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Currents

In this Issue...

Legacy Surveys Issues 4th Data Release: The Legacy Surveys project is imaging nearly a third of the sky in three color filters in preparation for the Dark Energy Spectroscopic Instrument survey. While previous releases have featured the equatorial sky, DR4 extends the survey footprint northward to declinations between 30 and 80 degrees and covers an area of 3600 square degrees. The data release includes images and catalogs. [Read more...](#)

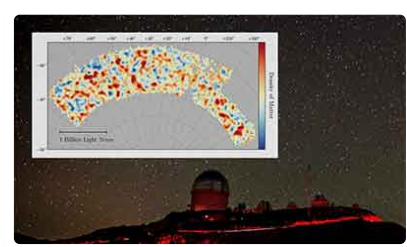
2020 Decadal Survey Community Input Invited, Deadline Extended: NOAO welcomes your input into our planning for the coming decade. Please visit our [Decadal Survey Planning website](#) to upload your white paper or to contribute a science-based comment on areas in which NOAO can provide critical resources and/or areas that will strengthen the US ground-based OIR system in the coming decade. An [updated "Dear Colleague" letter](#) describes the request and our planning process. The deadline for input and comments is **30 September 2017**. The follow-on community workshop is tentatively scheduled for 20-21 February 2018 in Tucson, AZ. [Read more...](#)

TMT Science Forum: This year's gathering of the international Thirty Meter Telescope community, "TMT: Beyond First Light," will be held in Mysore, India 7-9 November 2017. The registration deadline is **18 September 2017**. Limited travel support is available for US astronomers. To be considered for support, write to tmt@noao.edu. [Read more...](#)

Big Questions, Big Surveys, Big Data: Nighttime Astronomy & Cosmology in the 2020s: A community workshop, to be held **11-16 March 2018**, will examine the planning and resources needed to address major questions in survey-scale and data-intensive astronomy and cosmology. The results will provide input into the 2020 Decadal Survey in Astronomy and Astrophysics. [Read More...](#)

DECam in the News:

70-26-4 Cosmic Mix Confirmed: New results from the Dark Energy Survey (DES) confirm that the Universe is mostly made of dark energy (70%) and dark matter (26%), with normal baryonic matter comprising just a smidge (4%). The results of the survey, carried out with DECam on the CTIO Blanco telescope, were derived from high precision maps of gravitational lensing and large scale structure. The complete set of papers describing the DES Year 1 cosmology results is [now available](#).

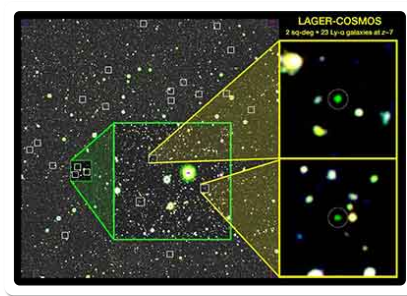


[Superluminous Supernova Proclaims the Death of a Star at Cosmic High Noon](#)

Noon: The supernova, one of the most distant ever discovered & confirmed, was detected with DECam.

[Distant Galaxies 'Lift the Veil' on the End of the Cosmic Dark Ages](#)

Small star-forming galaxies were abundant 800 million years after the Big Bang, suggesting that the earliest galaxies, which illuminated and ionized the Universe, formed at even earlier times. To detect Lyman alpha emission at $z \sim 7$, the investigators installed a custom narrowband filter on DECam.



A New Jovian Mini-Moon, discovered with DECam, is only a mile across and takes 2 years to complete an orbit around Jupiter.

Fourth Data Release for the Legacy Surveys

Stephanie Juneau and Arjun Dey (NOAO)

The Fourth Data Release (DR4) of the Legacy Surveys (LS) is now publicly available. Augmenting the previous data release (DR3), which featured the equatorial sky, DR4 covers an area of 3600 square degrees and extends the survey footprint northward to declinations between 30 and 80 degrees (Figure 1). Executed in preparation for the Dark Energy Spectroscopic Instrument (DESI) survey, the Legacy Surveys project is imaging nearly a third of the sky (approximately 14,000 square degrees) in three color filters using three telescopes: the Kitt Peak National Observatory's 4-m Mayall and the Steward Observatory's 2.3-m Bok telescopes on Kitt Peak in Arizona, and the Cerro Tololo Inter-American Observatory's 4-m Blanco telescope on Cerro Tololo in Chile. When complete in 2018, the Legacy Surveys images will be one of the widest area deep exploratory surveys of the sky.

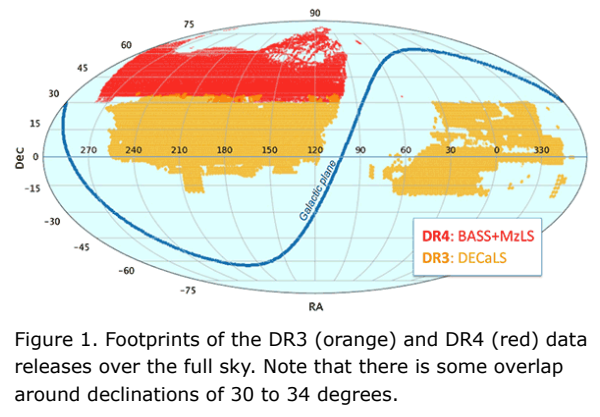


Figure 1. Footprints of the DR3 (orange) and DR4 (red) data releases over the full sky. Note that there is some overlap around declinations of 30 to 34 degrees.

DESI, an unprecedented cosmographic survey of the universe, will use the Legacy Surveys imaging data to select 35 million galaxy targets for spectroscopic observations and determine their cosmological distances. This in turn will yield the most detailed measurements to date of the expansion history of the Universe. The DESI project is currently under construction and is expected to begin its survey in 2019 using the Mayall telescope.

DR4 includes imaging in the z-band (approximately 850-1000nm) from the Mayall z-band Legacy Survey (MzLS; PI A. Dey) undertaken with the Mayall telescope, and in the g and r bands (400-550nm and 570-710nm, respectively) from the Beijing-Arizona Sky Survey (BASS; co-PIs Z. Xu & X. Fan) carried out on the Bok telescope. DR4 also includes mid-infrared photometry for all detected astronomical sources, derived from [newly co-added images](#) from NASA's Wide-field Infrared Survey Explorer (WISE).

The DR4 dataset contains raw, pipeline processed, and stacked (co-added) images, model images of the sky (constructed using *the Tractor*, an inference-based forward modeling approach) as well as other maps described [here](#). A total of 183.5 million sources were detected, with about half (90.7 million) fitted as point sources, and the remainder as resolved sources (mostly galaxies). Data products are available to the astronomy community and the public via the [LS team website](#), the [NOAO Science Archive](#) and [ftp server](#), and through the [NOAO Data Lab](#).

LS DR4 supplements the previous data release, DR3, as shown in Figure 1. The complementary footprints overlap in a region that lies between declination 32-34 deg. For additional information about LS DR3, see the [announcement](#) in the October 2016 issue of *Currents* and the [Legacy Surveys DR3 website](#).

The [NOAO Data Lab](#) has developed a database to query all DR3 & DR4 tables. Entry points into the database include a query manager tool, a Table Access Protocol (TAP) service, and a [web Query Interface](#). Additional information regarding data access is compiled on a dedicated [webpage](#) maintained by the Data Lab. The survey can be explored interactively using the LS [Image Viewer](#) (example image shown in Figure 2).

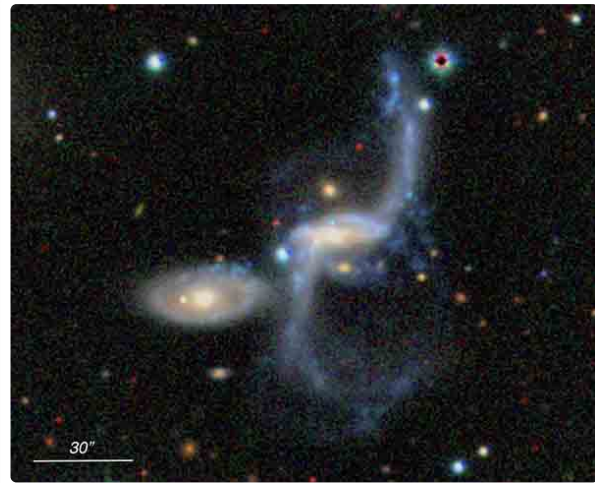


Figure 2. LS DR4 color composite image using g- and r-bands from BASS, and z-band from MzLS. The prominent interacting galaxy pair is UGC 10610. There are several distant galaxies in the background, and a few foreground stars from our Galaxy.

The Legacy Surveys project is possible thanks to several teams, observatories, and agencies. Acknowledgements are [listed in full here](#).

2020 Decadal Survey Community Input Invited

Dear Colleague,

In preparation for the 2020 Decadal Survey of Astronomy and Astrophysics, NOAO invites community input regarding scientific opportunities for the coming decade in areas in which NOAO can play a role in providing critical resources and/or areas that offer opportunities to strengthen the US ground-based OIR system.

We welcome a broad range of science ideas that motivate the need for resources such as:

- *Large science programs that use existing facilities at KPNO, CTIO, Gemini Observatory, and LSST*
- *Community access to observing time on non-NOAO facilities*
- *Community access to archival datasets not currently in the public domain*
- *Resources for the exploration and analysis of large datasets and the time domain*
- *New investigations and instrumentation at the mid-scale level (\$2M-\$100M)*

- *New observing facilities*
- *Other*

The scientific opportunities may build on the science and resources described in the recent studies “[Optimizing the US Ground-based OIR Astronomy System](#)” (the Elmegreen report) and the report from the Kavli Futures Symposium “[Maximizing Science in the Era of LSST: A Community-based Study of Needed OIR Capabilities](#)”, but they are by no means restricted to these. Concepts may include NOAO as a major or minor partner with universities and/or other federal agencies. To stimulate the flow of ideas, example items from the 2010 Decadal Survey and the above recent reports are listed below this letter.

To participate in this planning process, please [visit our website](#) where you can:

Submit a brief white paper. Upload a brief description (not more than 3 pages) in pdf format of your science concept and resource needs. Include a brief description of how your concept fits in with the [NOAO mission](#) and the [NOAO Strategic Plan](#).

Contribute to the development of community-based white papers. Suggest a white paper topic and/or contribute to topics suggested by others.

The deadline for initial input and comments is **30 September 2017**.

We will convene a community workshop in early 2018 to discuss the input received and to work toward an integrated development program that NOAO will present to the Decadal Survey committee. The workshop is tentatively scheduled for **20-21 February 2018** in Tucson, AZ. Please contact me (najita@noao.edu) with questions or suggestions. We look forward to hearing from you!

Sincerely,

Joan Najita

NOAO Chief Scientist



Examples from the Astro2010 Report

- Advanced technologies and instrumentation development

- Data archiving programs
- Highly multiplexed spectroscopy for a big baryon oscillation spectroscopic survey
- Large Synoptic Survey Telescope
- New instrumentation for exoplanet initiatives
- Next generation adaptive optics systems
- Open observing time on existing facilities
- Participation in a Giant Segmented Mirror Telescope (GSMT)
- Telescope System Instrument Program

Examples from “Maximizing Science in the Era of LSST”

- Highly multiplexed, 8-m wide-field optical multi-object spectroscopic capability
- Broad wavelength coverage, moderate-resolution ($R = 2000$ or larger) OIR spectrograph on Gemini South
- Development and early deployment of an alert broker, scalable to LSST
- Support into the LSST era for existing high-priority capabilities (wide-field imaging, multi-color imaging, spectroscopy, AO-fed diffraction limited imaging)
- OIR system infrastructure developments that enable efficient follow-up programs
- Data exploration and analysis tools that work at the scale of LSST
- Training for scientists at all career levels in LSST-related analysis techniques and computing technologies

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The 2017 TMT Science Forum: “TMT: Beyond First Light” **Mysore, India, 7-9 November 2017**

<https://conference.ipac.caltech.edu/tmtsf2017/>

Registration deadline: **18 September 2017**

This year’s Thirty Meter Telescope (TMT) Science Forum will be held in Mysore, India, on 7-9 November 2017. Each year, the Forum gathers members of the international astronomical community to meet, collaborate, and plan for future TMT science programs. It is the premier opportunity to learn about TMT, to discuss its capabilities, and to join in shaping the observatory’s future.

The theme for the 2017 Forum is “TMT: Beyond First Light”. Plans for TMT’s first-generation instrumentation and adaptive optics systems are quite mature, and the time is ripe to start planning new capabilities beyond first light. Conversations about this began at the [2016 TMT Forum in Kyoto, Japan](#), and the TMT International Observatory plans to launch feasibility studies for future-generation instruments later this year. The Forum in Mysore will be an important opportunity to foster discussion and to deepen collaboration among members of the international TMT community in

instrumentation and operations planning for the observatory's future beyond first light.

The Forum program will include overviews of the TMT project status; presentations about the big science questions to be answered with TMT's next-generation instruments; discussion of novel technologies to enable these capabilities; and parallel sessions organized by the [TMT International Science Development Teams \(ISDTs\)](#) to discuss new instrument concepts and motivating science priorities.

Also, before and after the main Forum, there will be satellite workshops focusing on particular capabilities and concepts, including high-contrast exoplanet imaging, high-resolution optical and infrared spectroscopy, and the Wide-Field Optical Spectrometer (a first-generation TMT instrument). Please see the [2017 Forum web page](#) for more information about these workshops.

Mysore is a fascinating and attractive city with many famous palaces, situated about 150 km from Bangalore (site of the nearest international airport). The surrounding area features national parks, wildlife and bird sanctuaries, charming villages and temples, waterfalls, and many other attractions (see <http://karnatakaturism.org/Mysore/en/>). The Forum itself will be held on the Infosys Campus at Mysore, which is extensively equipped for technical meetings of this sort.

Registration for the 2017 Forum is now open, with a deadline of **18 September 2017**. The [Forum website](#) has information about meeting logistics, lodging, transportation, and visa requirements. Most foreign participants will need visas if they are not Indian citizens, and the web site provides guidelines for visa application.

The National Science Foundation, as part of its cooperative agreement to develop a model for US potential national partnership with TMT, provides travel support for US astronomers (unaffiliated with TMT partner institutions Caltech and University of California) to attend the TMT Forum. To be considered for support, please write to the US TMT Science Working Group at tmt@noao.edu. Funding is limited, and it is important to plan travel for India well in advance, so early requests will be given strong consideration.

TMT BEYOND FIRST LIGHT
तीस मीटर दूरबीन NEXT-GENERATION INSTRUMENT STUDIES
फोरम २०१७

CONTENT:
INTERNATIONAL SCIENCE DEVELOPMENT TEAM (ISDT) SESSIONS ON INSTRUMENT STUDIES
KICKING OFF NEXT-GENERATION INSTRUMENT STUDIES
BIG SCIENCE QUESTIONS FOR TMT NEXT-GENERATION INSTRUMENTS
LESSONS LEARNED FROM 1ST GENERATION INSTRUMENTS

SCIENCE ORGANIZING COMMITTEE:
(CO-CHAIR) CHRISTOPHE DUMAS (TMT)
(CO-CHAIR) SRINAND RAGHUNATHAN (IACAA)
ANIRAMA S. C. (IA)
JUDY COHEN (CALTECH)
IAN DELL'ANTONIO (BROWN UNIV.)
MARK DICKINSON (NOAO)
HAO LEI (SHANGHAI OBS.)
JESSICA LU (UC BERKELEY)
CHRISTIAN MAROIS (NRC-HERZBERG)
OI NAGISA (TOKYO UNIV. OF SCIENCE)
LUC SIMARD (NRC)
SIVARANI THIRUPATHI (IA)
BIN YANG (YUNNAN OBS., NAOC & ESO)

NOVEMBER 7-9, 2017 - INFOSYS CAMPUS, MYSORE, INDIA
REGISTRATION DEADLINE: SEPTEMBER 18, 2017
[HTTPS://CONFERENCE.IPAC.CALTECH.EDU/TMTSF2017](https://conference.ipac.caltech.edu/TMTSF2017)

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Big Questions, Big Surveys, Big Data: Nighttime Astronomy & Cosmology in the 2020s (SnowPAC 2018)

Snowbird, Utah, 11-16 March 2018

NOAO is sponsoring the 7th annual Snowbird Workshop on Particle Astrophysics, Astronomy, and Cosmology (SnowPAC) in collaboration with the Department of Physics and Astronomy at the University of Utah.

The workshop is being organized on the occasion of the upcoming 2020 Decadal Survey in Astronomy and Astrophysics to gather community input and facilitate broad collaboration and coordination in addressing major questions in survey-scale and data-intensive astronomy and cosmology.

The structure and program of the workshop will build on the outcome of previous study processes ([Optimizing the US Ground-based OIR System](#), [Maximizing Science in the Era of LSST](#), [Cosmic Visions](#)), NOAO's [Decadal Survey community planning effort](#), and the input of workshop participants, to facilitate the creation of community-based whitepapers for submission to the Decadal Survey process.

For more information, and to sign up to receive notification when registration is open, please visit the [SnowPAC website](#).



Contact Us

We welcome your input on this issue of *Currents*. Please contact us at currents@noao.edu. We look forward to hearing from you!

Currents is a spark plug 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.

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