

# NOAO CURRENTS



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## Currents

### In this Issue...

**DECam Plane Survey Data Release:** A new publicly available data set offers a wealth of information on the structure of the disk of the Milky Way and its interstellar medium. The first data release from the DECam Plane Survey, which uses the Dark Energy Camera (DECam) to observe the southern Galactic plane, covers roughly one-third of the Milky Way's disk and extends over 1000 square degrees of the sky. Dive into survey images and explore the Galaxy with the survey's [Sky Viewer](#). Calibrated images and catalogs are [available online](#). [Read more...](#)

**2020 Decadal Survey Community Input Invited, Deadline Approaches:** NOAO welcomes your input into our planning for the coming decade. Please visit our [Decadal Survey Planning website](#) to upload your white paper or 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. Input received by **20 November 2017** will be given full consideration in planning the agenda for the follow-on community workshop scheduled for **20-21 February 2018** in Tucson (see next item). [Read more...](#)

**Registration Open – “NOAO Community Needs for Science in the 2020s”:** What science will you do in the 2020s? Join us at a community planning workshop **20-21 February 2018** to discuss community needs for the science of the coming decade. The workshop discussion will flow into an integrated development program that NOAO will present to the Decadal Survey committee. Input received online through the NOAO Decadal Survey planning website (see item above) will also inform the workshop discussion. Visit the [meeting website](#) to register and for further information. [Read more...](#)

**CHARA Community Workshop at January AAS Meeting:** Interested in exploring the Universe at high angular resolution? The Center for High Angular Resolution Astronomy (CHARA) will host a workshop designed to support the 50 nights per year of open access time to the CHARA Array that is available to the astronomical community through the NOAO time allocation process. The workshop, to be held **7 January 2018** at the AAS meeting, will provide tutorials on interferometry, the science capabilities of the Array, and how to prepare and apply for observing time. [Read more...](#)

**Pre-registration Open – “Big Questions, Big Surveys, Big Data: Astronomy & Cosmology in the 2020s”:** A community workshop, to be held **11-16 March 2018** in Snowbird, Utah, will examine the planning and resources needed to address major questions in survey-scale and data-intensive astronomy and cosmology in preparation for the 2020 Decadal Survey in Astronomy and Astrophysics. Pre-register now to help shape the agenda! [Read more...](#)

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**Registration Open – “Shedding Light on the Dark Universe with Extremely Large Telescopes”:** This conference, to be held at the University of California Los Angeles, **2-6 April 2018**, is the second in a three-part conference series aimed at gathering input from the dark matter and dark energy communities to optimize the operations and instrumentation of future extremely large optical/infrared telescopes. Register early at a discounted rate until **30 November 2017**. [Read more...](#)

**Save the Date – “Science and Evolution of Gemini Observatory”:** The next Gemini community meeting will be held **22-26 July 2018** in San Francisco. Join the Gemini community in reviewing recent science highlights, identifying needs in the context of Gemini’s evolving capabilities, and developing strategies for the future. [Read more...](#)

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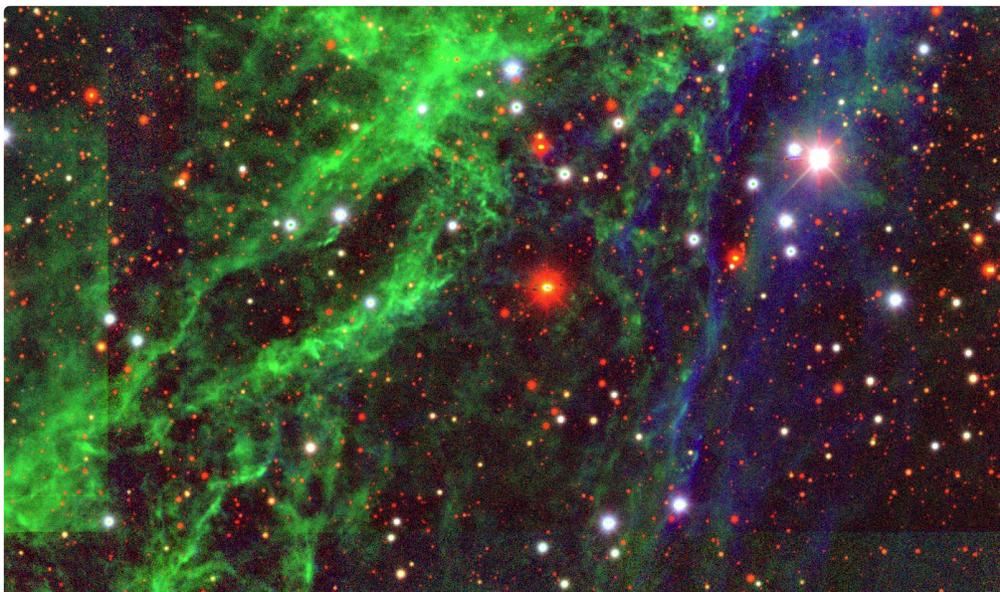
## **DECam Plane Survey Data Release: Catalogs and Images Now Available**

*Eddie Schlafly (Lawrence Berkeley National Lab)*

A new publicly available data set offers a wealth of information on the structure of the disk of the Milky Way and its interstellar medium.

The DECam Plane Survey (DECaPS), which uses the Dark Energy Camera (DECam) to observe the southern Galactic plane (dec < -30 degrees), has released data covering roughly one-third of the Milky Way’s disk: a swath within 5 degrees of the Galactic plane that extends over 1000 square degrees of the sky through Galactic longitudes between 5 degrees and -120 degrees. The survey reaches a depth of 23.7, 22.8, 22.2, 21.8, and 21.0 magnitudes in the g, r, i, z, and Y bands, roughly suitable for detecting main-sequence turn-off stars at the distance to the Galactic center through a reddening of 1.5 magnitudes E(B-V).

The data release includes images and catalogs. The full catalogs contain more than twenty billion detections of two billion objects, mostly corresponding to highly reddened stars deep in the Galactic disk. All of the images making up the survey can be browsed interactively through the [DECam Legacy Survey viewer](#) and are available through the NOAO Science Archive.



Some images from the DECaPS Data Release. Hover your mouse over the image to pause the slideshow. Click the image to step through a larger version of the slideshow (with links to the viewer for further exploration).

## The DECam Plane Survey

The DECam Plane Survey was designed to measure the fluxes of billions of stars in the southern Galactic plane to reveal the three-dimensional distribution of dust in the Milky Way. In concert with Pan-STARRS1 (PS1) observations of the northern Galactic plane, the survey results allow a full 360 degree map of the dust in the Milky Way.

DECaPS is not just an extension of PS1, however. It is significantly deeper than other wide-area surveys of the Galactic plane, reaching stars roughly one magnitude fainter than PS1 in individual images. The DECaPS pipeline is optimized for crowded fields of point sources, allowing precise photometry even in the inner Galaxy where the huge number of stars blend together in the typical 1" seeing obtained by DECaPS.

Nor is DECaPS just about dust. By studying many stars, the structure of the Milky Way's disk can be characterized in detail. Color-magnitude diagrams from the survey show a rich array of stellar populations that vary from place to place within the Galaxy. The DECaPS catalog is only a first step intended to enable many different scientific analyses of the survey.

Each part of the survey footprint was observed three times, usually on different nights, using the same tiling of the sky developed for the DECam Legacy Survey. This strategy was designed to enable precise photometric calibration, but it also provides some limited variability information about all of the observed stars. Observations for the survey took place over 22 nights from March 2016 to May 2017. The large etendue and low downtime of the DECam/Blanco system made this survey efficiency possible. Further details on the survey are available in a preprint by [Schlafly et al. \(2017\)](#).

## DECaPS Images

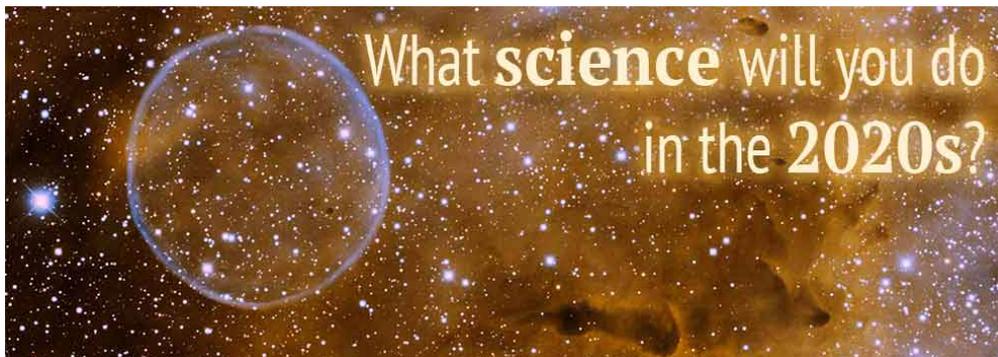
Color images from DECaPS can be interactively browsed through the DECam [Legacy Survey viewer](#), built by Dustin Lang. The three colors show the g, r, and z bands. Both the actual observations and "model observations" generated from the DECaPS catalogs and the pipeline-estimated PSF can be viewed, providing an immediate sense of the accuracy of the modeling. For example, compare the [actual observations](#) with the best-fit [models](#) in the viewer.

All of the images making up the survey are also available through the [NOAO Science Archive](#) (select all images with Program Number 2016A-0323 or 2016B-0279, PI: Finkbeiner).

## Catalogs

The DECam Plane Survey catalogs were constructed using a custom pipeline optimized for crowded stellar fields. The pipeline follows in the tradition of DAOPHOT, simultaneously fitting for the positions and fluxes of all of the stars in each image. This fit is performed by linearizing the problem and passing the optimization off to a large, sparse, linear-least-squares optimizer. In the densest regions, this can require simultaneously fitting the positions and fluxes of 60,000 stars per 1024x1024 pixel region.

Each DECaPS image is independently analyzed. In order to provide multiband information, single-image catalogs are matched together, and detections within 0.5" of one another are considered to be detections of the same star. All of the detections of the same object are then grouped together to provide average photometry and astrometry of each star in each band. Both the single-image and band-merged catalogs are available at the [survey web site](#).



## 2020 Decadal Survey Community Input Invited, Deadline Approaches

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.

Please visit our [Decadal Survey Planning website](#) to

- Read submitted white papers
- Upload your white paper
- Join an ongoing discussion of proposed topics, or
- Initiate a topic of your own.

Current open topics include:

- Precision cosmology with gravitational wave standard sirens
- Coordinating strategies for LSST follow up
- Wide-field, highly-multiplexed spectroscopy in the LSST era
- Southern Spectroscopic Roadmap
- Small-scale Projects to enhance LSST and DESI
- Future of the Blanco and DECam after the DES survey
- Future of the KPNO Mayall after the DESI survey
- Role of KPNO facilities in the LSST era
- Future role of the National Observatory for Gemini science support
- Value of US national participation in Giant Segmented Mirror Telescopes
- Maximizing science from large datasets
- Maximizing information extraction from astronomical spectra
- Modern computational techniques for everyone

Input received by **20 November 2017** will be given full consideration in planning the agenda for the follow-on community workshop scheduled for **20-21 February 2018** in Tucson, where we will work toward an integrated development program that NOAO will present to the Decadal Survey committee.

An [updated "Dear Colleague" letter](#) describes the request for input in greater detail as well as our planning process.



## Registration open for "NOAO Community Needs for Science in the 2020s"

**Tucson, Arizona, 20-21 February 2018**

<https://www.noao.edu/meetings/2020decadal/>

What are the exciting science opportunities of the 2020s?  
What challenges do we need to meet to accomplish the science?  
How can NOAO help make it happen?

NOAO welcomes your input on the exciting scientific opportunities of 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.

Join us at a community workshop **20-21 February 2018** in **Tucson** to discuss community needs and to work toward an integrated development program that NOAO will present to the Decadal Survey committee. Input received online through the NOAO Decadal Planning website will inform the workshop discussion.

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

- Large science programs that use facilities at KPNO, CTIO, Gemini, 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. An [updated "Dear Colleague" letter](#) provides additional details on the planning process.

**Format:** The workshop will feature plenary talks on major science themes and break out discussions centered on resource themes (facilities, software, archives) aimed at identifying important science and technical directions for the coming decade.

**Registration [is now open](#).** There is no registration fee for the meeting.

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## **CHARA Community Workshop at January AAS Meeting**

*Washington, DC*

*Sunday, 7 January 2018*

<http://www.chara.gsu.edu/workshops/aas-2018>

The Center for High Angular Resolution Astronomy (CHARA) will host a Community Workshop at the AAS Meeting in Washington, DC on Sunday, **7 January 2018**. The workshop is designed to support the 50 nights per year of open access time to the CHARA Array that is available to the astronomical community through the NOAO time allocation process.

The workshop will provide tutorials on interferometry, the science capabilities of the Array, and how to prepare and apply for observing time. There will be time for participants to discuss their ideas and plans for developing science programs. We encourage you to attend and invite people you know who may be interested in exploring the universe at milliarcsecond resolution.

All workshop participants must be registered to attend the AAS conference. The regular registration deadline for the AAS was on 2 November 2017, and there is an additional \$35 fee to register for the CHARA Community Workshop. If you've already registered for the AAS meeting and would like to add the workshop, you can sign in and [modify your registration](#).

More information can be found at the [workshop website](#).

— Gail Schaefer, CHARA Visitor Support Scientist

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## **Pre-registration open for SnowPAC 2018: "Big Questions, Big Surveys, Big Data: Astronomy and Cosmology in the 2020s"** **Snowbird, Utah, 11-16 March 2018**

<http://www.physics.utah.edu/snowpac/>

Pre-register at: <http://www.physics.utah.edu/snowpac/registration.html>

The 2018 Snowbird Workshop on Particle Astrophysics, Astronomy, and Cosmology (SnowPAC), co-sponsored by NOAO and the University of Utah, will be held at Snowbird Ski Resort **11-16 March 2018**.

SnowPAC 2018 will be a participatory workshop focused on survey-scale and data-intensive priorities in astronomy and cosmology for the 2020s, with the goal of producing outlines and roadmaps of science-driven community whitepapers for submission to the upcoming Decadal Survey and [Particle Physics Project Prioritization Panel](#) (P5) processes.

Pre-registration is your opportunity to shape the agenda! For more information, and to sign up, please visit the above webpages.



## **Registration open: "Shedding Light on the Dark Universe with Extremely Large Telescopes"**

***University of California Los Angeles, 2-6 April 2018***

<https://conferences.pa.ucla.edu/dark-universe/index.html>

Early registration deadline: **30 November 2017**

Regular registration deadline: **2 February 2018**

This will be the second installment of a three-part conference series aimed at gathering input from the dark matter and dark energy theory, phenomenology, and observational communities to optimize the operations and instrumentation at future extremely large 30-m class optical infrared telescopes. The conference aims to address the following questions:

- What are the most promising observations that will be enabled by giant telescopes? What capabilities are required?
- What are the key synergies between giant telescopes and other facilities? What are the areas and topics where a concerted effort will yield far superior results than the sum of all parts?
- What theoretical work is needed in preparation for first light? What are the limitations in our understanding that need to be overcome? What calculations are required in order to make testable predictions and interpret the results of future astronomical observations?

The first meeting of the series was held in Lanzhou China, and the third and final one will be held at ICTP Trieste Italy, 2-6 July 2018



**"Science and Evolution of Gemini Observatory"**

## **Fisherman's Wharf, San Francisco, 22-26 July 2018**

<http://www.gemini.edu/seg2018>

This meeting invites the Gemini community to review recent science highlights, identify needs in the context of Gemini's evolving capabilities, and develop strategies for the future.

Please visit the conference webpage for news and updates on the scientific program and invited speakers as they develop. Registration will open on **4 January 2018**, and the deadline for abstract submission is **15 May 2018**. To receive updates, please subscribe at: [http://www.gemini.edu/seg2018#seg2018\\_signup](http://www.gemini.edu/seg2018#seg2018_signup).

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## **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 [Decadal Survey Planning 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.

Input received by **20 November 2017** will be given full consideration in planning the agenda for the follow-on community workshop scheduled for **20-21 February 2018** in Tucson, where we will work toward an integrated development program that NOAO will present to the Decadal Survey committee. Please contact me ([najita@noao.edu](mailto: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<sup>SEP</sup>
- 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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## Contact Us

We welcome your input on this issue of *Currents*. Please contact us at [currents@noao.edu](mailto: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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