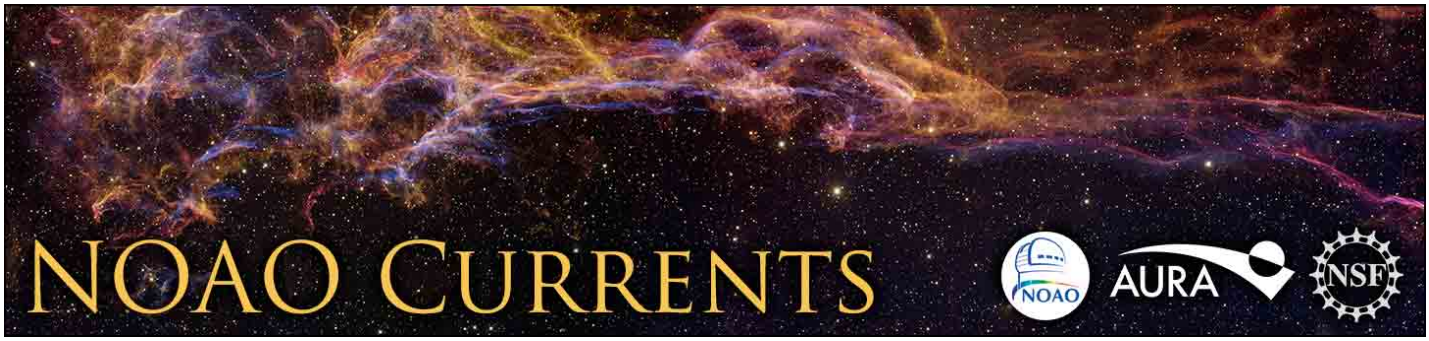

December 2010 • Issue 15

Currents

The annual NOAO Town Hall will be held on Wednesday, 12 January 2011, from 12:45 to 1:45 at the Seattle AAS meeting. We invite everyone to attend. Topics for discussion include those described in this issue of *Currents*.

In this Issue

In this Issue…

ReSTAR Phase 1 Update (Mosaic Upgraded and New Spectrographs to Arrive): The Kitt Peak Mosaic 1 imager has been upgraded to deliver substantially faster readout times and improved reliability. The optical spectrograph KOSMOS is expected at the Mayall 4-m telescope in August 2011. New optical and infrared spectrographs, currently being developed for the Blanco 4-m telescope, are scheduled to arrive in 2012 and 2014.

ReSTAR Phase 2 Update (Open Solicitation Process and Developments): NOAO has released an open solicitation for partners to collaborate on the second phase of ReSTAR activities that will strengthen the smaller aperture component of the US System. **Proposals are due Feburary 1, 2011.**

Blanco LSP Update (Delivery of DECam on the Horizon): The Dark Energy Camera (DECam) is a new 520-megapixel CCD imager being built for the Blanco 4-m telescope by the Dark Energy Survey Collaboration. With DECam potentially available for open-access use in 2012, we encourage the NOAO community to contemplate how they can use DECam to advance their own science goals. Upcoming opportunities to learn more about DECam include special sessions at the January AAS meeting.

Mayall LSP Update (BigBOSS Proposal Received and Reviewed): In response to the Large Science Program opportunity announced previously for the Mayall 4-m telescope, the BigBOSS collaboration has proposed to equip the Mayall with a highly multiplexed, wide-field multi-object spectrograph and to undertake a large spectroscopic survey that aims to measure the expansion history of the universe and to constrain cosmological parameters. The proposed facility instrument would be available to the community through the NOAO open access process. The proposal has been reviewed and recommendations are expected shortly.

NOAO Science Workshop (Presentations from "Massive Galaxies Over Cosmic Time 3" Now Available Online): With the advent of new data from Spitzer, Herschel and WISE, the imminent arrival of new ground-based capabilities for probing gas and dust in high-redshift galaxies, and recent improvements in theoretical simulations, it seemed timely to revisit our understanding of star formation in galaxies at their epoch of peak activity. More than 60 members of the international

community gathered in Tucson to wrestle with this topic. Their presentations are now available online.

Your input is welcome on any of these issues. Please send your thoughts to currents@noao.edu.

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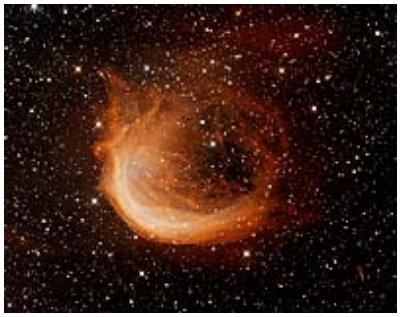
Mosaic Upgraded and New Spectrographs to Arrive

In 2009, the NSF awarded NOAO $3M to address the high priority initiatives recommended by the Renewing Small Telescopes for Astronomical Research (ReSTAR) committee, as described in the August 2009 issue of *Currents*. These initiatives are aimed at modernizing the capabilities on telescopes smaller than 6.5-m in aperture in the US System and increased access to these facilities.



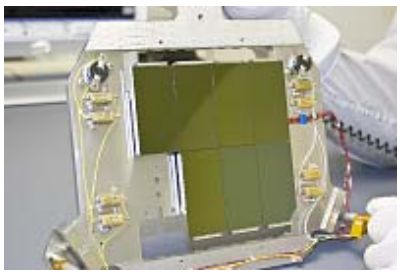
The planetary nebula Sh2-188 imaged in H alpha (red) and [OIII] (cyan) with the upgraded Mosaic 1 imager. View in Image Gallery.

Image Credit: T.A. Rector/University of Alaska Anchorage, H. Schweiker /WIYN and NOAO/AURA/NSF

In addition to providing access to the Palomar 200-inch telescope and its spectroscopic capabilities, the NSF funds were directed toward building a copy of the OSMOS spectrograph for the Mayall 4-m telescope on Kitt Peak, and upgrades to the optical detector and controller systems at CTIO and KPNO. Here, we report on the progress of these Phase 1 ReSTAR programs and announce the continuation of new programs in Phase 1 supported by additional supplemental funding from NSF in FY10.

Upgrade to Kitt Peak Mosaic 1.1

The Kitt Peak Mosaic 1 imager has been upgraded to provide users with substantially faster readout times and improved reliability. Science users at the Mayall 4-m telescope have been observing with the Mosaic 1.1 system since first light, which was achieved on the night of October 22-23. The system is performing as expected; readout times in particular have dropped from 150 seconds to 18 seconds. Further information is available at the Mosaic website.



Mosaic 1 upgrade. This figure shows the upgraded focal plane with 7 of the 8 e2v CCDs installed.

These gains result from the installation of eight new e2v CCDs and NOAO Monsoon controllers. The upgrade took about one year to go from design to operation under the guidance of project manager and engineer, David Sawyer. Sawyer's NOAO team handled design, fabrication, and integration. Kitt Peak staff provided additional support, including the re-integration of the instrument on the Mayall.

The KOSMOS Spectrograph

The optical spectrograph KOSMOS ("KPNO OSMOS") is a copy of the Ohio State OSMOS design, modified slightly for use on the Mayall 4-m. Designed to have an approximately 12 arcminute (diameter) field of view, KOSMOS will provide broad-band spectral coverage at spectral resolutions up to about 2000. Limited wavelength ranges can be served at resolutions up to about 5000. Two CCD packages in separate dewars will maximize the sensitivity in blue and red spectral regimes. The red channel device will offer nod-and-shuffle capability.

KOSMOS passed its critical design review in August, and is now proceeding to fabrication. The current schedule has KOSMOS being delivered to Kitt Peak in August 2011.

KOSMOS parts being machined in the Tucson shop.

Palomar Access to Optical and Infrared Spectroscopy

ReSTAR Phase 1 funding also provides community access to the Palomar 200-inch telescope, thereby offering the community more options for near-infrared and optical spectroscopy. Since the 2010A semester, NOAO has allocated approximately 20 nights on the 200-inch, with 10 additional nights to be allocated in 2011A. The initial agreement with Palomar will run for three years. Further information is available at the NOAO website

New Funding for Phase 1

The NSF provided an additional $3.9M in FY10 to further enable the highest priority projects proposed under the initial ReSTAR proposal. These new programs, which will begin in earnest in 2011, are a second copy of the OSMOS optical spectrograph for CTIO (called COSMOS) and a copy of the near-infrared spectrograph TripleSpec, also for the Blanco at CTIO. Carried out in collaboration with The Ohio State University, COSMOS is scheduled to be delivered in 2012. Building the second copy of OSMOS in parallel with the first results in significant cost savings (about $500K).

A sky spectrum from the TripleSpec instrument at the Hale 200 inch showing the simultaneous five-order wavelength coverage. The bluest wavelengths are at the lower right and the reddest at the upper left.

TripleSpec is a moderate resolution 1-2.5 micron spectrometer that provides complete coverage of the near-infrared bands in one exposure. The fixed slit is approximately 30" in length and the system includes a slit-viewing camera. Developed in collaboration with Cornell University, TripleSpec will be delivered in early 2014.

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ReSTAR Phase 2 Open Solicitation Process and Developments

In the previous issue of *Currents*, we discussed the planning process for the second three-year implementation phase of ReSTAR (Renewing Small Telescopes for Astronomical Research). As part of the planning process, NOAO has issued an open solicitation for partners to collaborate on activities that will strengthen the smaller aperture component of the US System. Such activities may include developing new instrumental capabilities, providing new open-access opportunities on observing facilities, renewing facility infrastructure, among other possibilities.

An open meeting was held on November 15 to discuss how interested groups and organizations could participate in this program. Approximately 40 people, representing 15 different facilities and organizations, attended the meeting. The attendees gave presentations about telescopes, instruments, and ideas for science themes around which a compelling case could be made for specific projects. The meeting culminated in a plenary discussion that explored ideas for collaboration. Among the items discussed were optical interferometry, adaptive optics systems for mid-size telescopes, and follow-up capabilities for time domain discoveries.

The final version of the open solicitation document is now available on the ReSTAR webpage. **Proposals are due February 1, 2011.** Submitted proposals will be evaluated by a panel drawn from the community and NOAO staff, including representation from the ReSTAR committee. NOAO will collaborate with the successful proposers on a funding proposal to the NSF for ReSTAR activities to be carried out during the period 2012-2014.

Attendance at the meeting is not a prerequisite for proposing, and we welcome proposals from all interested parties. Please address questions about the proposal process to restar@noao.edu. Todd Boroson will respond to inquiries received.

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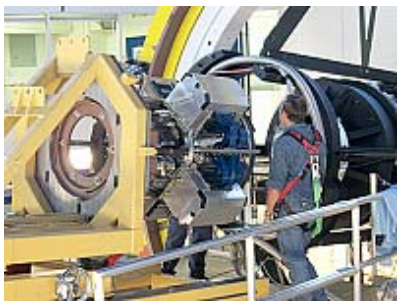
Delivery of DECam on the Horizon

The Dark Energy Camera (DECam) is a new 520 megapixel CCD imager being built for the CTIO Blanco 4-m by the Dark Energy Survey (DES) Collaboration. The Collaboration consists of more than 120 scientists from 12 US institutions plus international consortia located in Brazil, Spain, Germany, and the UK. DECam will be available for use by the astronomical community as a facility instrument. It will also be used to carry out the DES, requiring 30% of the observing time on the Blanco for five years for this purpose. DECam and DES are described in detail at http://www.darkenergysurvey.org.



The DECam Imager being installed on the telescope simulator at Fermilab. Full system tests on the simulator will include everything except the optical corrector.

The delivery of DECam is now only months away, with installation and commissioning expected to occur in 2011B. Some components, such as the F/8 mirror handling system, have already arrived on Cerro Tololo, and work continues apace at Cerro Tololo (telescope and facility preparation), Fermilab (DECam testing), University College London (optical corrector integration), and at the National Center for Supercomputing Applications (pipelines). Of particular note is the successful production by LBNL (Lawrence Berkeley National Lab) of the 62 2Kx4K red-sensitive CCDs needed for the focal plane.

DECam is now in an intensive integration and test phase on the Blanco telescope simulator at Fermilab, as the procurement and construction phases come to completion. The new prime focus cage, hexapod mounting system, filter changer, shutter, together with DECam and its full electronics and cryogenic system will be intensively tested for a three month period ending in February 2011. The instrument software, which is being developed at U. Illinois, Ohio State University, and the Stanford Linear Accelerator Center, will be thoroughly exercised as part of the simulator tests.

The expected science return from DECam, both for the DES Collaboration and for the community, is high. With DECam potentially available for DES and community use in 2012, we encourage interested members of the community to contemplate how DECam observations may be used to advance their own science goals.

Upcoming opportunities to learn more about DECam include special sessions at the January AAS meeting on "The Dark Energy Survey" and "Community Use of the Dark Energy Camera on the CTIO Blanco 4-m Telescope". Questions about these sessions, and about DECam and DES in general, may be directed to Alistair Walker (awalker@noao.edu). In future issues of *Currents*, we will advertise additional opportunities to learn about DECam and DES.

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BigBOSS Proposal Received and Reviewed

A year ago, NOAO announced an opportunity for groups in the community to partner with NOAO and the National Science Foundation in developing a major new capability for the Mayall 4-m telescope that the proposing team would use in carrying out a large science program of very high scientific impact. As described in the November 2009 issue of *Currents*, the dual goals of the large science program are to enable frontier science and to improve the US system of ground-based O/IR facilities. NOAO received one official letter of intent to propose, and NOAO responded to the letter with a request for a full proposal.

The full proposal ("A Proposal to NOAO for the BigBOSS Experiment at Kitt Peak National Observatory" by Schlegel et al.) was submitted on 1 October 2010 by a large international team that is led by the Lawrence Berkeley National Laboratory and includes 16 US institutions (universities and national laboratories) as well as international partners.

The team proposes to equip the Mayall with a 5000-fiber, 7 sq. degree field-of-view multi-object spectrograph and to undertake a spectroscopic survey of 20 million galaxies over 14,000 sq. degrees with the goal of measuring the expansion history of the universe and constraining several cosmological parameters. As with the Dark Energy Camera that will be delivered to the Blanco, the proposed instrument would be a facility instrument. The instrument would be available for use by the NOAO community through the NOAO open-access process, both while the proposed large science program is being carried out and for a significant amount of time (years) after the proposed large science program is completed. The community would also have access to the archive of data produced by the large science program.

In November, the proposal was reviewed by a 13-member non-advocate panel. A report will be submitted to the NOAO Director shortly. Comments on the proposal were also solicited from members of the NOAO Users Committee and the Observatory Council. Further details on the status of the proposal will be discussed at the NOAO Town Hall at the January AAS meeting.

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Presentations from "Massive Galaxies Over Cosmic Time 3" Now Available Online

In November, NOAO hosted the scientific workshop "Massive Galaxies Over Cosmic Time 3: the Role of Gas and Dust". Generous financial support for the workshop was provided by AURA, the Herschel Science Center, the Spitzer Science Center, Steward Observatory, and NOAO.

A Few Workshop Participants

Greg Rudnick, Phil Hopkins, Jason Melbourne, and Jeremiah Ostriker.

The workshop focused on the nature of star formation in massive galaxies at the epoch of peak activity. While it is well established that the old stellar populations in present-day massive galaxies were formed at high redshift, the conditions under which these stars formed are less clear. Observations with the *Spitzer Space Telescope* have revealed that much of the star-formation at high redshift takes place in dusty galaxies with very high infrared luminosities. In addition, there is a growing awareness that

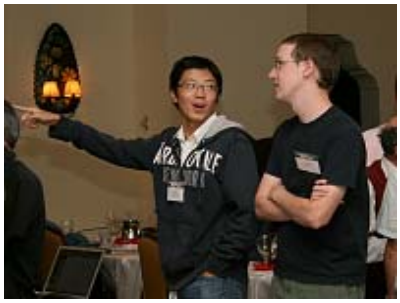
many factors may regulate the progress of star formation in galaxies (e.g., gas accretion, feedback from the growth of black holes and/or star formation).

The availability of new data from IR space telescopes (*Spitzer*, *Herschel* and *WISE*), the imminent availability of new ground-based capabilities for probing gas and dust in high-redshift galaxies, and the recent improvements in theoretical simulations made it timely to revisit our theoretical and observational understanding of star-formation in galaxies at their epoch of peak activity.

Approximately 60 participants gathered in Tucson to discuss questions such as the following. What do the state-of-the-art observations tell us about the formation, assembly, and activity in galaxies at this peak epoch, in particular about the fueling of star- and AGN-formation in galaxies? What do theoretical models predict for the physical state of gas and dust in high-redshift galaxies and what types of observations can best discriminate between competing paradigms for galaxy formation and assembly? What can be learned about the physical conditions in these distant luminous galaxies from studies of more local galaxies? The presentations and abstracts from the meeting are now available online at http://www.noao.edu/meetings/mgct3/.

Matt Malkan, Moshe Elitzur, Frederic Bournaud, Avishai Dekel, and Sandra Faber.

Mariska Kriek, Min Yun, Carrie Bridge, Shane Bussmann, and Moire Prescott.



LOC members Fuyan Bian and Kyle Penner.

Image Credit for above images: E. Acosta & NOAO/AURA/NSF

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Contact Us

Did something interesting, inspiring, or surprising happen on a recent observing run? Please tell us about it! Is there a topic that you would like to see covered in a future *Currents*? If you are planning a regional astronomy meeting or department internal symposium, would you like someone from NOAO to give a presentation on our new program? Please contact us at currents@noao.edu. We look forward to hearing from you!

Currents is a sparkplug for communication between NOAO and our community. It provides updates—and solicits community input—on NOAO observing opportunities and NOAO programs and policies on a more rapid timescale than is possible with the *NOAO Newsletter*.

NOAO is the national center for ground-based nighttime astronomy in the United States and is operated by the Association of Universities for Research in Astronomy (AURA), Inc. under cooperative agreement with the National Science Foundation.