasing the participation and advancement of women in academic science and engineering careers.

Asteroid Named in Memory of Oscar Saa

Nicole van der Bliek

Oscar Saa worked at Cerro Tololo Inter-American Observatory for more than 40 years: starting out as an operator for one of the first telescopes installed on the mountain, retiring as manager of the Telescope Operations group, then coming back to help supervise construction of some of the tenant facilities on Cerro Tololo. We are sure that the many generations of CTIO staff and visiting observers who had the pleasure of working with Oscar over this period will be happy to know that the IAU Minor Planet Center announced the naming of an asteroid after Oscar Saa. The asteroid was discovered on 31 July 2000 by M. W. Buie at Cerro Tololo and given the provisional designation of 2000 OS69. Its permanent designation is now (105222) Oscarsaa. The official citation for the asteroid reads:

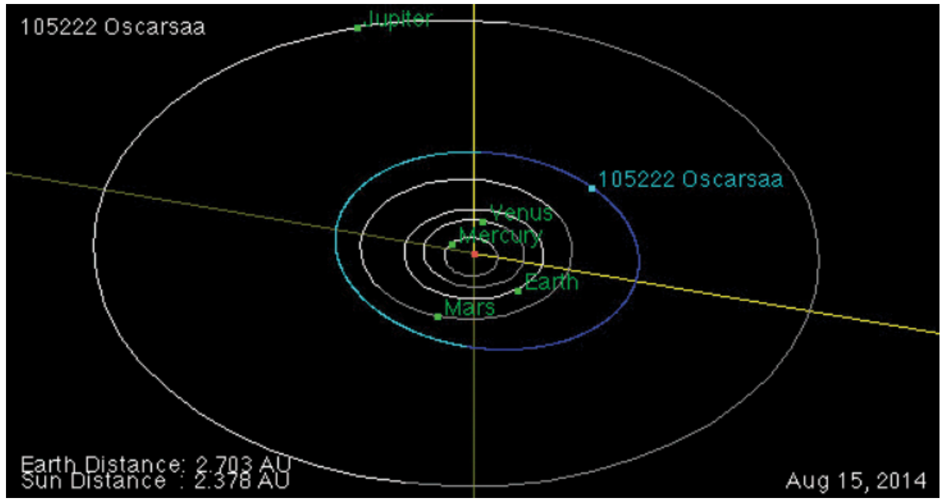
"Oscar Miguel Saa Martinez (1942–2013) managed telescope operations at Cerro Tololo Inter-American Observatory from 1982 to 2010, and kindly mentored generations of observatory staff and astronomers."

continued

Asteroid Named in Memory of Oscar Saa continued

Oscarsaa is in a slightly eccentric orbit (e = 0.09), orbiting the Sun every 3.24 years in the inner region of the main asteroid belt (semi-major axis 2.19 AU). It is not yet clear what class of asteroid Oscarsaa is, so its reflectivity can only be guessed based on the properties of other main belt asteroids. Based on its absolute magnitude (16.2), and adopting a typical asteroid albedo of 0.12, Oscarsaa probably has a diameter of about 2.2 km, similar to the height of Cerro Tololo above sea level.

The designation of Oscarsaa was made thanks to an initiative from Eric Mamajek (University of Rochester), a former astronomer at CTIO, and Marc Buie (Southwest Research Institute, Planetary Science Directorate), the discoverer of this asteroid.



Oscarsaa the Asteroid: This orbit diagram shows the orbit of asteroid (105222) Oscarsaa relative to the positions of the inner planets and Jupiter (generated using Orbit Viewer applet written by Osamu Ajiki and Ron Baalke). The orbit can be viewed interactively at: ssd.jpl.nasa.gov/sbdb.cgi?sstr=oscarsaa;orb=1;cov=0;log=0;cad=0#orb

NOAO Staff Changes at NOAO North and South

(16 August 2014–15 February 2015)

New Hires

Buckingham, William (Bill)	Kitt Peak Visitor Center Manager	North
Carlsten, Scott	Summer Research Assistant (CTIO REU)	South
Castle, Samuel	Summer Research Assistant (CTIO REU)	South
Correa, Carlos	Electrical Technician 3	South
Dubo, Guillermo	Electrical Technician 2	South
Fitzpatrick, Morgan	Special Projects Assistant I	North
Galiano, Alexander	Summer Research Assistant (CTIO REU)	South
Graham, Matthew	Senior Software Systems Engineer	North
Howard, Brittany	Summer Research Assistant (CTIO REU)	South
Juan, Amy	Visitor Center Cashier (Kitt Peak)	North
Karin, Md Tanveer	Summer Research Assistant (CTIO REU)	South
Keith, Hayley	Special Projects Assistant I	North
Leiker, Carole	Software Engineer II	North
Lopez, Juan Jose	Instrument Maker 3	South
Prickett, Cherish	Summer Research Assistant (CTIO REU)	South
Ume, Ugochukwu	Student Assistant	North
Wallace, Spencer	Public Program Specialist 1	North

Promotions

Aguirre, Victor	To Electronics Technician 3	South
Estay, Omar	To Computer Programmer 2	South

continued

NOAO Staff Changes continued

James, David	To Associate Astronomer	South
Kartaltepe, Jeyhan	To Assistant Scientist	North
Levy, Rebecca	To Special Projects Assistant II	North
Pinto, Victor	To Instrument Maker 2	South
Robledo, Victor	To Instrument Maker 2	South
Roddy, William	To Special Projects Assistant III	North
Salman, Dean	To Interim AOP/NOP Program Coordinator	North
Schurter, Patricio	To Engineer	South

New Positions

Guvenen, Blythe	Public Program Specialist 2	North

Transfers

Chandrasekharan, Srinivasan	From NOAO to LSST	North
Daly, Phillip	From NOAO to LSST	North
Delgado, Francisco	From NOAO to LSST	South
DeVries, Joseph	From NOAO to LSST	North
Gressler, William	From NOAO to LSST	North
Hileman, Edward	From NOAO to LSST	North
Hoblitt, Joshua	From NOAO to LSST	North
McManus, Sean	From NSO to NOAO	North
Mills, David	From NOAO to LSST	North
Narayan, Gautham	From NOAO to University of Arizona	North
Neil, Douglas	From NOAO to LSST	North
Schoening, William	From NOAO to LSST	North
Schumacher, German	From NOAO to LSST	South
Sebag, Jacques	From NOAO to LSST	North
Wiecha, Oliver	From NOAO to LSST	North

Retirements/Departures

Berkson, Emily*	Public Program Specialist, Kitt Peak	North
Brunker, Samantha	Summer Research Assistant (KPNO REU)	North
Burke, Jamison	Summer Research Assistant (KPNO REU)	North
Cheeseboro, Belinda	Summer Research Assistant (KPNO REU)	North
Dong, Hui	Research Associate	North
Hatfield, George*	AOP Imager Guide	North
Hong, Sungryong	Research Associate	North
Lackey, Kyle	Summer Research Assistant (KPNO REU)	North
Lee, Marcus	Summer Research Assistant (KPNO REU)	North
Miranda, Rodrigo Andres	Maintenance Man 4	South
Payne, Anna	Summer Research Assistant (KPNO REU)	North
Pizarro, Jaime	Maintenance Man 4	South
Small, Lindsay	Special Projects Assistant I	North
Zelaya, Kathie	Technical Associate II	North

* Inadvertently omitted from September 2014 *Newsletter* list.

continued

NOAO Staff Changes continued

Deaths

Fedele, Rich	Kitt Peak Visitor Center Manager	North
Ferris, Donald	Financial Administrator (retired)	North
Versluis, Donald	Contracts Administrator (retired)	North

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