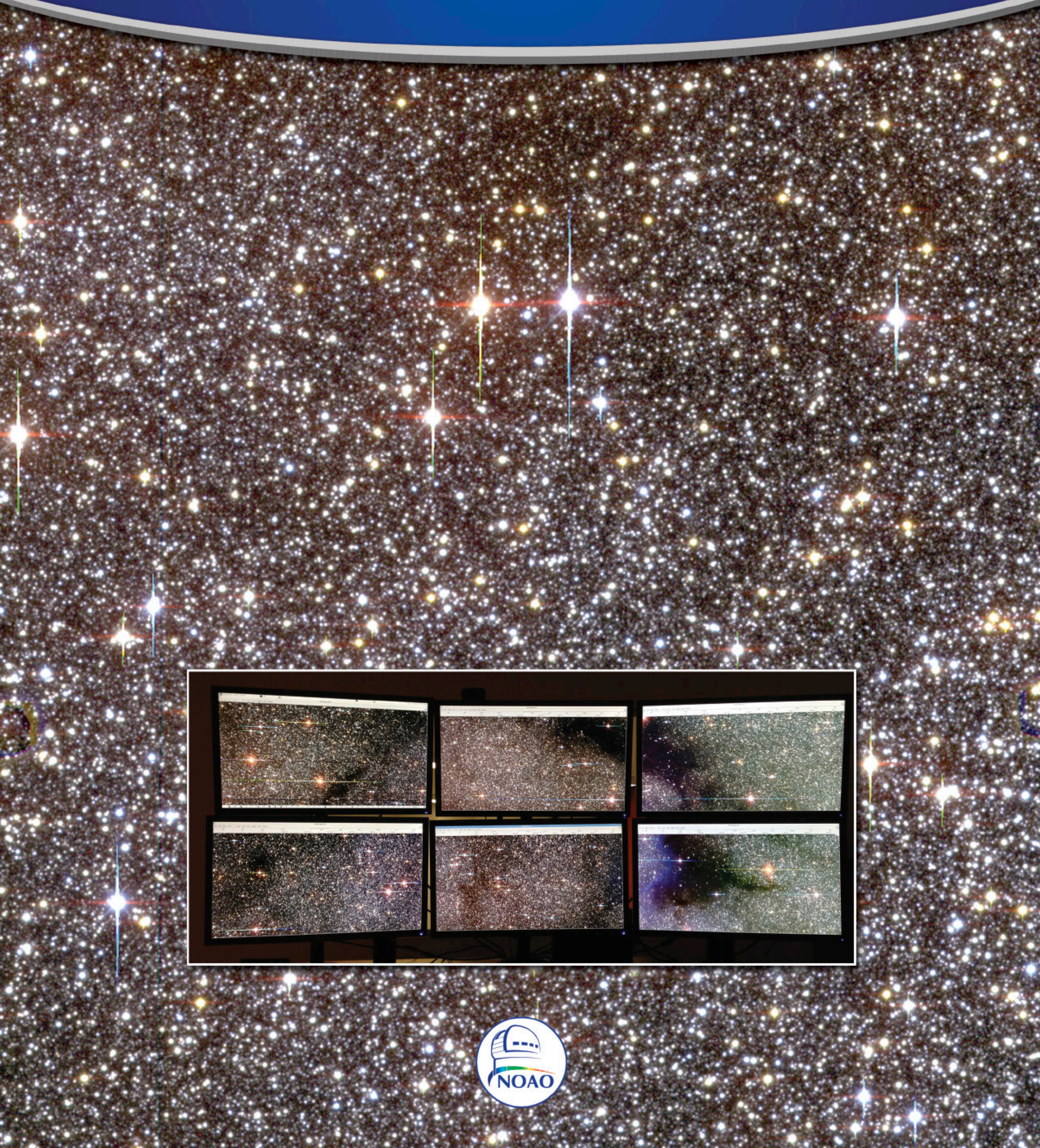
NOAO NEWSLETTER

Issue 110, September 2014



On the Cover

The cover shows an 8 × 9 arcminutes image of a portion of the Milky Way galactic bulge, obtained as part of the Blanco DECam Bulge Survey (BDBS) using the Dark Energy Camera (DECam) on the CTIO Blanco 4-m telescope. In this image, red, green, and blue (RGB) pixels correspond to DECam's *Y*, *z* and *i* filters, respectively.

The inset image shows the 2 × 3 array of monitors at the "observer2" workstation in the Blanco control room. The six chips shown here represent only 10% of the camera's field of view. For more information about the BDBS and their experiences observing with DECam, see the "The Blanco DECam Bulge Survey (BDBS)" article in the Science Highlights section of this *Newsletter*. (Image credit: Will Clarkson, University of Michigan-Dearborn; Kathy Vivas, NOAO; R. Michael Rich, UCLA; and the BDBS team.)

NOAO Newsletter

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Under Construction: A Revised KPNO Program Emerges

David Silva

P. Marenfeld/NOAO/AURA/NSF

P. Marenfeld/NOAO/AURA/NSF

A new NOAO program is emerging, driven by changing financial and programmatic constraints from NSF as well as new research aspirations at the scientific frontiers described by the 2010 decadal survey report, *New Worlds, New Horizons in Astronomy and Astrophysics*. For many readers, the changes with the highest immediate impact are happening at Kitt Peak National Observatory (KPNO). An overview of recent developments follows and then a few thoughts about what it all means. For a broader overview of the entire NOAO program, see my Director's Corner article in the March 2014 *NOAO Newsletter*.

In May, the Particle Physics Project Prioritization Panel (P5), a subpanel of the High Energy Physics Advisory Panel (HEPAP), released a 10-year strategic plan for US high energy physics. The report gave a strong vote of support to the Dark Energy Spectroscopic Instrument (DESI) project, which is a 5000-fiber, broadband, optical-infrared spectrometer for the KPNO Mayall 4-m telescope. The DESI project is sponsored by the Department of Energy (DOE) and led by the Lawrence Berkeley National Laboratory (LBNL). As a result, DOE and NSF have vigorously reengaged in their joint effort to bring this project to fruition, in coordination with NOAO and the DESI Science Collaboration. One immediate consequence is that operation of the Mayall as an open-access, multi-user, multi-instrument facility is expected to continue until at least mid 2017. You can find more information about DESI in the June 2014 issue of NOAO's electronic newsletter, *Currents*, at *www.noao.edu/currents/*.

Meanwhile, NOAO was informed by NSF that they are in discussions with another federal agency about using the WIYN Observatory for a major, new, scientific enterprise. That enterprise would be conducted during the NSF/NOAO share of WIYN nights. The university partners in WIYN (Indiana University, University of Missouri Columbia, and University of Wisconsin Madison) would continue to use WIYN as they choose during their share of WIYN nights. If those federal level discussions are concluded successfully, NSF might continue funding community access to WIYN for at least another year and perhaps longer until the new enterprise is ready for launch. While this is a very positive development, nothing is definitive yet. More details about this new science enterprise will be discussed as they become available in a future issue of *Currents*.

NOAO released an Announcement of Opportunity for the KPNO 2.1-m telescope in April and a revision in June. NOAO requested Letters of Intent by 1 August 2014 and has received five such letters. Each of the concepts received so far seems very interesting and viable. We look forward to receiving full proposals for these five concepts (and perhaps others) by 1 October 2014.

Overall, the facility reconfigurations under development for the Mayall 4-m, WIYN 3.5-m, and KPNO 2.1-m telescopes are consistent with recommendations of the NSF Mathematical and Physical Sciences division's 2012 Astronomical Sciences Portfolio Review. NSF currently provides funding for general community access to all three of these optical-infrared facilities; however, over the next few years all three facilities will transition to single-purpose platforms funded for the most part by non-NSF entities. In their new roles, all three facilities will be used by focused science collaborations for a small number of key projects. All key projects will likely produce high-impact results; moreover, all key projects will deliver data products suitable for fruitful re-use by the community at large. These data products will add to a rapidly growing collection of high-value data sets held by NOAO now or in the future (e.g., the Dark Energy Survey data products and catalogs). Furthermore, nothing rules out the reconfiguration of these facilities for other projects or groups in the 2020s. For example, approximately 30% of the Large Synoptic Survey Telescope (LSST) survey footprint is visible at airmass 1.5 or lower for two hours or more from KPNO; so any of these facilities could contribute productively to LSST follow-up research.

While the era of KPNO as a center for general purpose, open-access research is drawing smoothly to a close in the next several years, NOAO expects KPNO to remain a world-class center for astronomical and astrophysical research for at least another 10 years and likely many years into the future beyond that.

The Survey of the MAgellanic Stellar History (SMASH)

David Nidever (University of Michigan) & Knut Olsen (NOAO) for the SMASH Team

David Nidever (University of Michigan) and the SMASH team are using the Dark Energy Camera (DECam) on the Blanco telescope to conduct an NOAO Survey program to unveil the complex outer stellar structures of the Large and Small Magellanic Clouds, our Milky Way's (MW) two largest and closest satellite dwarf galaxies. These observations, with one of the world's largest cameras, will reveal the evolution of the Large Magellanic Cloud (LMC) and the Small Magellanic Cloud (SMC) and their interaction with each other, including exploring the possibility that they may have suffered a recent direct collision.

A decade ago, the interaction history of the Magellanic Clouds (MCs) was thought to be well understood. The gaseous components of the Magellanic System: the trailing Magellanic Stream, the Leading Arm, and the Bridge between the Magellanic Clouds were well reproduced by models invoking tidal stripping through the MCs' repeated close passages to the MW (e.g., Gardiner & Noguchi 1996). However, recent discoveries raise fresh questions about the structure and evolution of the MCs. Recent Hubble Space Telescope measurements of the proper motions of the MCs (Kallivayalil et al. 2006a, 2006b, 2013) suggest that the MCs are approaching the MW environment for the very first time (Besla et al. 2007). This discovery has forced a reinterpretation of many features of the Magellanic System, leading recent simulations (Besla et al. 2010, 2012; Diaz & Bekki 2012) to conclude that LMC-SMC interactions alone are responsible for the formation of the Magellanic Bridge, Stream, and Leading Arm, atomic hydrogen features now known to extend for at least 200° across the sky (Nidever et al. 2010; see lower panel of Figure 1).

The consequences of this new picture for the stellar component of the MCs are only beginning to be explored. Nevertheless, we now know that MC stellar populations can be found over vast areas of sky (~20 kpc away from the LMC, Muñoz et al. 2006, Saha et al. 2010); that the LMC has stripped a large number of stars from the SMC (~5% of the LMC's mass, Olsen et al. 2011); and that strong population gradients exist to large radii (Gallart et al. 2008, Cioni 2009, Meschin et al. 2014). These results point to a much richer and more complex structure and history than was imagined just a few years ago. They are based, however, on pencil-beam searches of only ~1% of the relevant area. The SMASH survey will map 480 deg^2 of the Magellanic periphery (distributed over ~2400 deg^2 at ~20% filling factor; see Figure 1) with deep *ugriz* images. Using old main-sequence stars as tracers, the SMASH survey, combined with the 5000 deg^2 Dark Energy Survey (DES), will reveal the relics of the formation and past interactions of the Magellanic Clouds down to surface brightnesses equivalent to $\Sigma_g > 35$ mags arcsec^{-2}. Specifically, the SMASH survey will:

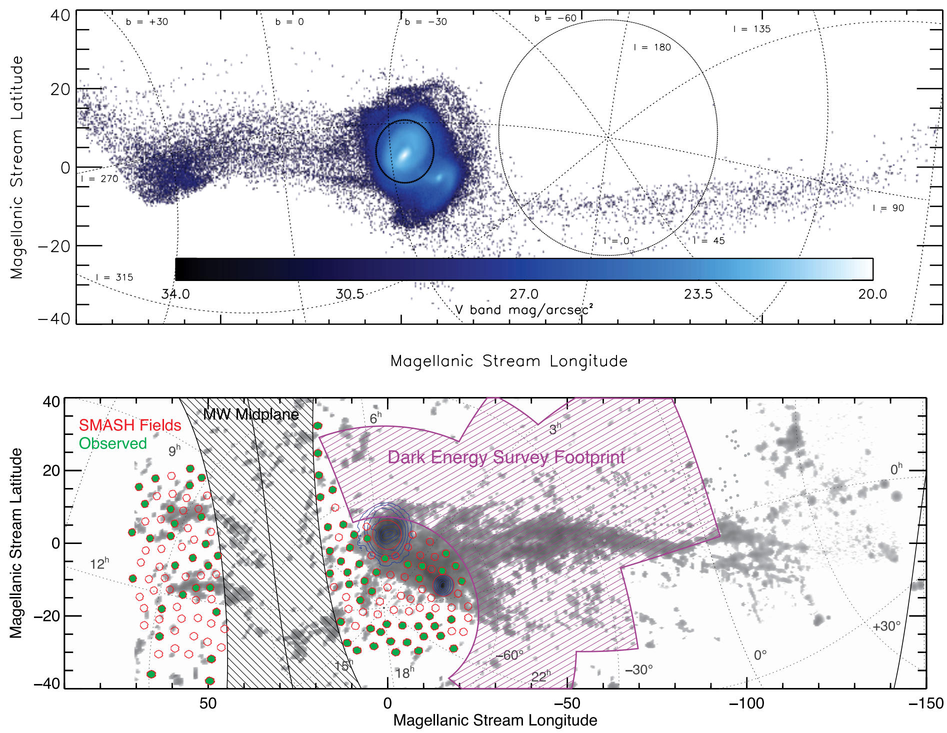

Figure 1: (Top) The predicted V-band surface brightness (mag/arcsec^2) of the stellar component of the Magellanic system from Besla et al. (2013). The simulation predicts stellar structures out to large radii from the main bodies of the Magellanic Clouds (varying on small scales), and a higher stellar density in the Leading Arm than in the trailing Magellanic Stream. (Bottom) The observed H I column density of the entire 200° Magellanic Stream system is shown in grayscale (Nidever et al. 2010), while the blue contours represent the 2MASS RGB star counts. The SMASH survey is shown in red including contiguous regions of the main bodies of the LMC and SMC. The 74 fields observed during the first year of the survey are shown as filled green hexagons. The footprint of the Dark Energy Survey is represented by the purple shaded region.

1. Search for the stellar component of the Magellanic Stream and Leading Arm. The detection of stellar debris in these structures would make them the only tidal streams with known gaseous and stellar components. This would not only be invaluable for understanding the history and consequences of the Magellanic interaction, but would provide a dynamic tracer of the MW's dark halo and a way to probe the MW's hot halo gas via ram pressure effects.

2. Detect and map the smooth components of the MCs, including their extended disks and potential stellar halos. The size of the LMC's stellar disk is a direct probe of the tidal radius of the LMC, with which the dark matter halos of the LMC and MW can be explored.

3. Detect and map potential streams and substructure in the Magellanic periphery not associated with gaseous features. These would probe stages in the formation and interaction of the MCs at times earlier than the evaporation timescale of the gas.

4. Derive spatially resolved, precise star formation histories covering all ages of the MCs and to large radii, thus providing detailed information on their complete evolution.

continued

The Survey of the MAgellanic Stellar History (SMASH) continued

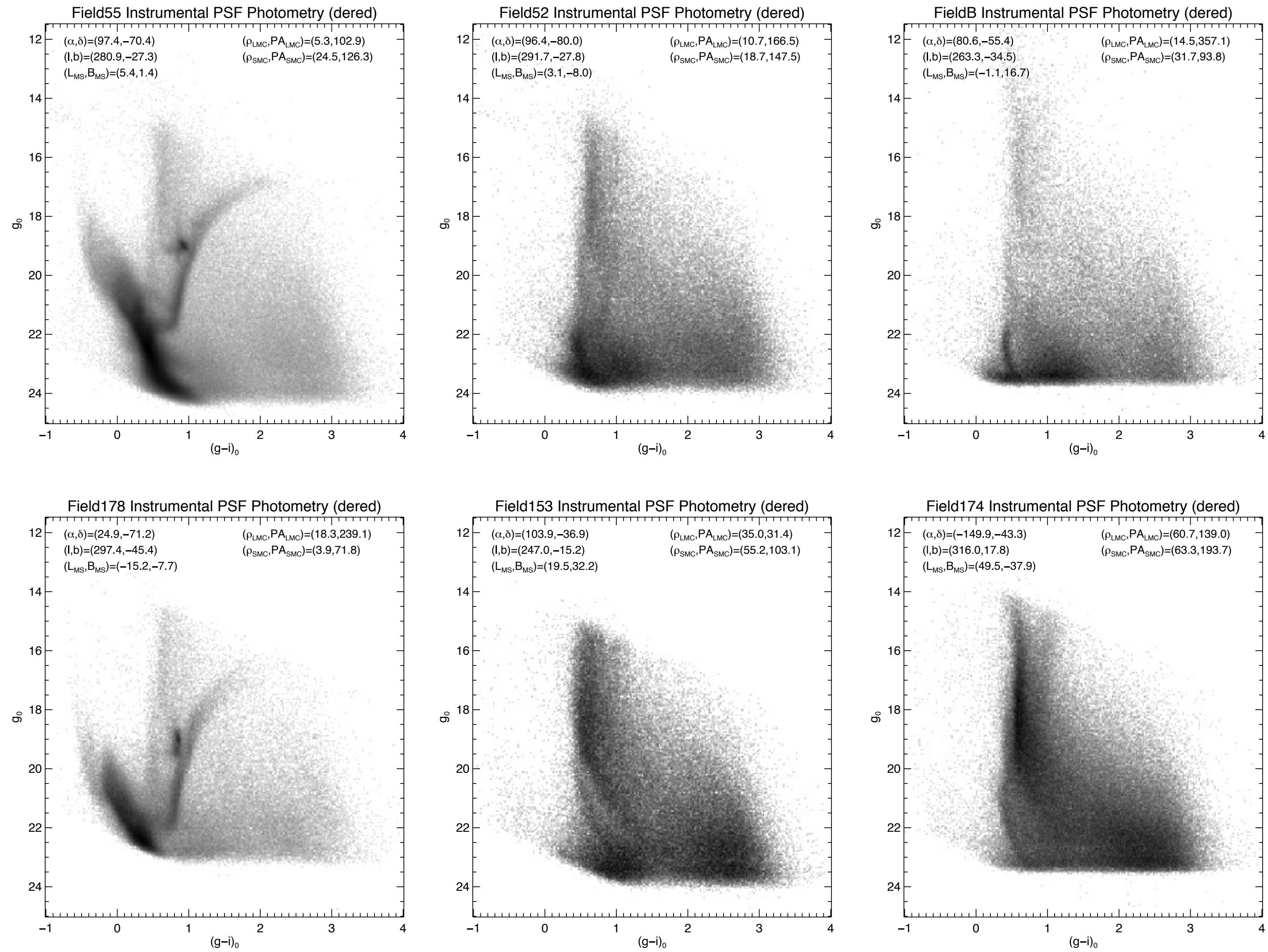

Figure 2: Color Magnitude Diagrams (CMDs) of some representative SMASH fields. The top row shows stellar populations in the outskirts of the Large Magellanic Cloud at a radius of 5.3° (left), 10.7° (middle), and 14.5° (right). While the inner-most field reveals stars of many ages, only faint old main-sequence stars are prominent in the outer two fields demonstrating the power of these deep observations to detect faint structures. In the bottom-left is a field at a radius of 3.9° from the center of the SMC with a very extended red clump indicating a large line-of-sight depth as recently shown by Nidever et al. (2013). The final two CMDs reveal stellar substructure in the halo of the Milky Way at 20–30 kpc from the Sun.

5. Enable many community-led projects, including studies involving the LMC/SMC main bodies, Galactic structure, discovery of variable objects, and background galaxy populations.

The SMASH team has just completed a successful first year, observing 74 of the total 180 fields (Figure 1). These fields nicely sample almost the entire region of the SMASH survey. Some representative color magnitude diagrams (CMDs) are displayed in Figure 2. The top row of LMC fields illustrates the power of the deep SMASH images to detect plentiful but faint Magellanic Cloud old main-sequence stars at large radii. The inner-most field at a radius of 5.3° from the LMC center (left) harbors a large number of stars of many ages and at several stages of evolution. The outer two fields at 10.7° (middle) and 14.5° (right), on the other hand, are dominated by old main-sequence stars. Once fully processed, many SMASH fields will be able to probe to much larger distances from the LMC. An extended red clump is visible in the CMD of an SMC field (R = 3.9°, bottom-left) indicating a large line-of-sight depth as recently shown by Nidever et al. (2013). In the final two panels of the bottom row the main-sequence stars of stellar substructures in the halo of the Milky Way at a distance of 20–30 kpc can be seen. The first year of SMASH data (observed before February 2014), including those shown in Figure 2, will be released to the public in January 2015. With two more years of observing ahead of them, the SMASH team still has a lot of work and interesting results to look forward to.

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Two's Company in the Inner Oort Cloud

Tod R. Lauer (NOAO)

Chad Trujillo (Gemini) and Scott Sheppard (Carnegie Department of Terrestrial Magnetism) used DECam at the CTIO 4-m telescope to discover a new object, designated 2012 VP113, which is only the second object to reside entirely in the region of the solar system known as the inner Oort Cloud. Observations determined that 2012 VP113 has a perihelion distance (closest approach to the sun) of 80 AU, greater than any other solar system object known. As with Sedna (discovered in 2004), the orbit of 2012 VP113 stays well beyond the 50-AU outer edge of the now well-known Kuiper Belt of icy planetoids. Understanding how this region of the solar system was populated is likely to hold clues into its very early dynamical evolution. Finding a second object in the inner Oort Cloud, however, suggests that this is a new frontier ripe for discovery via large-format CCD cameras on large telescopes, such as DECam.

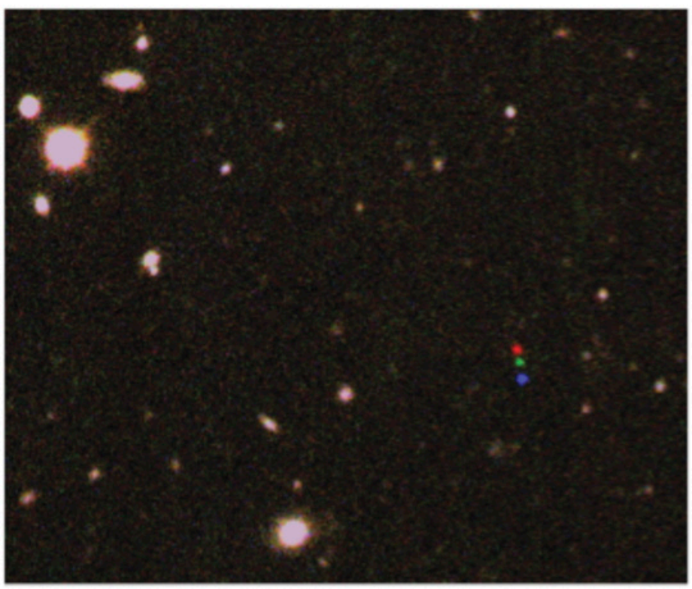


Figure 1: The discovery images of 2012 VP113. Three DECam images obtained on 5 November 2012 taken about two hours apart were combined into one image, coding the three images in a red, green, and blue triplet. 2012 VP113 moved between each image as seen by the red, green, and blue dots. The background stars and galaxies did not move and thus their three images combine to show up as white sources.

Trujillo and Sheppard discovered 2012 VP113 on 5 November 2012 with a DECam survey of 52 sq. degrees conducted during the initial commissioning of the instrument (Trujillo & Sheppard 2014, Nature 507, 471). Figure 1 shows the sequence of discovery images. With the exposure strategy used, objects like 2012 VP113 could be detected out to and beyond 300 AU distances. Follow-up observations were made with the Magellan 6.5-m telescope, and a prediscovery image of 2012 VP113 was found on Canada France Hawaii Telescope (CFHT) archival images obtained on 22 October 2011. The diameter of 2012 VP113 is estimated to be ~450 km based on standard assumptions about its albedo. Like

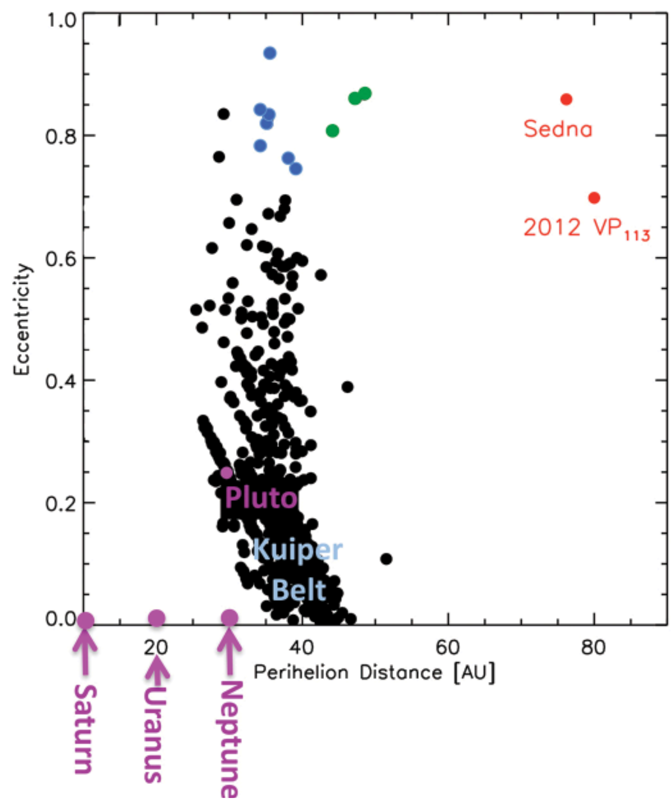


Figure 2: The orbital perihelion and eccentricities are plotted for all known Kuiper Belt objects. Sedna and 2012 VP113 have markedly larger perihelion distances.

continued

Two's Company in the Inner Oort Cloud continued

Sedna, 2012 VP113 has a highly eccentric orbit, taking it out to 452 AU at aphelion.

The context for understanding the importance of the discovery of 2012 VP113 is given in Figure 2, which plots the perihelion distances and orbital eccentricities of the ~1000 solar system minor planets known with perihelion distances in excess of 10 AU. The Kuiper Belt is the marked over-density of objects with perihelion distances >30 AU. The structure of the Kuiper Belt has only been mapped out in the last two decades with the first generation of large-format CCD detectors. A large fraction of the KBOs (Kuiper Belt objects) were in fact discovered with the NOAO Deep Ecliptic Survey, using the Mosaic imager on the KPNO Mayall 4-m telescope. Critically, the Kuiper Belt has a strongly delineated edge at 50 AU. Sedna with a 76-AU perihelion stood by itself in Figure 2 for a decade. The Kuiper Belt is hypothesized to result from the sweeping of resonances across the outer solar system as the four gas/ice giants migrated during the early formation of the solar system. This drove icy planetesimals formed in the region of the solar system occupied by the gas giants out into orbits past Neptune. Sedna's formation and orbit cannot be explained by the mechanism, however. The discovery of 2012 VP113, and the implication that there is likely to be an undiscovered population of objects in the inner Oort Cloud, underscores this problem. One favored idea exploits the likelihood that the Sun was formed in some sort of cluster. Perturbations from nearby stellar companions would have acted to lift KBO-like objects into higher orbits than could be accessed by the mechanisms that formed the Kuiper Belt itself. As these are early days for investigating the inner Oort Cloud using DECam, the next decade of work could see similar observational progress in mapping out this unknown part of the solar system as was demonstrated for charting out the Kuiper Belt.

Where the Brightest Cluster Galaxies Live

Tod R. Lauer (NOAO), Marc Postman (STScI), Michael A. Strauss, Genevieve J. Graves & Nora E. Chisari (Princeton University)

Tod R. Lauer (NOAO), Marc Postman (Space Telescope Science Institute), Michael A. Strauss, Genevieve J. Graves, and Nora E. Chisari (Princeton University) used the KPNO 2.1-m, CTIO 4-m, and CTIO 1.5-m telescopes to obtain images and spectroscopy of the brightest cluster galaxies (BCGs) in 433 Abell clusters with redshifts ≤ 0.08 as part of the Warpfire project. The volume-limited BCG sample covers nearly the full sky, excluding only a ±15° zone-of-avoidance about the plane of the Milky Way, and is designed to provide a reference frame for measuring the relative space velocity of the Local Group. The sample also provides a rich data set to characterize the properties of BCGs, the relationship of those properties to those of their hosting galaxy clusters, and where the BCGs live in the clusters and how that influences their formation and evolution. These problems have been investigated before, but for the first time, the survey provides parametric expressions for the distribution of the velocities and projected spatial locations of the BCGs within their clusters. The results support a picture in which the galaxies that ultimately become BCGs were formed in smaller galaxy groups that merged with a central rich cluster.

The classic picture of a rich galaxy cluster puts its BCG right at its heart, at rest (or nearly so) with respect to the average velocities of the surrounding cluster galaxies, and centered on the peak X-ray emission from the hot intracluster gas. There are many clusters that match this description, but it has long been known that

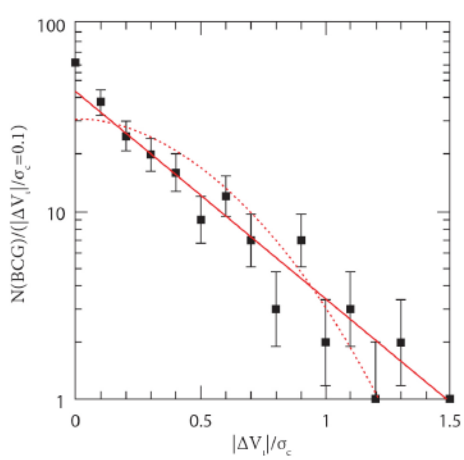


Figure 1: The distribution of $|\Delta V_1|/\sigma_c$ the absolute value of the radial velocity difference between the BCG and mean cluster velocity, normalized by the cluster velocity dispersion. The solid line is an exponential with scale-length 0.39. The dotted line is the best-fit Gaussian distribution.

a fraction of BCGs that have large "peculiar velocities" or large spatial offsets from the X-ray emitting gas within their hosting clusters. The Warpfire team thus cast a wide net in attempting to identify the BCG with the cluster sample. For any cluster, multiple BCG "candidates" were identified on sky survey plates, all of which were observed with CCD cameras on the KPNO 2.1-m and CTIO 1.5-m telescopes (the latter telescope is now operated by the Small and Moderate Aperture Research Telescope System consortium: SMARTS). The final BCG for a cluster was selected based on its "metric luminosity," L_m, the stellar luminosity within an aperture of 14.3 kpc radius, rather than a total luminosity, which is tricky to observe given the greatly extended envelopes of many BCGs. Selection of the BCG was also informed by accurate cluster and BCG radial velocities, which were obtained from the NASA/IPAC Extragalactic Database (NED) and Sloan Digital Sky Survey (SDSS) archives for the former and from KPNO 2.1-m and CTIO 4-m spectroscopy for the latter.

Figure 1 shows the distribution of BCG absolute peculiar radial velocities, $|\Delta V_1|$, which is the velocity offset of the BCG relative to the mean cluster velocity. The peculiar velocities are normalized by the cluster velocity dispersion, σ_C, to account for variation in this parameter over the sample. The analysis is limited to clusters with 50 or more redshifts to minimize the effects of uncertainty in the mean cluster velocity. As expected, most BCGs have small peculiar velocities; the median value of $|\Delta V_1|/\sigma_C$ is 0.26. At the same time, the distribution continues smoothly up to 1.5 in this parameter. One surprise is that the form of the distri-

continued

Where the Brightest Cluster Galaxies Live continued

bution is exponential, rather than Gaussian—the form of the distribution of cluster member velocities over all.

The mate to Figure 1 is the distribution of projected spatial offsets, r_X, of BCGs with respect to the X-ray center given in Figure 2. The

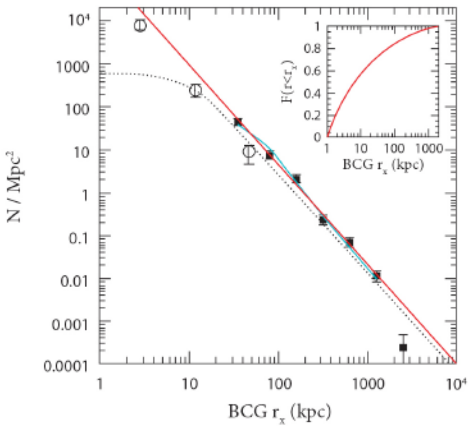


Figure 2: The surface density distribution of BCGs with respect to the cluster X-ray center: Chandra (open points), ROSAT (solid points). The red line is a $\gamma = -2.33$ power-law. The dotted line is the same form with a 10-kpc core. The blue line is the core form as "observed" by ROSAT. The inset gives the cumulative integral of the power-law.

X-ray centers are provided by the ROSAT (Röntgen Satellite) All-Sky Survey, augmented with pointed Chandra X-ray images for a subset of the Warpfire clusters. The accuracy of the ROSAT centers is at the 30-kpc level, but the Chandra images provide centers over an order of magnitude more accurate. The distribution of projected spatial offsets of the BCGs from the X-rays is a simple $r^{-2.33}$ power-law. As with the velocity distribution, most BCGs fall close to the X-ray centers of their clusters—the median offset is only ~10 kpc. Again the distribution continues smoothly to large offsets, with ~15% of the sample having $r_X >$ 100 kpc, and a small number of clusters having offsets as large as ~1 Mpc.

The structure of the BCG appears to be related to its position within its hosting cluster. The extent of the BCG is characterized by the α-parameter, which gives the slope of the photometric curve-of-growth at the metric radius. Small α corresponds to compact BCGs, while large α corresponds to more extended galaxies. Figure 3 plots α as a function of r_X. There is a steady trend showing that more extended BCGs are the ones closer to the X-ray center. Interestingly, there is no correlation with the metric luminosity, L_m. BCGs appear to arrive in the cluster with most of their central luminosity already assembled. Interactions within the cluster may grow the BCG's stellar envelope but do not add much luminosity. This picture and the distribution of $|\Delta V_1|/\sigma_C$ and r_X bear a strong similarity to the cluster formation simulations of Martel et al. (2014, ApJ, 786, 79), in which the BCGs are largely formed in groups that later merge with the cluster. Large velocity or positional offsets are seen in these simulations of massive clusters most typically when the BCG has arrived in the cluster relatively recently. NL

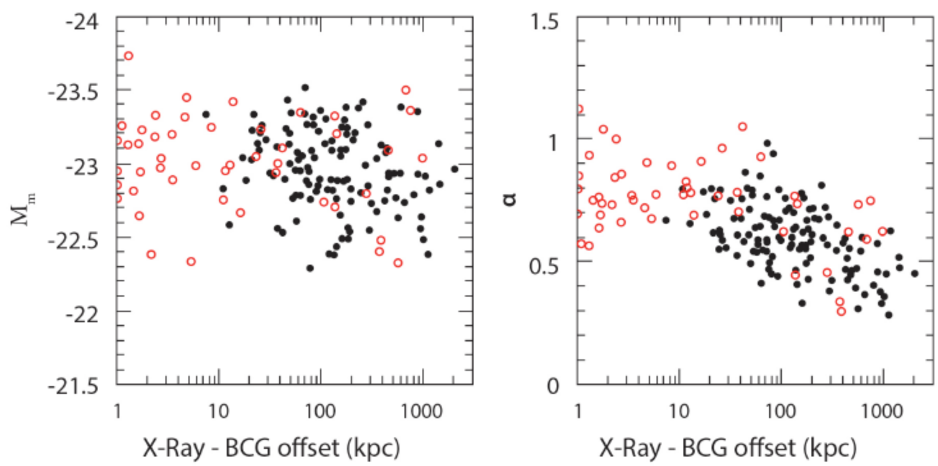


Figure 3: Metric luminosity, M_m, and α are plotted as a function of distance of the BCG from the X-ray defined center of the cluster: black symbols (ROSAT), red symbols (Chandra). Little dependence on L_m with distance from the center is seen, while α increases with decreasing distance.

Our Red Dwarf Neighbors

Jennifer Winters (Georgia State University)

Jennifer Winters (GSU) and collaborators on the RECONS (REsearch Consortium On Nearby Stars, *www.recons.org/*) team used data from the CTIO/SMARTS 0.9-m telescope to pinpoint the 1398 nearest M dwarf systems in the Southern Hemisphere sky, each of which is believed to lie within 25 parsecs of the Sun. M dwarfs comprise at least 75% of the stars in the Universe, but because they are faint, a careful assessment of their population remains to be done. Recent efforts from the CTIO/SMARTS 0.9-m telescope have made a significant contribution to understanding just how important these M dwarfs, also known as red dwarfs, are to our Galaxy and the Universe beyond.

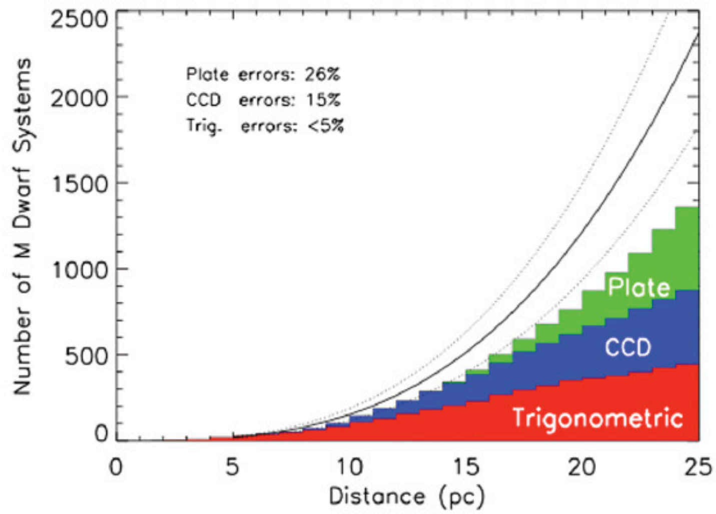
The entire M dwarf spectral sequence from M0.0V through M9.5V is represented in the RECONS survey and therefore provides a comprehensive snapshot of our current knowledge about our ubiquitous neighbors. Roughly one-third (~450) of the systems have published high-quality trigonometric parallaxes, including ~150 from the RECONS astrometry program at the CTIO 0.9-m telescope. For the remaining systems, the authors provide photometric distance estimates that have well-calibrated errors. The bulk of these (~450) are based on new V-, R-, and I-band (VRI) photometry acquired at the CTIO/SMARTS 0.9-m telescope using

continued

Our Red Dwarf Neighbors continued

the CCD camera, while the remaining ~500 primaries have photographic plate distance estimates calculated using SuperCOSMOS BRI photometry.

A histogram showing our current knowledge of the nearest red dwarfs is shown in Figure 1. The cumulative number of expected systems at distances to 25 pc is represented by the solid curve (statistical ranges are outlined with dotted curves), based upon the 19 southern M dwarf systems found within 5 pc and assuming a constant density to the survey horizon. Of the 2375 systems expected, we now know the names and addresses of 60% of the nearest southern red dwarfs, and estimate that another 1000 remain to be identified—an effort on which the RECONS team continues to make progress. The results obtained so far have been submitted to *The Astronomical Journal*.



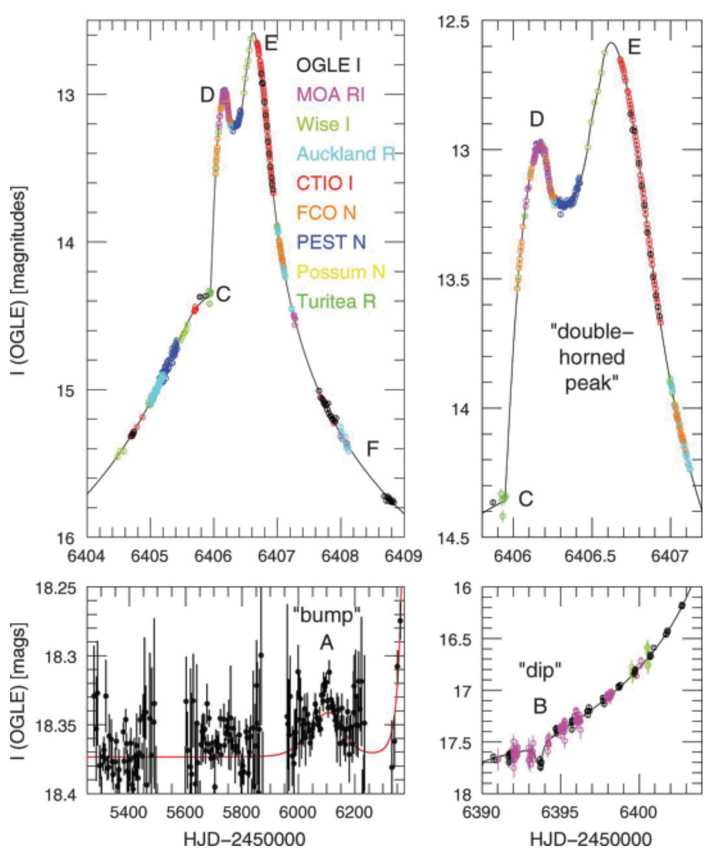
The cumulative numbers of red dwarf systems currently identified in the southern sky via trigonometric parallaxes (red), CCD distance estimates (blue), and photographic plate distance estimates (green) are shown. The solid curve outlines the size of the red dwarf population based on the 19 red dwarf systems known with 5 parsecs, extrapolated to 25 parsecs, and assuming a constant density. Dotted lines outline the range expected, using statistical errors. NL

A Planet Discovered by Microlensing

Andrew Gould (Ohio State University)

Andrew Gould (Ohio State University) and collaborators (2014, Science, 345, 46) used the CTIO SMARTS 1.3-m telescope (and eight others) and the gravitational microlensing technique to discover a 2-Earth-mass planet orbiting at about 1 AU from one member of a binary star system. Each star has slightly more than 1/10 the mass of the Sun, and so shines 400 times less brightly than the Sun. Hence, the planet has a temperature of 60 K, somewhat colder than Jupiter's icy moon Europa. The stars are separated by 10–15 AU. The planet was discovered by combining around-the-clock photometric data from a total of nine telescopes in four countries, including ANDICAM on the CTIO SMARTS 1.3-m telescope. The planet was first noticed when it caused a short "dip" (B, in figure) in the rising light curve taken with the OGLE telescope (black points in lower right panel of figure).

The rising light curve is due to a background star in the galactic bulge (at 8 kpc) that is progressively magnified by the planet's host (much closer at 1 kpc) as the two become more closely aligned on the sky. When the planet becomes closely aligned with one of the two magnified images, its gravity disrupts the image, creating a momentary dip. As the host becomes yet more closely aligned (and so more magnified), the influence of its stellar companion causes a sudden eruption in the light curve (C), which evolves into a double-horned profile (C–F) characteristic of binary-lens microlensing events. Three hundred days earlier, by chance, the source happened to pass near enough to the stellar



Light curves of planet discovered by Gould et al. using gravitational microlensing and the CTIO SMARTS 1.3-m telescope. (Image courtesy of Andrew Gould and originally published in 2014, Science, 345, 46.)

A Planet Discovered by Microlensing continued

companion to induce a low-amplitude "bump," which is only visible in binned data (A, in lower-left panel). Finally, although not obvious from the plot, the double-horned profile contains a subtle distortion due to the planet. Even if the data near the "dip" are removed, the fit to the light curve requires a planet at just the mass and position that are indicated by the "dip." Hence, both the planet and the binary companion are detected by two separate signatures.

Although 5000+ planets (and strong planetary candidates) have been discovered, there are only three others orbiting one component of such a relatively close system, and no other terrestrial planets in 1-AU orbits. This discovery therefore opens up a rich hunting ground for planets in such binary systems, which are a large fraction of all stars in the Milky Way Galaxy.

The Blanco DECam Bulge Survey (BDBS)

R. Michael Rich (UCLA), Will Clarkson (University of Michigan-Dearborn), Kathy Vivas (NOAO), Christian Johnson (Harvard-Smithsonian Center for Astrophysics), Caty Pilachowski (Indiana University) and the BDBS Collaboration

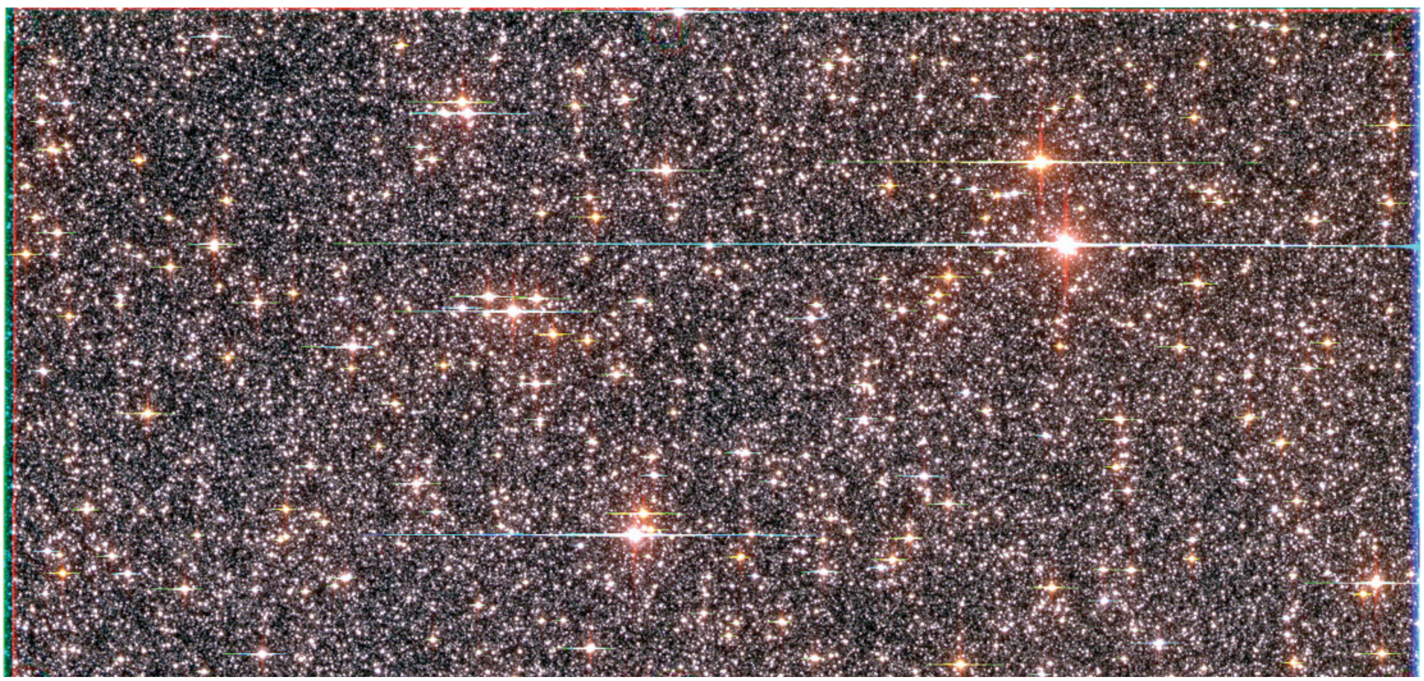


Figure 1: Color image constructed from a single raw DECam exposure in each of *i*, *z*, and *Y* filters toward the near side of the galactic bulge (l, b = 7.14°, −3.46°). A single chip (from the 60 active chips in the DECam focal plane) is displayed. (Image credit: Will Clarkson, Kathy Vivas, R. Michael Rich, and the BDBS team.)

The Dark Energy Camera (DECam) is designed for high-fidelity measurements of extragalactic targets, but also is proving to be superb for studies within the Milky Way. The galactic bulge is a somewhat poorly understood mixture of stellar populations that has much to tell us about how our own Galaxy and other spirals form and evolve. The bulge has complexity on scales of a few arcseconds (such as high, variable extinction), which is compounded by strong image crowding. However the bulge also is complex on kiloparsec scales; it has bar-like morphology and dynamics and a complex X-structure over 5-degree scales. DECam fulfills our need for optical perfection of arcsecond imaging, while spanning a huge, nearly 3-square-degree field of view. Our aim is to study stellar proper motions and variations in population and metallicity with the bulge over all scales through the Blanco DECam Bulge Survey (BDBS, PI: R. Michael Rich), an imaging survey that covers nearly the entire Southern Bulge (main survey area ~20° × 12°), including the core of the Sagittarius dwarf spheroidal galaxy and uses DECam's entire filter complement (*ugrizY*).

A first run through the BDBS data shows that we will measure six-filter magnitudes and positions for roughly half a billion stars in total, down to the main sequence turn-off (in most fields). The catalog should serve as a legacy data set for proper motions when combined with different epochs. Although our European Southern Observatory colleagues have surveyed much of the bulge in the infrared with the Variables in the Via

continued

The Blanco DECam Bulge Survey continued

Lactea (VVV) survey, the optical grasp of BDBS will enable mapping of the bulge blue horizontal branch population and more precise photometric age and metallicity measurements, offering the first large-scale map of bulge structure as a function of these parameters.

Two observing seasons of this project have been conducted following the competitive NOAO review process: observing semesters 2013A and 2014A. To date, some 84 of 89 program fields toward the bulge have been imaged, with observations completed for a significant fraction (76 fields) including most of the Southern Bulge and the minor axis. Additional fields observed include the Sagittarius Dwarf galaxy and a sample of population calibration fields toward the Galactic Disk.

view, Figure 2 shows just six active chips plotted, in a similar manner to Figure 1, on the observer workstation in the Blanco control room. Dramatic structure becomes visually apparent when displaying one chip image on each of the 2 × 3 array of monitors at the workstation. We remind the reader that Figure 2 represents only 10% of the field of view of the camera! To handle the large number of measurements required, the BDBS collaboration includes computer hardware and expertise from the Pervasive Technology Institute (PTI) at Indiana University. The capability to rapidly process the multi-terabyte dataset is critical to the success of the survey. This daunting data crunching effort will be led by Clay Fellow Christian Johnson (Harvard/CfA).

Figure 2: Color images constructed from a single raw exposure in each of *i*, *z*, and *Y* filters as per Figure 1—this time from six detectors within the DECam field of view—displayed on the 2 × 3 array of monitors at one of the observer workstations in the Blanco control room. This figure shows 10% of the 60-chip field of view of DECam. This image is centered near (l,b)J2000.0 = (7.11°, −1.63°). (Image credit: Will Clarkson, Kathy Vivas, R. Michael Rich, and the BDBS collaboration.)

The data have proven particularly easy to work with at the telescope, because images are delivered to the observer's console within a few minutes of execution, while a well-developed set of command-line tools greatly aid the observer in making decisions on the fly based on delivered data quality.

The image quality delivered by the Blanco/DECam combination has been breathtaking. An example is shown in Figure 1, which superficially resembles a space-based image. Although this particular image was created just a few nights after observation, an observer would typically be able to make such an image within minutes of the constituent raw frames being taken.

With 60 active chips per exposure (like that in Figure 1), visualization is an interesting challenge. To illustrate the sheer scale of the field of

Most of the survey area has been observed, and analysis is underway. As well as photometry using well-proven methods, this analysis includes estimates of both completeness and error through artificial star-tests, as well as astrometry. Because the BDBS fields include millions of stars per exposure, it should be possible to measure residual spatially correlated instrumental effects to a finer degree than possible in the baseline Dark Energy Survey (DES). Thus, it is expected that BDBS will be of benefit to the entire DECam user community, including DES. The BDBS team is working toward a first catalog release. Input from the community is particularly welcome. Questions or comments should be directed to R. Michael Rich, BDBS PI, at *rmr@astro.ucla.edu*.

The 2014 TMT Science Forum in Tucson

Mark Dickinson

Attendees of the second annual TMT Science Forum, which was held 17–19 July 2014, at Loews Ventana Canyon Resort in Tucson. (Image credit: Michael Bolte, UC Santa Cruz.)

NOAO and the Thirty Meter Telescope (TMT) Project hosted the second annual TMT Science Forum, 17–19 July 2014 at Loews Ventana Canyon Resort in Tucson. More than 150 scientists and educators attended the meeting. Many came from the TMT partners (India, China, Japan, Canada, Caltech, and the University of California), but more than half of the participants were from US institutions outside the current TMT partners. The NSF provided generous funding to support attendance by members of the US-at-large community, as part of its cooperative agreement with TMT to develop a plan for possible future US federal participation in TMT. The Forum is an opportunity for US astronomers to learn about TMT and to become involved in planning for future science and instrumentation.

The theme of this year's meeting was "TMT in the Astronomical Landscape of the 2020s." On the first day, NOAO Director David Silva opened the meeting with an overview of that landscape, both scientific and programmatic, and discussed the potential for (and the challenges facing) future US federal investment in TMT. Gary Sanders, the TMT Project Manager, reviewed the status of the project as it moves into its construction phase (see sidebar). Thirteen invited speakers then discussed other forefront astronomical facilities, ground- and space-based, present and future, and their scientific synergies with TMT. There were talks about space-based observatories (JWST, WFIRST and Euclid, future X-ray missions such as eROSITA, Astro-H and ATHENA, space exoplanet explorers like TESS and PLATO), radio/millimeter facilities (ALMA, CCAT, the VLA, and SKA), and next-generation ground-based O/IR facilities, including the Subaru HyperSuprimeCam and Prime Focus Spectrograph, PanSTARRS, LSST, and the other two giant telescope projects, the Giant Magellan Telescope and the European Extremely Large Telescope.

An instrumentation workshop on the second day thoroughly reviewed the design and status of TMT's first-light instrument suite and adaptive optics system, TMT system engineering, and the process of planning and development for future-generation instrumentation. In the afternoon, there were parallel topical science sessions organized around the themes of the TMT International Science Development Teams (ISDTs): fundamental physics and cosmology, galaxy formation and the intergalactic medium, the Milky Way and nearby galaxies, supermassive black holes, the formation of stars and planets, extrasolar planets, our solar system, and time domain science. There were about 30 contributed science talks in these sessions, as well as lively discussions. In particular, the ISDT members were asked to start developing ideas for potential TMT key programs—high-impact science projects that might use substantial allocations of TMT time, coordinating teams that could span the TMT partnership. The ISDTs are a growing community of astronomers focused on TMT science. They are open to participation by all PhD scientists, and there will be annual calls for new ISDT members.

In the morning of the third day, the parallel session organizers reported on scientific highlights from their discussions, including these key program ideas, as well as the ISDTs' work on updating the Detailed Science Case, a document that describes at a high level the fundamental scientific problems and projects that motivate the design and construction of TMT. Gordon Squires gave a presentation on TMT's efforts in workforce development, education, and public outreach. The meeting concluded with a lively panel and audience discussion session. Posters were displayed throughout the conference. The presentations are available at the TMT Science Forum website, *conference.ipac.caltech.edu/tmtsf2014*, under "Program."

Many exciting ideas for key-program science were discussed in the parallel sessions, and there was widespread support for such projects in the panel discussion at the end of the meeting. Some US community astronomers viewed this as an effective way to maximize scientific return from an NSF-funded share of the observatory, likely to yield large, coherent scientific data sets with high re-use values. One of the panelists in the closing discussion, Dr. Shude Mao (National Astronomical Observatories, Chinese Academy of Sciences), noted that large, partnership-spanning programs are a good opportunity for astronomers from China and India to engage in forefront international science collaborations. There was general support for investment in data reduction software and archives in order to facilitate use and maximize re-use of TMT data. Some participants stressed the importance of flexible scheduling modes, especially to enable time-critical observations that might otherwise be impossible if time were allocated to each TMT partner in strictly defined blocks. There was interest in finding ways to take advantage of complementary instrumentation on the three extremely large telescopes, such as time trades between the observatories.

Finally, there was widespread enthusiasm for possible future US/NSF participation in TMT, not only from the US participants but from the international TMT partners as well. Of course, the astronomers who

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The 2014 TMT Science Forum in Tucson continued

attended the TMT Forum are perhaps already inclined toward an interest in science with giant telescopes! However, the US TMT Science Working Group (SWG) is surveying the broader US astronomical community to understand its interests, aspirations, and concerns regarding national participation in TMT. The US TMT SWG is organized by NOAO (see *ast.noao.edu/system/us-tmt-liaison*) and consists of astronomers from institutions across the country and outside the current TMT partners (UC and Caltech). The NSF has asked the SWG to develop a model for potential US partnership in TMT. Please stay tuned to the NOAO electronic newsletter, *Currents*, for information about the TMT SWG's survey and its other activities as well as for future announcements about new opportunities to join the TMT International Science Development Teams. NOAO thanks everyone who attended this TMT Forum for making it such a success. We look forward to seeing you again at next year's meeting!

TMT Enters Its Construction Phase

The Thirty Meter Telescope (TMT) project has passed several critical milestones in the past few months and has transformed from a "project" into an observatory in the making.

In May, the financial authorities from the National Institutes of Natural Sciences in Japan, the National Observatories of the Chinese Academy of Sciences, the California Institute of Technology, and the University of California signed their commitments to fund construction of TMT, and the partnership formally incorporated as the TMT International Observatory, LLC (or TIO). The Indian Institute for Astrophysics and the Association of Canadian Universities for Research in Astronomy (ACURA) joined TIO as associate members and are aiming for full membership within the next year. AURA is also an associate member representing the US astronomical community. NOAO is charged with executing the responsibilities, privileges, and participation activities of AURA in TMT. The Gordon & Betty Moore Foundation has provided substantial funding to support the development of the observatory.

At the first meeting of the new TIO Board on 22 May 2014, the members voted to proceed with construction of TMT, contingent on the final approval of a sublease for TMT on Mauna Kea. That approval, by the Hawaii Board of Land and Natural Resources, was granted on 25 July 2014, launching the official start of the TMT construction phase.

The first construction activity in Hawaii will be a ground-breaking and blessing ceremony in October. In Japan, contracts have been signed for the final design of the telescope and for mirror segment blank fabrication. More than 60 mirror segment blanks (out of nearly 500 total) have already been manufactured. Design of the articulated tertiary steering mirror system, as well as the laser guide star system, is proceeding in China. India is prototyping the primary mirror segment assemblies, mirror actuators, edge sensors, and support systems. The adaptive optics facility is nearing its final design stage in Canada, and the TMT enclosure design is ready for construction by a Canadian industrial company. Three first-light instruments are under development by consortia that include contributions from all of the TMT partners.

Image credit: Tim Pyle, IPAC

"It has been an amazing journey for TMT, from idea to shovel-ready project," said Henry Yang, TIO Board Chair and Chancellor of the University of California Santa Barbara. "We are grateful to the Gordon and Betty Moore Foundation, the State of Hawaii, its citizens, and our project partners in bringing this important astronomical science effort to fruition. It is also my rewarding experience to work with so many community friends, University of Hawaii colleagues, and officials in both the Big Island and Oahu in this journey."

2015A NOAO Call for Proposals Due 25 September 2014

Verne Smith & Dave Bell

Proposals for NOAO-coordinated observing time for semester 2015A (February–July 2015) are **due by the evening of Thursday, 25 September 2014, midnight MST**.

The facilities available this semester include the Gemini North and South telescopes, Cerro Tololo Inter-American Observatory (including SOAR), Kitt Peak National Observatory (including WIYN), community-access time with the CHARA Interferometer, and time available on the Subaru 8.2-m telescope and the 4-m Anglo-Australian Telescope (AAT) through exchange programs.

The formal Call for Proposals is available at *ast.noao.edu/observing/proposal-info* as a self-contained, downloadable PDF document that contains all information necessary to submit an observing proposal to NOAO. Included in this document are the following:

- How to prepare and submit a proposal for an observing program
- Deadlines
- Descriptions of classes of programs, such as normal, survey, or long-term, as well as the criteria of evaluation for each class
- Who may apply, including special guidelines for thesis student proposals or travel support for classical observing on the Gemini telescopes
- Changes and news or updates since the last Call for Proposals
- Links to the web pages of System facilities
- How to acknowledge use of NOAO facilities in your papers

Previous information on various web pages that contain all of the information within the Call for Proposals document also remains available at *www.noao.edu/noaoprop/*.

There are three options for submission:

Gemini Phase I Tool (PIT) – Investigators proposing for Gemini time are required to use Gemini's proposal tool, which runs on Solaris, RedHat Linux, Windows, and Mac platforms. PIT can be downloaded from *www.gemini.edu/sciops/observing-gemini/proposal-submission/phase-i-tool-pit*.

Web Submission – The NOAO Web proposal form may be used to complete and submit proposals for all telescopes other than those at Gemini. The information provided on the form is formatted and submitted as a LaTeX file, including figures that are "attached" to the proposal as encapsulated PostScript files.

File Upload – A customized LaTeX file may be downloaded from the Web proposal form after certain required fields have been completed. "Essay" sections can then be edited locally and the proposal submitted by uploading files through a web page at *www.noao.edu/noaoprop/submit/*.

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

Proposal Preparation and Submission Help

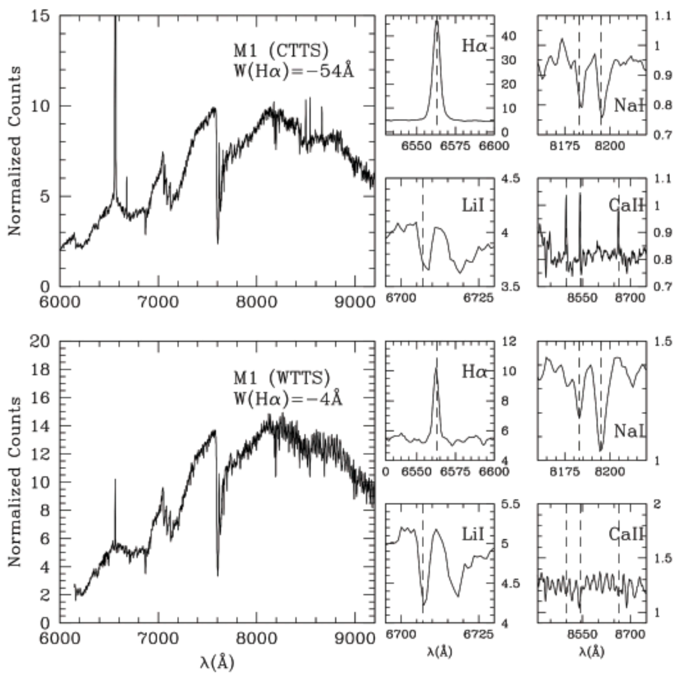
Web proposal materials and information	*www.noao.edu/noaoprop/*
TAC information and proposal request statistics	*www.noao.edu/gateway/tac/*
Web submission form for thesis student information	*www.noao.edu/noaoprop/thesis/*
Request help for proposal preparation	*noaoprop-help@noao.edu*
Gemini-related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

COSMOS Is Ready for Science Starting in 2015A

Jay Elias, César Briceño

The Cerro Tololo Ohio State Multi-Object Spectrograph (COSMOS) completed its second successful commissioning run on the Blanco telescope during several nights in early July 2014, following an equally successful first run in April. We have now exercised all modes of the instrument, including end-to-end operation of the multi-object slit (MOS) mode, starting with mask design and fabrication in La Serena, and ending with data taking on-sky through those masks. The measured COSMOS throughput is a little better than that for the Kitt Peak Ohio State Multi-Object Spectrograph (KOSMOS), which we attribute to the better state of the primary mirror coating on the Blanco telescope, as compared with the Mayall.

As an example of COSMOS performance, the accompanying image shows spectra that showcase the potential of this new instrument for producing high-quality low-resolution spectra over a very wide wavelength of many objects simultaneously. In addition, its imaging capability provides for combined photometric and spectroscopic programs in the Southern Hemisphere. NOAO is therefore offering all modes of the instrument for semester 2015A and encourages prospective users to apply for time with this new science tool at CTIO.



Spectra of two T Tauri stars in the Lupus 3 star-forming region were obtained through a MOS mask and the "red" configuration. Three 15-min exposures were median-combined to produce these high signal-to-noise ratio (SNR) spectra spanning ~0.6 to almost 1 micron. These are just two of 12 targets configured in one particular MOS mask. The upper spectrum corresponds to an M1 spectral type Classical T Tauri star (CTTS, Rc = 15.0), exhibiting the characteristic strong Hα emission line, produced in an extended magnetosphere through which material is accreting from a circumstellar disk onto the star. The lower spectrum is of a weak-lined T Tauri star (WTTS, Rc = 15.2), almost identical in all aspects to its CTTS sibling, except for the weak Hα emission, which originates in an active chromosphere. The Li I 6707 Å absorption line, an indicator of youth in K- and M-type dwarfs, with W(Li I) = 0.42 Å in the CTTS and W(Li I) = 0.64 Å in the WTTS, is clearly detected in both objects.

CTIO and KPNO Telescope and Instrument Combinations for 2015A

Steve Heathcote (CTIO), Lori Allen (KPNO), & Victoria Misenti (Yale University, SMARTS)

Blanco 4-m Telescope

In 2015A, CTIO will be offering three instruments on the Blanco 4-m telescope: the Dark Energy Camera (DECam), the Cerro Tololo Ohio State Multi-Object Spectrograph (COSMOS), and the Infrared Side-Port Imager (ISPI). The multi-object spectrograph, Hydra, is not being offered in 2015A; similar observing capabilities are available through the time trade with the Anglo-Australian Telescope (AAT). Details of the telescope and instruments can be found on the CTIO website, *www.ctio.noao.edu/*.

For the duration of the Dark Energy Survey (DES), 105 nights per year will be allocated to DES. DES started on 31 August 2013 and will run through 2017. In the B semesters, DES will take up a large part of the time in the months of September to January, while the community will have access to no less than 25% of the time (roughly one week per month). In the A semesters, community access will be largely normal, although there may be up to 20 half-nights scheduled for DES in February.

A companion article ("Peaceful Coexistence with DES: Tips for a Successful Blanco Telescope Proposal") in this *Newsletter* offers some tips for maximizing the chances that your proposal will succeed despite this fierce competition.

continued

CTIO and KPNO Telescopes and Instrument Combinations for 2015A continued

SOAR 4.1-m Telescope
For semester 2015A, the following instruments will be offered: the SOAR Optical Imager (SOI), the Ohio State Infrared Imager/Spectrometer (OSIRIS), the Spartan IR imager, the Goodman Spectrograph, and the SOAR Adaptive Module (SAM). The Goodman Spectrograph is available in single-slit mode. Multi-slit mode may be offered on a shared-risk basis depending on the successful outcome of science verification observations in February; confirmation and further information will be posted on the website in advance of the proposal deadline.

Approximately 85% of the time on SOAR will be scheduled for science in semester 2015A, with the remainder being used mostly for instrument commissioning. NOAO users get 30% of the available science time.

Remote observing is being offered for proposals requesting time through the NOAO Time Allocation Committee (TAC) and the Chile National TAC with SOI, OSIRIS, Spartan, or the Goodman Spectrograph provided: (a) *the person who will carry out the observations has previously observed at SOAR using the instrument(s) requested in the proposal,* and (b) our review of the proposal does not reveal any special technical requirements that would make it preferable to have an observer on site.

Details of these and future instruments can be found at:
www.soartelescope.org.

Small Telescopes (SMARTS)
The Small and Moderate Aperture Research Telescope System (SMARTS) Consortium continues to operate the CTIO small telescopes under the SMARTS 3 agreement.

In semester 2015A, 15% of the time on the 1.5-m, 1.3-m, and 0.9-m telescopes is available through the NOAO TAC. The 1.5-m and 1.3-m telescopes are offered in service mode, while the 0.9-m telescope is only offered in user mode. The 1.0-m telescope is closed currently. The 1.3-m telescope is used primarily for monitoring projects, thus programs are scheduled in non-contiguous segments of an hour or less with a limit of three hours total within any given night. The conversion from nights to hours might thus lead to inaccuracies in time requests. Please consult the SMARTS web pages for the latest information: *www.astro.yale.edu/smarts/*. In addition, please check the Call for Proposals for the availability and observing modes on the SMARTS telescopes.

New SMARTS partners are always welcome; see the SMARTS website at *www.astro.yale.edu/smarts/about.htm* for information on membership. SMARTS 3 also allows PIs to purchase smaller amounts of time by the night (at the 0.9-m) or by the hour (at the 1.5-m and 1.3-m). Please contact Victoria Misenti at Yale (*victoria.misenti@yale.edu*) for information on the 1.5-m and 1.3-m telescopes and Todd Henry at Georgia State University (*thenry@chara.gsu.edu*) for information on the 0.9-m telescope.

Mayall 4-m Telescope
In response to budgetary constraints, KPNO must scale back its science operations. Our goal remains to help our users obtain the best data possible; but to provide this level of support, we will be offering fewer instruments in 2015A and beyond. Instruments offered in 2015A are: KOSMOS (in single-slit and multi-object spectroscopy modes), NEWFIRM, Mosaic, R-C Spectrograph, and Phoenix. We will continue to block schedule instruments, with the dates and lengths of scheduled blocks driven in part by demand. Observers are reminded to check the "Telescopes and Instruments" web page at *ast.noao.edu/observing/current-telescopes-instruments* for current information before submitting proposals.

Users should be aware of the following:

- Phoenix: 2015A will be the last semester for Phoenix. Proposals should not be submitted for new, long-term projects requiring more than one semester with Phoenix to complete.
- R-C Spectrograph: It is likely that 2015A will be the last semester for the R-C Spectrograph. As soon as high-dispersion grisms have been obtained for KOSMOS, the R-C will be retired. Projects not requiring the higher dispersion of the R-C should be proposed for KOSMOS, which has higher throughput.
- Echelle: The Echelle spectrograph is **not** included in the 2015A Call for Proposals because the instrument is being retired at the end of the 2014B semester.
- The instrument complement at the 4-m telescope will be even further restricted in coming semesters. By 2015B, it will consist of only three instruments: Mosaic, NEWFIRM, and KOSMOS.

WIYN 3.5-m Telescope
NOAO is happy to announce that community access to WIYN will continue during 2015A. The Hydra, SparsePak, GradPak, and HexPak bench instruments are offered, as is the IR imager WHIRC. Proposers should visit the WIYN status web page, *www.wiyn.org/Observe/wiynstatus.html,* prior to proposing.

Proposers should note the following:

- GradPak and HexPak: Available on a shared-risk basis, subject to approval by the PI, Matt Bershady (University of Wisconsin).
- WHIRC: The IR imager can be used either with or without the tip-tilt module WTTM.
- Hydra and the instrument package that supports WHIRC and the integral field units are scheduled in blocks.
- pODI will be off the telescope for a focal plane upgrade until approximately mid-June. Check the WIYN website for developing information on science verification plans.

WIYN 0.9-m Telescope
The Half Degree Imager remains available for up to 20 nights per semester.

All NOAO proposers are reminded that **requests for remote observing** are considered on an individual basis, and that certain criteria must be met in order for a proposal to be considered. These criteria can be found at *www.noao.edu/kpno/remote.html.*

System-Wide Observing Opportunities for Semester 2015A: Gemini, Subaru, and AAT

Letizia Stanghellini, Dave Bell & Verne V. Smith

Observing semester 2015A runs from 1 February to 31 July 2015. The NOAO System Science Center (NSSC) encourages the US community to propose for observing time using all of the ground-based, open-access, system-wide facilities available during this semester. Observing opportunities on telescopes other than those of KPNO, CTIO, WIYN, and SOAR are summarized below.

The Gemini Telescopes

The US user community is allocated about 75 nights per telescope per semester on the Gemini North and Gemini South telescopes, which represents the largest piece of open-access observing time on 8-m-class telescopes. The Gemini Observatory provides unique opportunities in observational and operational capabilities, such as the ability to support both classically and queue-scheduled programs.

NOAO encourages US investigators to propose for classical programs, which can be as short as one night, on the Gemini telescopes in an effort to increase interactions between US users and the Gemini staff and to increase observing directly with the telescopes and instruments. We also encourage queue observers to visit Gemini to see the operation firsthand. NOAO will cover the travel costs for thesis student observers to observe at or visit Gemini.

US Gemini observing proposals are submitted to and evaluated by the NOAO Time Allocation Committee (TAC). The formal Gemini Call for Proposals for 2015A will be released in early September 2014 (close to the publication date of this *Newsletter* issue), with a US proposal deadline of Thursday, 25 September 2014. As this article is prepared well before the release of the Gemini Call for Proposals, the following lists of instruments and capabilities are only our expectations of what will be offered in semester 2015A. Please watch the Gemini Science Operations web page (*www.gemini.edu/sciops*) for the Gemini Call for Proposals, which will list clearly and in detail the instruments and capabilities that will be offered.

NSSC anticipates the following instruments and modes on Gemini telescopes in 2015A:

***Gemini North*:**

- NIFS: Near-infrared Integral Field Spectrometer.
- NIRI: Near Infrared Imager.
- GMOS-North: Gemini Multi-Object Spectrograph and imager. Science modes are multi-object spectroscopy (MOS), long-slit spectroscopy, integral field unit (IFU) spectroscopy and imaging. Nod-and-Shuffle mode is also available. GMOS-North currently features red-sensitive e2v CCDs.
- GNIRS: Gemini Near Infrared Spectrograph offers a wide variety of spectroscopic capabilities including long-slit (single order) spectroscopy within the 1.0–5.4 µm range. The instrument can be used with adaptive optics over most of its wavelength range.
- ALTAIR adaptive optics (AO) system in natural guide star (NGS) mode, as well as in laser guide star (LGS) mode, with sky coverage limited by the need for natural AO or tip/tilt guide stars. A mode that uses LGS along with fast guiding from the peripheral wavefront sensor yields improved image quality with 100% sky coverage. ALTAIR can be used with NIRI imaging, NIFS IFU spectroscopy, NIFS IFU spectral coronography, and GNIRS.
- All of the available instruments and modes are offered for both queue and classical observing, except for LGS, which is available as queue only. Classical runs are offered to programs that are one night or longer and consist of integer nights.
- Details on the use of the LGS system can be found at *www.gemini.edu/sciops/instruments/altair/?q-node/11*, but a few points are emphasized here. Target elevations must be >40 degrees, and proposers must request good weather conditions (Cloud Cover = 50%, or better, and Image Quality = 70%, or better, in the parlance of Gemini observing conditions). Proposals should specify "Laser guide star" in the Resources section of the Observing Proposal. Because of the need for good weather, LGS programs must be ranked in Bands 1 or 2 to be scheduled on the telescope.

Gemini South:

- GMOS-South: Gemini Multi-Object Spectrograph and imager. Science modes are MOS, long-slit spectroscopy, IFU spectroscopy and imaging. Nod-and-Shuffle mode is also available. Hamamatsu CCDs are available in 2015A.
- GeMS+GSAOI: Gemini Multi-Conjugate Adaptive Optics System with the Gemini South Adaptive Optics Imager.
- FLAMINGOS-2: Florida Multi-Object Imaging Near-Infrared Grism Observational Spectrometer version 2. FLAMINGOS-2 is expected to be available in imaging and long-slit modes for regular proposals in 2015A. Commissioning of the MOS mode is planned in 2015A.
- GPI: Gemini Planet Imager. Gemini expects to offer GPI regularly for observations in 2015A.
- GMOS-South and FLAMINGOS-2 are offered for both queue and classical observing. As with Gemini North, classical runs are offered to programs with a length of at least one or more integer nights.

Detailed information on all of the above instruments and their respective capabilities is available at:
www.gemini.edu/sciops/instruments/.

Starting in 2015A, all Gemini proposals must be prepared and submitted with the Gemini Phase I Tool (PIT) software. This is intended to improve operations. For additional instructions and guidelines on the PIT, please see *www.noao.edu/noaoprop/help/pit.html*. **Furthermore, PIs must attach the pdf output of the Gemini Integration Time Calculator (ITC) relevant to their proposal.** The ITC is available at:
www.gemini.edu/sciops/instruments/integration-time-calculators.

Gemini proposals can be submitted jointly with collaborators from other Gemini partners. An observing team requests time from each relevant partner.

Efficient operation of the Gemini queue requires that it be populated with programs that can effectively use the full range of observing condi-

continued

tions. Gemini users have become increasingly experienced at specifying the conditions required to carry out their observations using the online Gemini ITC for each instrument. NSSC reminds you that a program has a higher probability of being awarded time and of being executed if ideal observing conditions are not requested. The two conditions that are in greatest demand are excellent image quality and no cloud cover. We understand the natural high demand for these excellent conditions, but wish to remind proposers that programs using less-than-ideal conditions are also needed for the queue.

Subaru Access through Gemini Exchange Program

We expect classical observing time to be available on Subaru through an exchange program with Gemini. Up to 5 nights are available through this exchange, depending on the request for Gemini time from proposers in the Subaru community. Observers interested in the Subaru time exchange should check the status of these capabilities closer to the deadline.

AAT Access through CTIO Exchange Program

In 2012, CTIO and the Australian Astronomical Observatory (AAO) started a program to exchange time between the CTIO 4-m telescope and the 4-m Anglo-Australian Telescope (AAT). This program is expected to continue in 2015A, with 10 classically scheduled nights on the AAT available to the NOAO community. All AAT instruments are available to this program. NOAO users may also apply directly for AAT time through the AAO's open call. For additional information, see: *www.noao.edu/gateway/aat/*.

Access to CHARA Optical Interferometer Array

About 50 hours will be available during calendar year 2015. All proposals are due by the 2015A deadline of 25 September 2014, even for observations that would nominally fall in 2015B. For information on available beam combiners and links to observation planning tools, see: *www.noao.edu/gateway/chara/*.

Summary of Instruments Available

Lists of instruments that we expect to be available in 2015A can be found following this article. As always, investigators are encouraged to check the NOAO website for any last-minute changes before starting a proposal.

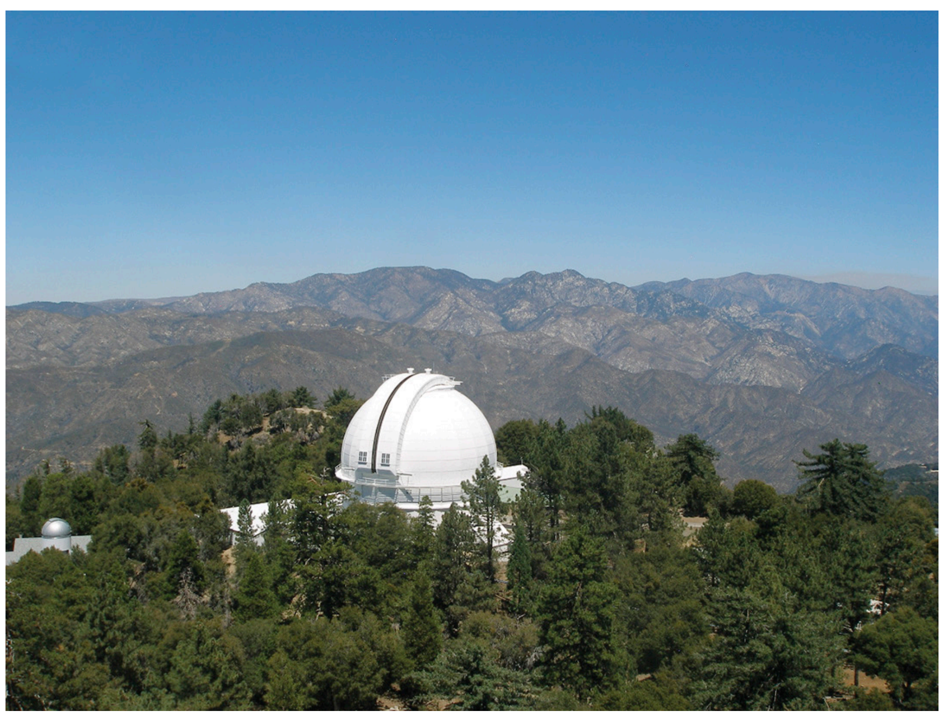
If you have any questions about proposing for US observing time on Gemini, Subaru, or AAT, feel free to contact Letizia Stanghellini (*lstanghellini@noao.edu*), Dave Bell (*dbell@noao.edu*), or Verne Smith (*vsmith@noao.edu*). NL

Community Access Time Available in 2015 with CHARA

Steve Ridgway

NOAO and Georgia State University are announcing a sixth opportunity for observations with the Center for High Angular Resolution Astronomy (CHARA) optical interferometer array at Mt. Wilson Observatory. About 50 hours will be available during calendar year 2015. Observations will be carried out by CHARA staff.

Requests should be submitted using the standard NOAO proposal form. Select "CHARA" in the telescope list and enter "nights requested" as a decimal, assuming 10 hours/night (e.g., 1.6 nights = 16 hours). Proposals must be submitted by the standard 2015A deadline of 25 September 2014. This one-time call covers all of calendar year 2015, as opposed to the six-month period of February–July 2015 for other resources in the 2015A proposal cycle. For more information, see *www.noao.edu/gateway/chara/*.



View of the Mount Wilson Observatory from the CHARA tower cam. (Image credit: UCLA Department of Physics and Astronomy Aug 14 14 13:51:21.)

CTIO Instruments Available for 2015A

Spectroscopy	Detector	Resolution	Slit Length
CTIO Blanco 4-m			
COSMOS [1]	e2v (2K×4K CCD)	2100	10'
SOAR 4.1-m			
OSIRIS IR Imaging Spectrograph [2,5]	HgCdTe (1K×1K array, JHK windows)	1200, 1200, 3000	3.2', 0.5', 1.2'
Goodman Spectrograph [3,5]	Fairchild (4K×4K CCD, 3100–8500Å)	1800, 2800, 4300, 5900, 10,100	3.5'
CTIO/SMARTS 1.5-m [4]			
CHIRON	e2v (4K×4K CCD, 420–870nm)	80,000 (with image slicer)	2.7" fiber

Imaging	Detector	Scale ("/pixel)	Field
CTIO Blanco 4-m			
DECam Optical Imager	LBNL (62- 2K×4K CCD mosaic)	0.27	2.0 degrees diameter
ISPI IR Imager	HgCdTe (2K×2K array, 1.0–2.4µm)	0.3	10.25'
COSMOS [1]	e2v (2K×4K CCD)	0.29	12' diameter cropped to 100 sq. arcmin
SOAR 4.1-m			
SOAR Optical Imager (SOI) [5]	e2v (2- 2K×4K CCD mosaic)	0.08 (1×1 binning)	5.25'
OSIRIS IR Imaging Spectrograph [5]	HgCdTe (1K×1K array)	0.33 (*f*/3 camera), 0.14 (*f*/7 camera)	3.2' (*f*/3 camera), 1.3' (*f*/7 camera)
Spartan IR Imager [5,6]	HgCdTe (4- 2K×2K array mosaic)	0.0661, 0.0400	5.04', 3.05'
Goodman Spectrograph [3,5]	Fairchild (4K×4K CCD)	0.15 (1×1 binning)	7.2' diameter
SOAR Adaptive Module (SAM)	e2v (4K×4K CCD)	0.045	~3'×3'
CTIO/SMARTS 1.3-m [7]			
ANDICAM Optical/IR Camera	Fairchild (2K×2K CCD)	0.17	5.8'
	HgCdTe (1K×1K array, IR)	0.11	2.0'
CTIO/SMARTS 0.9-m [8]			
Direct Imaging	SITe (2K×2K CCD)	0.4	13.6'

[1] COSMOS will be offered in long-slit and imaging modes in 2015A and as shared risk in multi-slit mode for 2015A, pending successful multi-slit commissioning in late 2014A and early 2014B. The spectral resolution is given for a 3-pixel (~0.9") slit for the central wavelength of the blue and red VPH gratings. A 2-pixel (0.6") slit is also available. In imaging mode, COSMOS uses 4×4 inch square filters.

[2] The spectral resolutions and slit lengths for the OSIRIS imaging spectrograph correspond to its low-resolution, cross-dispersed, and high-resolution modes, respectively. In the cross-dispersed mode, one is able to obtain low-resolution spectra at JHK simultaneously.

[3] The Goodman Spectrograph is available in single-slit mode and multi-slit mode for 2015A. The resolutions given are the maximum resolution achievable with the 400, 600, 930, 1200, and 2100 l/mm gratings using the narrowest (0.46") slit and measured at 5500Å. Imaging mode is also available. The instrument has its own set of U, B, V, and Rc filters, but it is also possible to install any of the SOI 4×4 inch square filters.

[4] Service observing only.

[5] Remote observing is possible with this instrument. Please see *www.soartelescope.org/observing/remote-observing-at-soar* for details.

[6] Spartan is available in the low-resolution mode. The high-resolution mode is commissioned but has seen very little use. Spartan should be preferred to OSIRIS for most NIR imaging observations.

[7] Service observing only. Proposers who need the optical only will be considered for the 0.9-m telescope unless they request otherwise. Note that data from both ANDICAM imagers is binned 2×2.

[8] Classical only.

Gemini Instruments Available for 2015A *

GEMINI NORTH	Detector	Spectral Range	Scale ("/pixel)	Field
GMOS-N	3×2048×4608 e2v deep depletion CCDs	0.36–1.0μm R~670–4400	0.072	5.5' 5" IFU
GNIRS	1024×1024 Aladdin Array	0.9–5.4μm R~1700, 5000, 18,000	0.05, 0.15	50", 100" slit (long) 5"–7" slit (cross-d)
GNIRS + Altair	1024×1024 Aladdin Array	0.9–2.5μm R~1700, 5000, 18,000	0.05, 0.15	50", 100" slit (long) 5"–7" slit (cross-d)
NIFS	2048×2048 HAWAII-2RG	1–2.5μm R~5000	0.04×0.10	3"×3"
NIFS + Altair	2048×2048 HAWAII-2RG	1–2.5μm R~5000	0.04×0.10	3"×3"
NIRI	1024×1024 Aladdin Array	1–5μm Broad and narrow filters	0.022, 0.050, 0.116	22.5", 51", 119"
NIRI + Altair	1024×1024 Aladdin Array	1–2.5μm + L Band Broad and narrow filters	0.022, 0.050	22.5", 51"

GEMINI SOUTH	Detector	Spectral Range	Scale ("/pixel)	Field
FLAMINGOS-2	2048×2048 HAWAII-2	0.9–2.4μm R~1200, 3000	0.18	6.1' (circular)
GMOS-S	3×2048×4176 Hamamatsu	0.36–1.0μm R~670–4400	0.081	5.6' 5" IFU
GPI	2048×2048 HAWAII-2RG	0.9–2.4μm R~40–90	0.0141"/lenslet	2.8"×2.8"
GSAOI + GeMS	4×2048×2048 HAWAII-2RG	0.9–2.4μm Broad and narrow filters	0.02	85"×85"

EXCHANGE	Detector	Spectral Range	Scale ("/pixel)	Field
COMICS (Subaru)	6×320×240 Si:As	8–25μm R~250, 2500, 8500	0.13	42"×32"
FMOS (Subaru)	2048×2048 HAWAII-w	0.9–1.8μm R~250–7500	0.216	30' diameter
FOCAS (Subaru)	2×2048×4096 CCDs	0.33–1.0μm R~250–7500	0.104	6' (circular)
HDS (Subaru)	2×2048×4096 CCDs	0.3–1.0μm R<90,000	0.138	60" slit
HSC (Subaru)	104×2048×4096 CCDs	0.4–1.0μm	0.17	90' diameter
IRCS (Subaru)	1024×1024 InSb	1–5μm R~100–20,000	0.02, 0.05	21"×21", 54"×54"
IRCS+AO188 (Subaru)	1024×1024 InSb	1–5μm R~100–20,000	0.01, 0.02, 0.05	12"×12", 21"×21", 54"×54"
MOIRCS (Subaru)	2×2048×2048 HAWAII-2	0.9–2.5μm R~500–3000	0.117	4'×7'
Suprime-Cam (Subaru)	10×2048×4096 CCDs	0.36–1.0μm	0.2	34'×27'

* Availability is subject to change. Check the NOAO and Gemini Calls for Proposals and/or the Gemini web pages for up-to-date information.

KPNO Instruments Available for 2015A

Spectroscopy	Detector	Resolution	Slit Length	Multi-object
Mayall 4-m				
R-C CCD Spectrograph [1]	T2KA/LB1A CCD	300–5000	5.4'	single/multi
KOSMOS [2]	e2v CCD	2400	up to 10'	single/multi
Phoenix [3]	InSb (512×1024, 1–5μm)	50,000–70,000	30"	single
WIYN 3.5-m				
Hydra + Bench Spectrograph [4]	STA1 CCD	700–22,000	NA	~85 fibers
SparsePak [5]	STA1 CCD	400–13,000	IFU	~82 fibers
GradPak [6]	STA1 CCD	~400–13,000	IFU	90 fibers
HexPak [6]	STA1 CCD	~400–13,000	IFU	102 fibers

Imaging	Detector	Spectral Range	Scale ("/pixel)	Field
Mayall 4-m				
CCD MOSAIC 1.1	8K×8K	3500–9700Å	0.26	35.4'
NEWFIRM [7]	InSb (mosaic, 4, 2048×2048)	1–2.3μm	0.4	28.0'
WIYN 3.5-m				
WHIRC [8]	VIRGO HgCdTe (2048×2048)	0.9–2.5μm	0.10	3.3'
WIYN 0.9-m				
Half-Degree Imager [9]	4K×4K	3500–9700Å	0.43	29.2'

[1] PIs can propose for RC Spec in 2015A, but projects that can be moved to KOSMOS will be. T2KA is the default CCD for RC Spec. T2KB now serves as T2KA's backup. LB1A may be requested for RC Spec if appropriate.

[2] KOSMOS is offered in both single-slit and multi-object mode. See *www.noao.edu/nstc/kosmos/* for more information.

[3] See *www.noao.edu/kpno/phoenix/phoenixhome.html* before preparing the proposal.

[4] One-degree field with two fiber bundles of ~85 fibers each. "Blue" (3") and "Red" (2") fibers.

[5] Integral Field Unit, 80"×80" field, 5" fibers, graduated spacing.

[6] GradPak and HexPak are relatively new IFUs containing multiple fiber diameters in the same head, designed to sample different spatial scales within the same observation. They are offered in 2015A on a shared-risk basis, subject to approval of the PI. Proposers should check the WIYN status web page *www.wiyn.org/Observe/wiynstatus.html* for contact information before proposing.

[7] Permanently installed filters include J, H, Ks. See *www.noao.edu/ets/newfirm/* for further information, filter availability, and the policy on filter changes.

[8] WHIRC was built by Dr. Margaret Meixner (STScI) and collaborators. Potential users requiring WTTM are advised to contact KPNO support staff for details on its current status before making a proposal and to check *www.wiyn.org/Observe/wiynstatus.html* for any updates.

[9] HDI was successfully commissioned in 2013B.

AAT Instruments Available for 2015A

	Detector	Resolution	Spectral Range	Scale ("/pixel)	Field
AAOmega + 2dF (392-fiber MOS)	2x e2v 2024×4096	R~1300–8000	0.37–0.95µm	R~1.3K–8K	120'
AAOmega + KOALA (1000-element IFU)	2x e2v 2024×4096	R~1500–10,000	0.4–0.95µm	0.7" or 1.25"	24"×18" or 43"×32"
HERMES + 2dF (392-fiber MOS)	4x e2v 4096×4112	R~28K, 45K	0.47–0.79µm	R~28K or 45K	120'
IRIS2 (near-IR img/spec/mos)	1024×1024 HgCdTe	R~2400	0.9–2.5µm	0.45	7.7'×7.7'
UCLES (cross-dispersed echelle)	2K×4K EEV2 or MITLL3	R~40K–120K	0.38–1.1µm	0.16, 0.18	NA
UCLES + CYCLOPS2 (16-element IFU)	2K×4K EEV2 or MITLL3	R~70K	0.45–0.74µm	0.6"/fiber	2.45"

CHARA Instruments Available for 2015

	Beam Combiner	Resolution	Spectral Range	Beams
The CHARA Array consists of six 1-meter-aperture telescopes with baselines from 30 to 330 meters.	Classic, Climb	Broadband	H or K	2 or 3
	MIRC	40	H or K	6
	VEGA	6000/30,000	45nm in 480–850nm	2 or 3
	PAVO	30	630–900nm	2

Changes in the Role of System User Support

Letizia Stanghellini, Ken Hinkle & Verne V. Smith

The System User Support (SUS) group in the NOAO System Science Center (NSSC) is focused on supporting users of non-NOAO facilities who have time awarded through the NOAO Time Allocation Committee (TAC). For the most part, these are Gemini users. Thus, the main responsibility of SUS is to ensure a seamless connection between Gemini and the US community. Since the first call for Gemini proposals through NOAO, SUS has reviewed all submitted programs for technical issues before the TAC meeting, handled all Tier 1 HelpDesk queries, supported the TAC panelists for Gemini-related queries, participated in the Gemini International TAC (ITAC), and supported US-led Phase II programs. SUS also has supported post-observing activities, although this has not been a priority in the past.

Recently, the Gemini Observatory and the Gemini Board discussed the possibility of negotiating different agreements with the individual international partners, which could translate into trading certain responsibilities and tasks between Gemini and the various National Gemini Offices (NGOs). These trades would avoid duplication of work, improve the mapping of task to expertise across partners, and streamline the observing process. It became clear that trading Phase II support back to Gemini would be an improvement for the US community and allow SUS to redirect some of its staff efforts to support post-data analysis.

Beginning in semester 2014B, for a trial of three years, Gemini will be responsible for the Phase II programs awarded by the NOAO TAC. Dur-

continued

Changes in the Role of System User Support continued

ing the same time, SUS is planning to provide post-observing support activities such as Gemini science and data workshops and data reduction cookbooks for specific instruments and modes. We are now collecting data and community feedback to plan these new tasks with the ultimate goal of improving data analysis and publication rates for programs based on Gemini observations.

Another change to optimize operations involves technical support for Gemini Phase I programs submitted to the NOAO TAC. Starting in semester 2015A, SUS will perform technical reviews exclusively on programs that are ranked highly by the NOAO TAC and thus are likely to be scheduled. To accommodate this process, the TAC and ITAC schedules will be modified accordingly. SUS will continue to support the TAC on technical queries on all offered instruments and modes and will stand ready to review individual programs should the NOAO TAC request it. To optimize the Phase I process, NOAO will require that all Gemini programs starting in 2015A use the PIT format for time requests, and that a PDF attachment from the exposure time calculation be submitted with the proposal. This mode of operation has been successfully implemented by other observatories and will minimize the time spent on unsuccessful proposals, while still devoting full expert attention to the highest ranked programs. The goal is that the best possible science with Gemini will get the most focused technical support.

In the future, NOAO/SUS support of Gemini observations will be aimed at providing support after observations have been obtained. Up until now this support has largely been absent. Over the next year, expect to hear about our new documentation and data reduction forums. Please feel free to contact us if you have some topic or process that you feel needs documentation.

For questions on the change of the US NGO role, please contact Letizia Stanghellini (*lstanghellini@noao.edu*), Ken Hinkle (*khinkle@noao.edu*), or Verne Smith (*vsmith@noao.edu*).

Peaceful Coexistence with DES: Tips for a Successful Blanco Telescope Proposal

Steve Heathcote

The Dark Energy Survey (DES) has been allocated 105 nights per year, for five years, on the Blanco Telescope. These nights are scheduled to allow the wide-field survey of the Southern Galactic cap to be executed as efficiently as possible. This means that all but about five of these nights fall in the B semester, with the DES time concentrated in the months of September through November, and with second-half nights scheduled during the first half of August, and first-half nights scheduled from late December to February. After subtracting engineering time, the 14 nights allocated to Chile, and up to 5 nights each to the Australian Astronomical Observatory and Brazil under the terms of their respective time trade arrangements, this leaves less than 40 nights on Blanco that are available to the US open-access community in the B semester. Conversely, the situation during the A semester is more or less normal with around 125 community nights available.

Having completed the first DES season and scheduled the second, we have some tips that may increase the chances that your proposal will be highly ranked by the NOAO Time Allocation Committee (TAC), and, if it is ranked highly, can be scheduled on the telescope in the face of this fierce competition.

- The DES wide-field survey covers 5000 square degrees in the *grizY* filters, and the data has only a twelve-month proprietary period (see the "DES Year One Data Availability" article in this *Newsletter* for a report on survey progress). If your targets fall within the survey footprint, then inevitably you will be going head to head with DES for telescope time. However, it is likely that images of your field have already been obtained or will be during 2014B (and hence will be public around the time you could obtain your own data). So before you propose for imaging, check whether your science program could be done using archival DES data, and only request time to do those parts that cannot (e.g., u-band imaging, deeper exposures). The TAC will expect a very careful justification of why additional data is needed for fields within the DES area.
- If your targets must be observed during the critical months of September through November, in second-half nights in August, or first-half nights in late December and January (i.e., the periods emphasized by DES), grit your teeth and be sure to explain very carefully why you need time during these periods. This will both help convince the TAC and may suggest alternate scheduling strategies.
- If your objects can be observed during first-half nights in August or second-half nights in late December or January, be happy. Competition for time in these periods is no worse than in the A semester and may even be better; bright time in particular has been undersubscribed in these periods in the last two semesters.
- The time allocated to DES is uniformly distributed in lunar phase except that the two or three brightest nights each month are being assigned to engineering. However, we have noted that, in general, our other users often request darker time than they need. As discussed in the "DECam – Status and Statistics" article in this *Newsletter*, imaging in the reddest (*izY*) passbands can be obtained with little loss of efficiency even in the brightest time. So consider asking for a slightly longer allocation of bright time; and if you must use dark time, be sure to explain why.
- DES also includes a supernova search that involves repeatedly observing 10 fields with a target cadence of once every four to five nights. This makes it hard to schedule contiguous blocks of time longer than three or four nights. If your run can be split into shorter blocks, whether only a few days apart or at entirely different times in the semester, be sure to note that in your proposal.

The Dark Energy Survey's First Season

Josh Frieman (Fermilab and the University of Chicago)

The international Dark Energy Survey (DES) collaboration (about 300 scientists from 25 institutions) carried out the first of five 105-night observing seasons from 31 August 2013 to 9 February 2014 using the 570-megapixel Dark Energy Camera (DECam) built by the collaboration for the CTIO Blanco telescope. DES is imaging 5000 sq. deg. of southern extragalactic sky to ~24th magnitude in the *grizY* bands and carrying out a time-domain *griz* survey (optimized to measure light curves for distant supernovae) over 30 sq. deg. The primary goal of the survey is to probe the origin of cosmic acceleration via galaxy clusters, weak gravitational lensing, the large-scale galaxy distribution, and Type Ia supernovae.

In its first season, DES imaged roughly 2000 sq. deg. of its wide-area footprint with up to 40% of the full-depth exposure time, which is 900 sec in *griz* and 450 sec in *Y*. The time-domain survey had a mean cadence of roughly six nights in each filter in each supernova field and will yield much deeper cumulative exposures over the lifetime of the survey. In the second season, which starts 15 August 2014, we plan to cover the complementary portion of the survey footprint and to continue the time-domain survey. Subsequent seasons will increase the depth of the wide-area survey, while continuing the time-domain survey.

During the observing season, an automated, optimized scheduler dynamically selected target fields and filters based on then-current observing conditions, moon phase, and previously observed fields. The data were sent via the NOAO Data Transport System to the National Center for Supercomputing Applications (NCSA) for rapid processing through the DES Data Management System, to check data quality and determine if wide-area fields needed to be re-observed based on survey requirements as well as to rapidly identify supernova candidates for spectroscopic follow-up. Over 16,000 survey-quality images were taken and rapidly processed. The median Point Spread Function full width half-maximum (FWHM) for the *riz* wide-area exposures was 0.94 arcsec.

The raw DES images will be available publicly from the NOAO Science Archive (*portal-nvo.noao.edu/*) 12 months after they are taken. NCSA and NOAO will simultaneously release reduced, calibrated images passing data quality criteria on a similar but longer time scale (see the "DES Year One Data Availability" article in this *Newsletter*). In addition, DES will make two public releases of calibrated, co-added images and catalogs: one based on the first two seasons of data, the other on the full data set.

Season 2 will include 101.5 equivalent nights in the 2014B observing semester and 3.5 nights in the early part of semester 2015A. Compared to the first season, the second season will include more half-nights early (August) and late (December–February) in the season and more full nights in the September–November time frame, enabling the survey to more optimally target the bulk of its footprint area (see Figure 1). The increase in half-nights naturally slots in community time during those periods of the year.

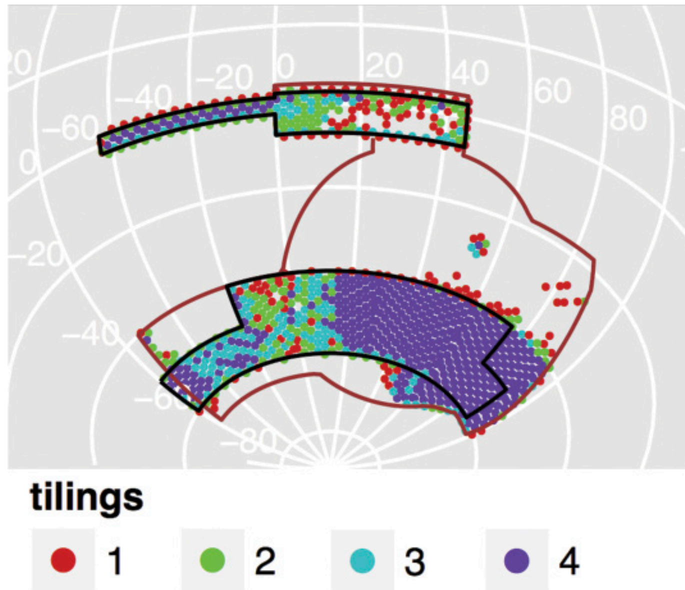


Figure 1: First-season *i*-band coverage of the DES wide-area footprint, in RA-DEC coordinates. The full survey footprint outline is in red; the first-season footprint outline is in black and comprised a southern area overlapping the SPT SZ survey and a narrower region along the South Celestial Equator that overlaps SDSS Stripe 82. Each tiling corresponds to a 90-sec exposure. During Year 2, the complementary part of the footprint will be covered.

The collaboration has been carrying out science analyses of roughly 150 sq. deg. of deep data taken during DES science verification from November 2012 to February 2013. Several papers have been submitted for publication, with another 10 or so papers in the pipeline. Early results were presented at a DES Special Session at the January 2014 American Astronomical Society meeting in Washington, D.C. Highlights include measurements of several galaxy cluster masses via weak lensing; discovery of high-redshift supernovae, a super-luminous supernova, and high-redshift clusters (see Figure 2); construction of a large-scale weak lensing mass map; detection of galaxy-galaxy lensing; measurement of galaxy angular clustering and the cross-correlation between DES galax-

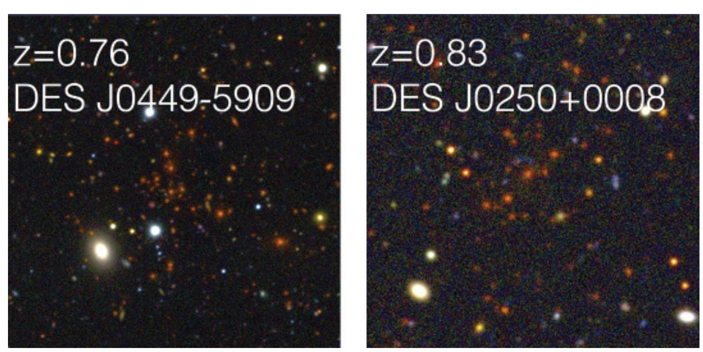


Figure 2: Two high-redshift galaxy clusters discovered in DES science verification data.

continued

The Dark Energy Survey's First Season continued

ies and lensing of the Cosmic Microwave Background; measurement of the Sunyaev-Zel'dovich (SZ) signal from stacked South Pole Telescope (SPT) data around DES-selected galaxy clusters; measurements of X-ray properties of DES-selected clusters; characterization of optical galaxy populations in SZ-selected clusters; construction of a joint optical near-infrared catalog with the Vista Hemisphere Survey; measurement of galaxy photometric redshifts that demonstrate the precision needed to carry out dark energy studies; detection of a number of strong lensing systems (see Figure 3); discovery of a redshift z = 6.1 quasar; and studies of the geometry and outer stellar populations of the Large Magellanic Cloud.

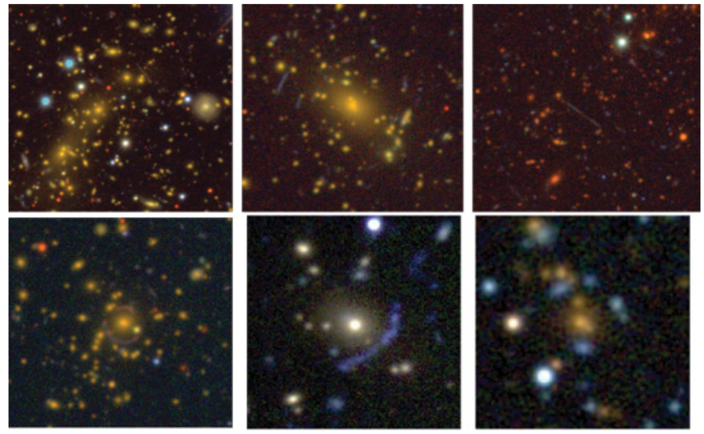


Figure 3: Strong gravitational lensing candidates from DES science verification data. A 266-hour Gemini Large and Long Program will follow up these and other candidates. NL

DECam – Status and Statistics

Alistair Walker

The data flows…

The Dark Energy Camera (DECam) has been installed at the Blanco telescope for 22 months as of 11 July 2014 and has been the only instrument scheduled with the exception of one night of Infrared Side Port Imager (ISPI) time. We have assembled a few interesting statistics in the following table:

Time that DECam has been on the Blanco telescope	600 nights
Number of exposures since installation	201,824
Largest number of exposures in one night	1170
Time after the end of night for all data to be in Tucson	A few minutes
Data delivered to the NOAO Science Archive (raw+reduced compressed)	520 TB
Uncompressed equivalent data	1.7 PB
Unscheduled DECam + Blanco down time in the last 12 months	4.4%
Dome closed due to weather in the last 12 months	10.6%
Number of CTIO scientists on the "DECam-help" support team	7
Number of nights support team has been on Tololo in the past 18 months helping observers and participating in engineering runs	~200 nights

Improvements are continuing

Improving the Blanco/DECam system and providing the best possible support for it are on-going efforts. Here are some highlights:

1. The DECam support pages have recently been updated with a copy of the "DECam Data Handbook" (led by Dara Norman) and there is now a "DECam User Guide" (led by Kathy Vivas). See *www.ctio.noao.edu/noao/content/dark-energy-camera-decam*. Please let us know what is missing! And don't forget, the support astronomer assigned to your observing run can be found at *www.ctio.noao.edu/noao/content/Support-2014B*.

2. While the failure down-time is not high (see table above), we are working to make the system even more reliable and to keep it that way. For instance, with online reports by major users stating poor long-term reliability of the model of disk drives we use in the SISPI computer system, and having had a disk failure on one of the RAIDS, we preemptively replaced all 70 disk drives with 3-TB Toshiba units. We are rebooting and file system checking (fscking) the 25 SISPI computers once a month, as well as running a test suite to check other hardware components. These procedures take several hours. One advantage of doing this regularly is a lower chance of having a multi-hour fsck initiate during observing. In addition, we developed a computer plan that specifies what is to be done if any particular computer fails, where the action can range from configuring another machine in the cluster to take over the tasks, to a complete replacement with a preconfigured spare.

continued

DECam – Status and Statistics continued

3. Two major Blanco telescope improvements are near completion. The first is the installment of an air-conditioning system in the dome that will operate in the daytime to keep the air temperature as close as possible to the expected ambient temperature of the following night. This will help to keep the telescope, and particularly the primary mirror, closer to the nighttime temperature for longer than is possible at present. A mirror hotter than the ambient temperature develops a thin, highly turbulent layer of air on its surface, causing poor image quality. The second improvement is to replace the pressure transducers in the primary mirror support system with units that have higher resolution. This will allow us to better keep the mirror at its correct figure as the telescope moves around the sky and give us the ability to tweak the mirror figure using the DECam active optics system. Whether this active control is needed once per season, once per night, or once per slew is something we will be testing in the months following installation.

How accurate is the Exposure Time Calculator?

The DECam Exposure Time Calculator (ETC) is a tool that we provide to help astronomers prepare observing proposals. It is available at *www.ctio.noao.edu/noao/content/Exposure-Time-Calculator-ETC-0*. As far as we can tell, the ETC performs accurately compared to actual photometry of stars with moderate to high signal-to-noise (S/N) ratio on DECam images. A reality check that compared it with ETCs for other telescopes and imagers showed consistency. However, it should be stressed that ETCs tend to be optimistic in the very low S/N regime, where less than perfectly modeled reduction corrections, non-included systematics and noise sources, and noise degradation due to the particular way the data is reduced (e.g., difference imaging images have increased sky noise when compared to a single image) all tend to make the real performance worse than the ETC would predict. There are a lot of subtleties: Are you trying to detect, or to measure a source? What are the priors (if any) on the objects in which you are interested? We will be sure to discuss this and other DECam data-related issues at the NOAO DECam Community Workshop in March 2015 (see elsewhere in this *Newsletter*).

Do you suffer from Selenophobia?

Observers using optical imagers have traditionally avoided the Moon, particularly when it gets near full, in contrast to our near-infrared (IR) colleagues who do not care about the Moon and sometimes even observe in daytime. But the boundaries between optical and near-IR are somewhat blurred with the high quantum efficiency and low-fringing CCDs being developed, such as the Lawrence Berkeley National Laboratory (LBNL) devices installed in DECam. In the redder passbands, DECam performs very well in bright skies. The instrument is well-baffled, with some recent improvements, and tests by Paul Martini (Ohio State University) during DECam science verification showed from tests with the Moon illuminations of 55%, 75%, and 90% that if the telescope is pointed at least ~40 degrees from the Full Moon, the sky brightness is stable near the nominal value. An important caveat is that with a 2-degree-diameter field of view, some background gradients are always to be expected.

The data acquisition software SISPI will refuse to open the shutter if the telescope is pointing within 10 degrees of the Moon, this is a safety feature as the CCDs can be damaged by excessive light.

The table below shows approximate sky background rates for a Moonless sky compared to the sky with Full Moon. It is clear that the performance in the reddest passbands is not strongly degraded by the bright Moon. DECam dark time is highly over-subscribed, and we notice that proposal writers often ask for darker time than they need. Asking for a slightly longer allocation of bright time is recommended as a strategy for increasing the chances of getting on the telescope. A caveat is that the numbers assume a clear Tololo sky, with usual (low) aerosol content. And, while thin cirrus in a dark sky may not be a great impediment, thin cirrus illuminated by a bright Moon usually is not a good thing. We will be repeating sky brightness measurements over the next few months and will provide a more comprehensive table than the one below on our DECam web pages prior to the 2015A Call for Proposals,

Filter	Counts/s, dark sky	Counts/s, Full Moon
u	0.2	25
g	1.5	10
VR	10	60
r	5	18
i	10	19
z	20	32
Y	12	16

NL

Data Available in the NOAO Science Archive

Rob Seaman

The NOAO Science Archive (NSA) began operations with observing semester 2004B and is thus exactly ten years old as semester 2014A comes to an end. Ten million images from NOAO's evolving instrumentation and pipelines have been saved during this decade, corresponding to more than 29,000 nightly observing sessions contributed by community, staff, and observatory-partner observers on eleven telescopes.

The majority of these images are now public data, having passed their proprietary period of the typical 18 months. This includes reduced data products from the NOAO High Performance Pipeline System (NHPPS) for the wide-field optical and infrared imagers at the Mayall and Blanco telescopes. When numbers get so large, it becomes easier to count instruments instead of images and semesters instead of nights. For the

continued

Data Available in the NOAO Science Archive continued

three optical 8K × 8K Mosaic cameras, 32 telescope-semesters of data are now publicly available via the NSA portal (*portal-nvo.noao.edu*). For the NEWFIRM wide-field infrared imager, the first 10 semesters from its time shared between Kitt Peak and Cerro Tololo are public.

These workhorse instruments now have been joined by the remarkable Dark Energy Camera (DECam) on the Blanco telescope. (See the "DECam – Status and Statistics" article by Alistair Walker in this *Newsletter*.) The DECam science verification data from 2013A were taken with a zero proprietary period and have always been publicly available. These data will be joined by more and more post-proprietary data sets now that DECam has been on the telescope longer than 18 months. All DECam data are processed through either the Dark Energy Survey (DES) pipeline or the community pipeline (CP), and the resulting reduced science data products will become publicly available at the same time as the raw data. Principal investigators and their teams benefit from the pipeline data immediately after their observing runs.

A typical DECam observing year generates more than 100 TB (compressed) of raw and pipeline-reduced data products representing hundreds of exposures on each of hundreds of nights. The scientific value of those data products cannot be reduced to mere numbers, no matter how large; however, those many exposures include targeted surveys over the entire Southern Hemisphere sky. NOAO anticipates that the DECam data set, like Mosaic and NEWFIRM before it, will enrich a wide range of science projects and multiply the community value of these data and observing facilities. NL

DES Year One Data Availability

Alistair Walker & Elizabeth Stobie

Data taken for the Dark Energy Survey (DES) proposal 2012B-0001 (PI: J. Frieman) carries a proprietary time of 12 months. On 31 August 2014, DES Year One (31 August 2013–9 February 2014) data becomes publicly available. Raw images will be made available on a rolling basis 12 months after they are taken. In addition, single-epoch images reduced and calibrated by the DES Data Management (DESDM) system will be made publicly available.

Due to the nature of the DES calibration process, it is expected that the reduced images will be released in batches some months after the corresponding raw images are released. When available, the reduced images will be those that are fully verified and accepted for use in the DES. Images that are rejected for use in the DES will only be available in raw format, although we are evaluating the possibility of reducing the rejected DES images with the DES community pipeline (CP).

Although both pipelines share a common base (the CP was derived primarily from the DESDM pipeline), the processing differs in some details. Please check the CTIO Dark Energy Camera (DECam) or NOAO Science Archive websites for status.

Two NOAO Workshops in 2015

NOAO announces two back-to-back workshops on big data and surveys that will be held in Tucson, in March 2015, at the Tucson Marriott University Park Hotel. Consider attending both!

NOAO Big Data Workshop, 9–10 March 2015
The goal of the "Big Data" meeting is to inform the NOAO staff and its user community about the tools, software, and methodologies now available for tackling the visualization and analysis of astronomical "big data." The focus is to be on practical solutions and real-world applications that can be used with current research problems. The talks will cover three topics: (1) Algorithms—the basic logic, methodologies, and ideas on how to best assess and extract relevant information from big-data; (2) Software—surveys on what packages, tools, etc. are available and in use now to address big data problems; and (3) Managing big data—strategies for setting up databases and accessing or developing large data sets. The format of the meeting will be that of a small workshop with informal breakout sessions to foster loosely structured discussions and interactions.

DECam Community Science Workshop 2015, 11–13 March 2015 (2.5 days)
This workshop will bring together those with experience in obtaining, reducing, and analyzing DECam data—both from the Dark Energy Survey (DES) and the community—with those who would like to use DECam to take their own data or do science with publicly available DES and community images from the NOAO Science Archive. The meeting will provide an opportunity to showcase early DECam science and serve as a forum to discuss the steps NOAO could take to better support community science programs: what are the successes and what are the problems, what could be improved at the telescope and in the community pipeline, what new observing modes should be considered, etc.

For full details, and to register an early interest in participating in either or both, please go to *www.noao.edu/meetings/save-the-date/*.

Summer Research on Light Pollution Measurement Calibration

Constance Walker

For the past nine years, NOAO has hosted a citizen-science campaign on light pollution called Globe at Night. This campaign has been instrumental in educating local and global communities on the impacts of light pollution and the conservation of dark skies. Since the summer of 2010, undergraduate research students have been contributing to our understanding of the characteristics of how light pollution changes locally over time and whether it affects native wildlife. This summer, students from two programs added to the research: Amy Juan and John Kanemoto (see Figure 1). Amy is a Research Experiences for Undergraduates (REU) student at the University of Arizona's Integrated Optics for Undergraduate Native Americans program. She is from the Tohono O'odham Nation. John is part of the STEM Teacher and Researcher (STAR) program, a nine-week summer research internship for aspiring K-12 science and mathematics teachers headquartered at the California Polytechnic State University. John is one of two STAR teachers who worked with NOAO this summer.

The two worked together this summer to find out how well we can measure levels of light pollution using different types of instruments. To take data, they used several tools: a digital single-lens reflex (DSLR) camera, a handheld Sky Quality Meter (SQM model L), the "Loss of the Night"

Figure 1: Amy Juan and John Kanemoto with the DSLR camera, the SQM (model L, in John's hand) and the SQM Data Logger (to the right of John on the ground).

continued

Summer Research on Light Pollution Measurement Calibration continued

application for Android phones, the "Dark Sky Meter" application for iPhones, and the Globe at Night web application that records the Naked Eye Limiting Magnitude (NELM).

Sixteen locations were identified throughout the city of Tucson and surrounding areas at which measurements would be taken. The locations had a complete range of sky brightness conditions and included parks, highly populated areas, and observatory mountaintops.

The process to acquire data using the DSLR camera consisted of taking 14 360-degree panoramic photographs using specified exposure times. Photographs also were taken with a fisheye lens at the zenith along with a series of "dark frames" used to optimize noise reduction in the data.

In addition to the photographs, Amy and John used two Unihedron Sky Quality Meters (model L) to measure the brightness per area in magnitudes per square arcsecond. Visual estimates of limiting magnitudes were made using the Globe at Night technique described at *www.globeatnight.org*. These different brightness scales are illustrated in the Night Sky Brightness Nomogram designed by Dr. Henk Spoelstra of the NachtMeetnet Team in the Netherlands (see Figure 2).

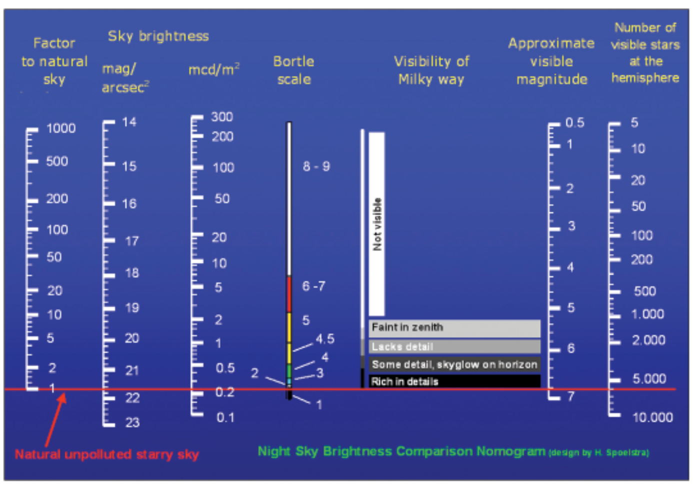


Figure 2: A comparison of different scales that measure night sky brightness (designed by Henk Spoelstra).

The "Loss of the Night" phone application consists of locating seven stars that range in magnitude. With the star chart provided by the app, the user follows directions to each star, answering each time whether or not the star is visible. By answering whether or not each of the seven stars can be seen, the app is determining the faintest star visible. This translates into a limiting magnitude, which is a measure of the current night sky brightness.

The "Dark Sky Meter" iPhone application is the easiest to operate. One simply takes a "dark" photograph first, then takes a photograph of the night sky choosing one of four options for the sky that range from clear to very cloudy, and then submits the data. When the process is completed, the "Dark Sky Meter" gives the current magnitude per square arcsecond, as well as the NELM.

The raw images from the DSLR camera are run through a special program to produce values in units of magnitudes per square arcsecond at zenith. These values are used to compare to all of the other different types of measurements to see how well they correlate.

The different types of measurements described above have never been compared all-together before. The results will be applicable to a wide variety of circumstances and will allow people who may own any one of these instruments to more easily take measurements that can be intercompared with other measurements of different types.

This summer Amy and John are comparing all of their measurements with a year's worth of data from six SQM data logging stations around Tucson and at local observatories and with data from a sophisticated Night Sky Brightness Monitor at one of the local observatories. The intent is to use the inter-comparison of methods for future research and development in cities like Tucson and in neighboring areas like the Tohono O'odham Nation.

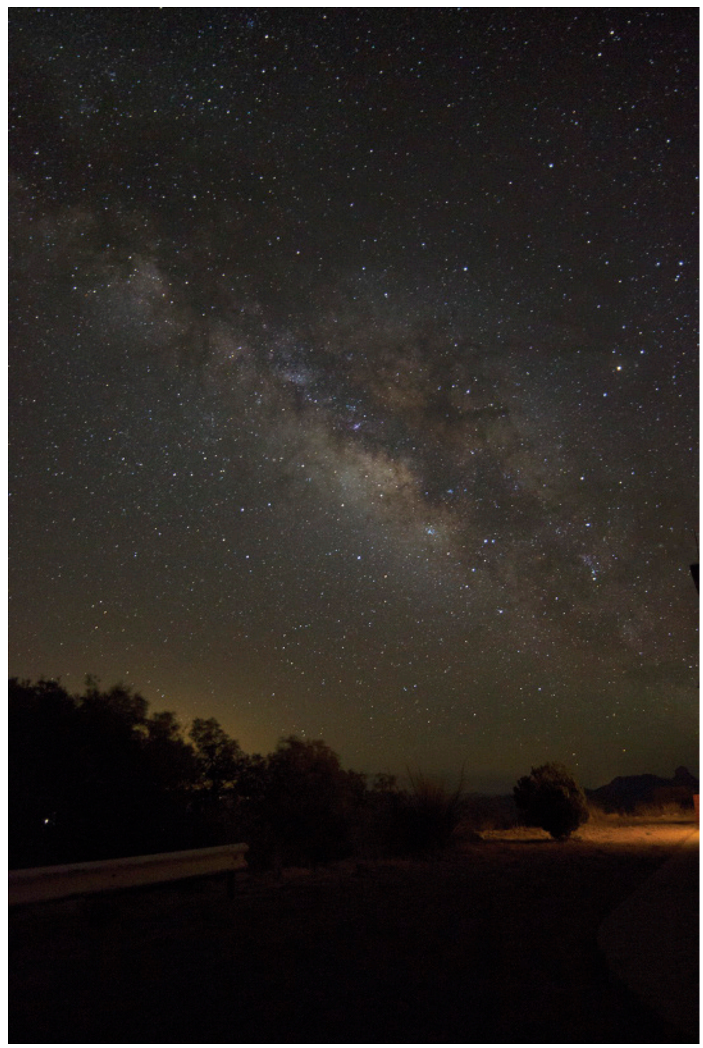


Figure 3: The Milky Way as seen from Kitt Peak.

Students Wanted for 2015 CTIO REU Program

Catherine Kaleida

The Cerro Tololo Inter-American Observatory (CTIO) offers six undergraduate research assistantships in La Serena, Chile, during the Chilean summer (winter semester in Northern Hemisphere) through the NSF-funded Research Experiences for Undergraduates (REU) program. The CTIO REU program provides an exceptional opportunity for undergraduates considering a career in science to engage in substantive research activities with scientists working at the forefront of contemporary astrophysics. Student participants will work in close collaboration with members of the CTIO scientific and technical staff on specific research projects with topics such as galaxy clusters, supernovae, planetary nebulae, stellar populations, star clusters, star formation, variable stars, and interstellar medium. The CTIO REU program emphasizes observational techniques and provides opportunities for direct observational experience using CTIO's state-of-the-art telescopes and instrumentation. Participants must be enrolled as full-time undergraduate students during the REU program and must be citizens or permanent residents of the United States.

The program will run for 10 weeks, from approximately 9 January to 21 March 2015. A two-night observing run on Cerro Tololo and a field trip to another observatory in Chile are included in the program. Students are provided with a modest stipend and subsidized housing on the CTIO compound in La Serena. In addition, the students usually attend the American Astronomical Society (AAS) winter meeting to present their research the year following their REU program, which will be the 2016 AAS meeting in Kissimmee, Florida, for this group.

Complete applications, including applicant information, official transcripts, and two or three letters of recommendation should be submitted no later than 1 October 2014. More information and the program application can be found at: *www.ctio.noao.edu/noao/REU*. Women and candidates from underrepresented minorities in the sciences are particularly encouraged to apply.

NOAO Hosts "Colors of Nature" Summer Academy

Robert Sparks & Stephen Pompea

The NOAO's Education and Public Outreach (EPO) group led the Colors of Nature Summer Academy at the University of Arizona Art Building from 8–19 June 2014. Twenty-eight middle-school girls from Tucson and the Tohono O'odham Nation attended the two-week program.

The Colors of Nature is a four-year program funded by the National Science Foundation and is a partnership of the University of Alaska Fairbanks, the University of Washington-Bothell, and NOAO (see *www.colorsofnature.org/*). One goal of the program is to research how science identities are formed in middle-school girls. Dr. Carrie Tzou from the University of Washington-Bothell is the lead education researcher. She conducted interviews with the girls before and after the academy as well as gathered data on how the participants interacted with and responded to the activities. NOAO support of the program was provided by staff members Rob Sparks, Katie Kaleida, Kathie Coil, and Stephen Pompea, and by undergraduate EPO students Will Roddy, Daniel Tellez, Zach Watson, and Calvin Ortega.

Figure 1: The Colors of Nature Summer Academy students show their pride in Tucson through light painting.

The two-week summer academies are held in both Tucson and at the University of Alaska's Museum of the North. Middle-school girls are se-

continued

NOAO Hosts "Colors of Nature" Summer Academy *continued*

lected for the academy through a competitive application process, with twice as many girls applying for the Tucson academy as there were spots available this year. All of the girls selected for the academy have shown a strong interest in art.

During the two-week summer academy in Tucson, the girls participated in a wide variety of projects to build their skills in both art and science. The girls learned the roles color plays in biology and studied pigments as well as colors produced by microstructures that create interference-based colors. The biological functions of color were explored during a field trip to the Arizona-Sonora Desert Museum. The girls learned about pigments and dyed their own scarves with vegetable-based dyes. They also explored both subtractive and additive color mixing using pigments and colored lights. Measurements of pigmented colors were done using a spectrometer. One of the popular activities was looking at colored objects under a monochromatic, low-pressure sodium light and trying to figure out how they would look under a white light. Another popular activity looked at ultraviolet reflectance of animals and fluorescence effects. The girls applied the knowledge they gained through a number of design challenges throughout the camp.

Figure 2: Students experiment with colored shadows in one of their design challenges.

The students also applied the knowledge they gained throughout the summer academy in their final projects at the end of the program. The students combined their knowledge of color and nature by creating a costume based on a fictional plant or animal that used colors to survive in its environment. Each participant created a poster to describe the functions of the colors used in the costume. The posters contained photomicrographs of the fabrics and materials used in the costumes as well as reflectance spectra of some of the materials, including fluorescent materials. These costumes and posters were displayed at a poster session held at the University of Arizona's College of Optical Sciences the afternoon of June 19.

Although the Colors of Nature program allows participants to attend only one summer academy, we will provide other opportunities for the participants throughout the year. NOAO will host several science cafes featuring local speakers at sites around Tucson and on the Tohono O'odham Nation for the girls and their families. The students and their families will be invited to attend a star party on Kitt Peak this fall.

The Colors of Nature program is currently in the second year of the four-year program. The Summer Academy in Fairbanks was held 7–18 July 2014. Applications for the 2015 Colors of Nature summer academies in Tucson and Fairbanks will open in the spring of 2015.

Figure 3: The students and staff from the 2014 Colors of Nature Summer Academy in Tucson.

Dr. Jay Elias to become SOAR Director

David Silva & Bob Blum

Dr. Jonathan (Jay) Elias has been selected to be the next SOAR Director starting 1 August 2014. Jay is no stranger to living and working in Chile. After graduating from Caltech, Jay took a postdoc position at Cerro Tololo Inter-American Observatory (CTIO) where he studied young stellar objects (among other sources) with emerging new infrared technologies. After a brief return north, Jay became an NOAO staff astronomer at CTIO in the late 1980s. He was an early leader in near infrared instruments and observing at Tololo and worked with other staff members there to develop many of the near infrared facility instruments deployed there in the 1980s and 1990s. By the mid 1990s, Jay had moved back to the US to lead the Gemini Near Infrared Spectrograph (GNIRS) project at NOAO. GNIRS was one of the first generation Gemini instruments, and it saw first light in 2004 at Cerro Pachón in Chile. GNIRS was later moved to Gemini North in Hawaii where it remains a highly productive facility instrument.

Following GNIRS, Jay became the head of the NOAO Giant Segmented Mirror Telescope Project Office (GSMTPO). The GSMTPO worked directly with the Thirty Meter Telescope (TMT) until the NSF required NOAO to disengage from the project. Jay oversaw technical development work on a host of systems and design studies in which NOAO was involved, including the site survey activity in northern Chile run through CTIO. The GSMTPO continued to work on various aspects of GSMT development both with TMT and the Giant Magellan Telescope (GMT) under Jay's leadership until 2010, when most of this development effort at NOAO was complete.

More recently, Jay stepped in to manage the NOAO North Engineering and Technical Services (NN-ETS) group in Tucson. NN-ETS has the responsibility to provide technical service to Kitt Peak National Observatory. In parallel, Jay was the NOAO project manager and systems engineering lead for the ReSTAR (*https://www.noao.edu/system/restar/*) instruments KOSMOS and COSMOS. These two nearly identical, optical multi-object spectrographs were built for the Mayall and Blanco 4-m telescopes, respectively, in collaboration with The Ohio State University astronomy department (P. Martini, PI). Both KOSMOS and COSMOS have been commissioned on time and on budget.

Jay is an extremely talented and hardworking astronomer with 30+ years of dedicated service to NOAO and its community. He will be missed at NOAO, but we are delighted he is staying close to home and moving to SOAR. We have no doubt SOAR will benefit greatly from his experience, intelligence, and careful management style. Good luck Jay!

NOAO Staff Changes at NOAO North and South

(16 February 2014–15 August 2014)

New Hires

Auza, Nicole	Librarian (part-time)	South
Brunker, Samantha	Summer Research Assistant (KPNO REU)	North
Burke, Jamison	Summer Research Assistant (KPNO REU)	North
Cheeseboro, Belinda	Summer Research Assistant (KPNO REU)	North
David, Nicole	Optical Engineer	South
Fuentes, Cesar	Research Associate (Postdoc)	South
Lackey, Kyle	Summer Research Assistant (KPNO REU)	North
Lavoie, Tammie	Risk Manager	North
Lee, Marcus	Summer Research Assistant (KPNO REU)	North
Martinez, Manuel (Tony)	Cook II, Kitt Peak	North
Payne, Anna	Summer Research Assistant (KPNO REU)	North
Pothier, Steve	Software Systems Engineer (Temporary)	North

continued

NOAO Staff Changes continued

Schmidt, Ricardo	Senior Engineer (Temporary)	South
Promotions		
Allen, Lori	To Scientist (full)	North
Cantarutti, Rolando	To Senior Engineer Manager	South
Elias, Jonathan (Jay)	To SOAR Director	North
Hernandez, Rodrigo	To Assistant Observer 1	South
Munizaga, Jaime	To Commissaryman 5	South
Pompea , Stephen	To Observatory Scientist	North
New Positions		
Hernandez, Rodrigo	Floater Assistant Observer	South
Transfers		
Barr, Jeff	From NS Facilities Ops. to LSST	South
Economou, Efrossini (Frossie)	From Science Data Management to LSST	North
Serrano, Juan Eduardo	From SOAR TelOps to LSST	South
Retirements/Departures		
Agresti, Michele	Office Assistant	North
Beers, Timothy	Astronomer/Tenure	North
Burke, Jamison	Summer Research Assistant (KPNO REU)	North
Burkhart, Sarah	Summer Research Assistant (CTIO REU)	South
Cifuentes, Guido	Electrical Technician	South
Dottori, Horacio	Interim SOAR Director	South
Dugan, Chuck	PAEO Program Specialist II	North
Duprey, Allan	Tour Guide	North
Farmer, John M.	Summer Research Assistant (CTIO REU)	South
Frechem, Joshua	Summer Research Assistant (CTIO REU)	South
Furlan, Elise	Research Associate (Postdoc)	South
Lackey, Kyle	Summer Research Assistant (KPNO REU)	North
Loeffler, Shane	Summer Research Assistant (CTIO REU)	South
Paez, Veronica	Summer Research Assistant (CTIO REU)	South
Pantoja, Blake	Summer Research Assistant (CTIO REU)	South
Pforr, Janine	Research Associate (Postdoc)	North
Ponce, Sergio	Driver	South
Deaths		
Strom, Karen	Former KPNO Research Associate	North
2014 AURA Outstanding Achievement Awards		
Science	Saha, Abhijit	North
Technology/Innovation	Tokovinin, Andrei	South
Service	Fraps, Barbara	North

continued

NOAO Staff Changes continued

2014 NOAO Excellence Awards

Service	Bonati, Marco	South
Service	Hansey, Brent	North
Service	Marenfeld, Pete	North
Service	Montes, Jose	North
Service	Poczulp, Gary	North
Service	Price, Jane	North
Service	Ramos Quinzacara, Pedro	South
Team	*NOAO South Computer Infrastructure Services Group:* Ron Lambert, James Hughes, Petri Garagorri, David Walker, Rodolfo Cardemil, Carlos Segovia, Samuel Flores, Mauricio Rojas	South
Team	Katy Garmany, Colette Salyk, Rich Fedele, Rob Sparks	North

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