

Imaging Under the Dark Skies at Deep Springs College

Presentation to BRDSC

November 15, 2022

Brian Hill, Herb Reich Chair of Natural Science

Outline

1. Deep Springs College
2. Siting the Observatory
3. Funding and Construction
4. Teaching and Research Objectives



Deep Springs College



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Sierra National Forest

Yosemite National Park

Sierra National Forest

Inyo National Forest

Kings Canyon National Park

Sequoia National Park

Sequoia National Forest

Death Valley National Park

Desert Nat'l Wildlife Range

Lee Vining

June Lake

Mammoth Lakes

Silver Peak

Goldfield

Lida

Bishop

Big Pine

Bonnie Claire

Beatty

Amargosa Valley

Mercury

Indian Springs

Las Vegas

Henderson

Fresno

Hanford

Lemoore

Man City

Visalia

Tulare

Porterville

Hume

Independence

Lone Pine

Olancho

Tonopah

Rachel

Hiko

Crystal Springs

Ash Springs

Alamo

93

Shoshone

Tecopa

Pahrump

Deep Springs College

- Founded 1917 by L.L. Nunn
- Two-year college accredited by ACCJC
- 12-14 students admitted each year — ~25 total!
- Full scholarship for every student admitted
- The Three Pillars:
 1. Academics
 2. Labor
 3. Self-Government

Academics at Deep Springs College

- President Sue Darlington (Anthropology) — Sept. 1, 2020
- Dean Ryan Derby-Talbot (Mathematics) — July 1, 2021
- Three Long-Term Faculty
 - Antón Barba-Kay (Philosophy) — July 1, 2022
 - Anna Feuer (Political Science) — July 1, 2020
 - Brian Hill (Physics & Astronomy) — July 1, 2020
- Several visiting faculty each year round out the disciplines
- Long-term faculty capped at a maximum of 6 years
- Enduring yet constantly in flux

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Siting Criteria

- Excellent Horizon
- Hidden
- Away from Campus Light
- On Deep Springs Property

Google Earth view, looking southeast



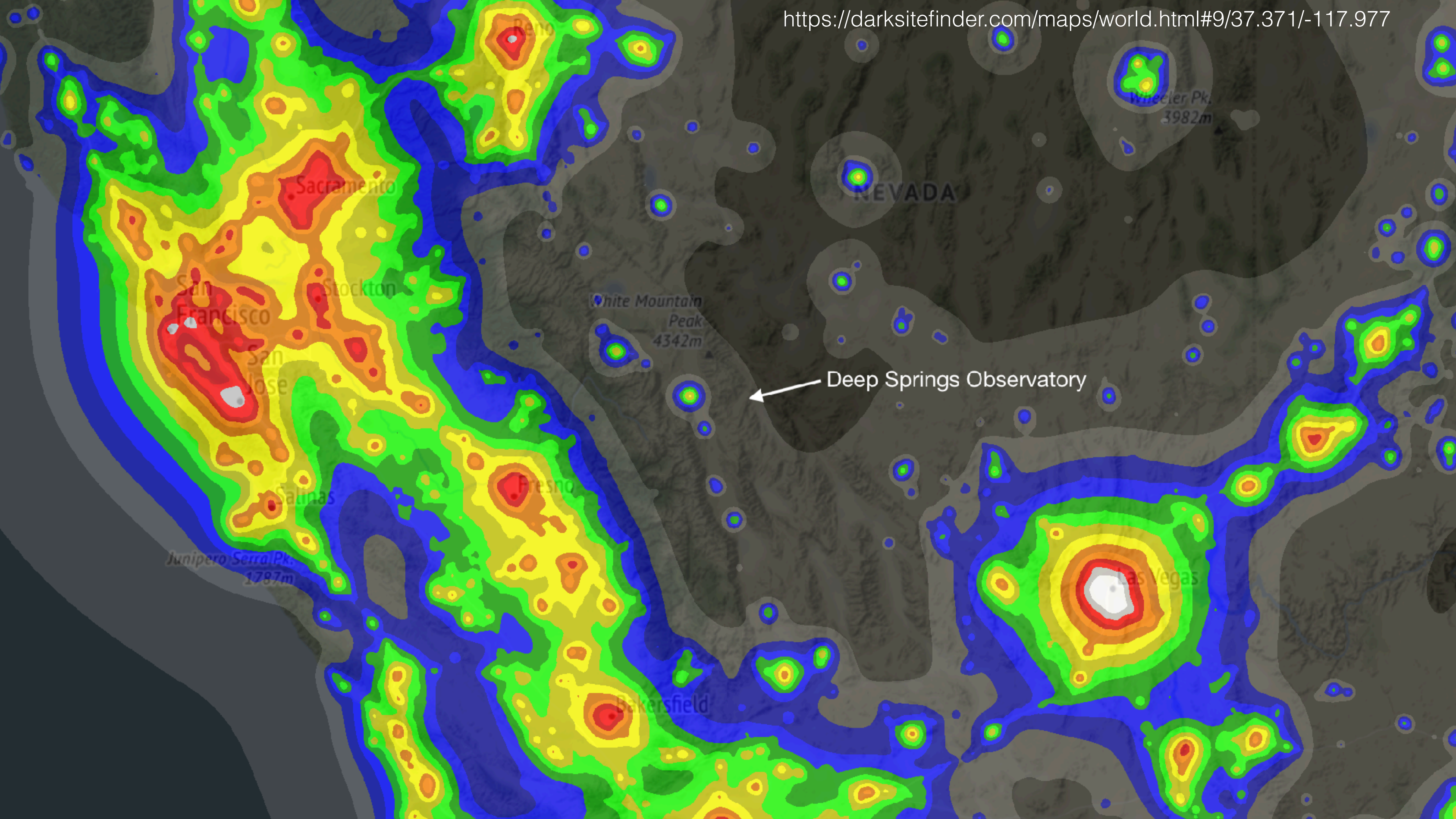
<https://www.lightpollutionmap.info>

Zenith sky brightness info (2015)

Coordinates	37.37100, -117.97700
SQM	22.00 mag./arc sec ²
Brightness	0.172 mcd/m ²
Artif. bright.	0.650 μcd/m ²
Ratio	0.0038
Bortle	class 1
Elevation	1681 meters

Deep Springs Observatory

Our site's classification in (2015) was Bortle 1 (better than 21.99 mag/arcsec²) per <https://www.lightpollutionmap.info>





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Funding and Construction

- Site selected, work begins, July 2020
- Dome and control room funded by Deep Springs Class of '77, December 2020
- Observatory put into service for spring course while still being completed, March and April 2022
- Observatory complete, science begins, October 2022
- Dedication & Class of '77 reunion, April 2023?

Oct., 2020



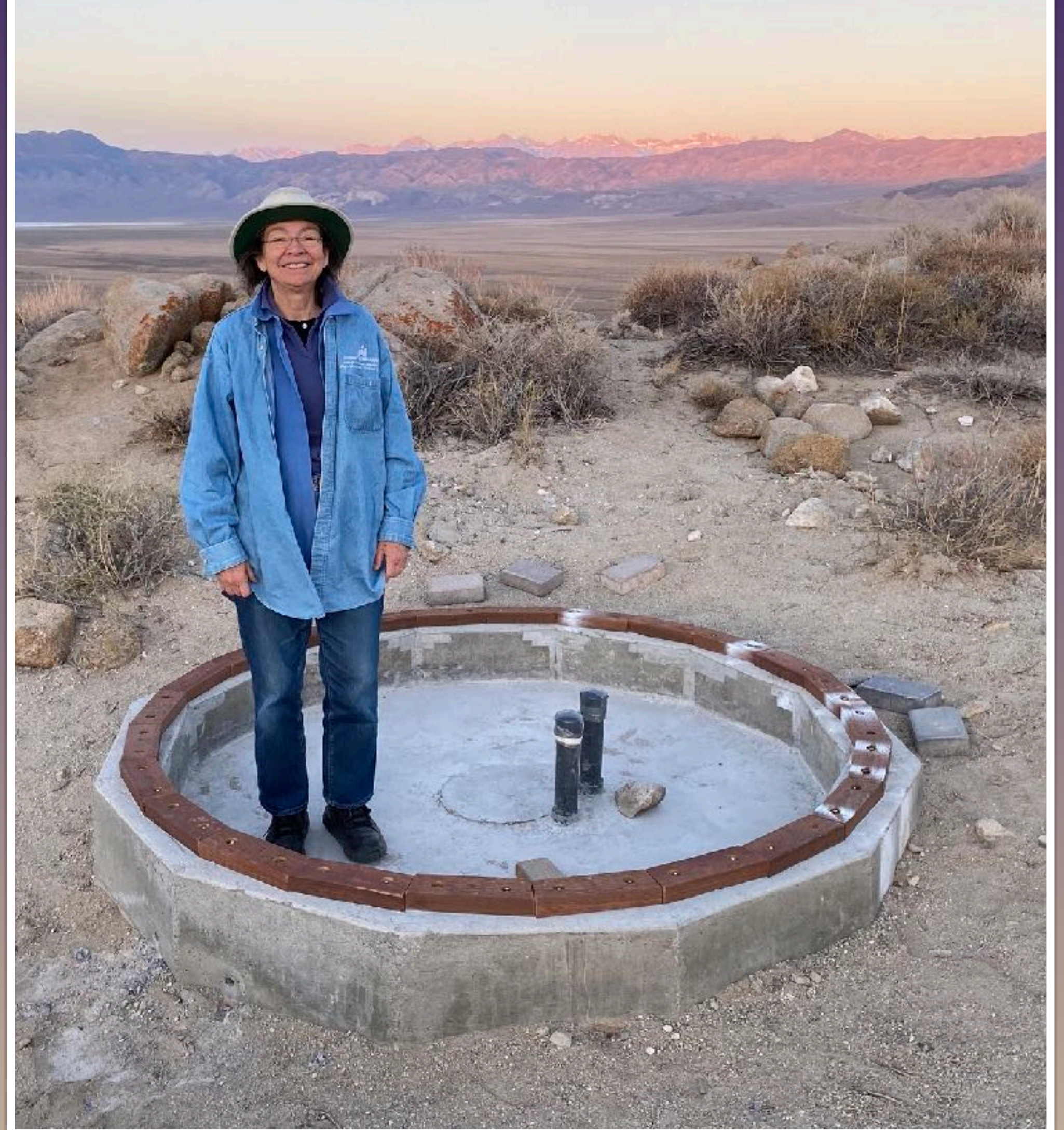
Mar., 2021



Apr., 2021



May, 2021



June, 2021





Feb., 2022



Moonlight Operation, April, 2022



Aug., 2022



Sept., 2022





Oct., 2022



Nov., 2022

Custom desk, custom shelf, and LED lighting installed (and observatory declared complete!), Oct. 23, 2022

Sofia Mikulasek (entering class of '22) and Luke Suess (entering class of '21) demonstrating data-taking for visitors, Nov., 3, 2022



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Teaching and Research Objectives

- General astronomy courses
- Research experience for undergraduates
- Push small telescope operation under dark skies
- Contribute to transient astronomy

Push small telescope operation under dark skies

Reporting on work done in collaboration with Geoff Marcy, Sofia Mikulasek, and Luke Suess

Deep Springs Observatory

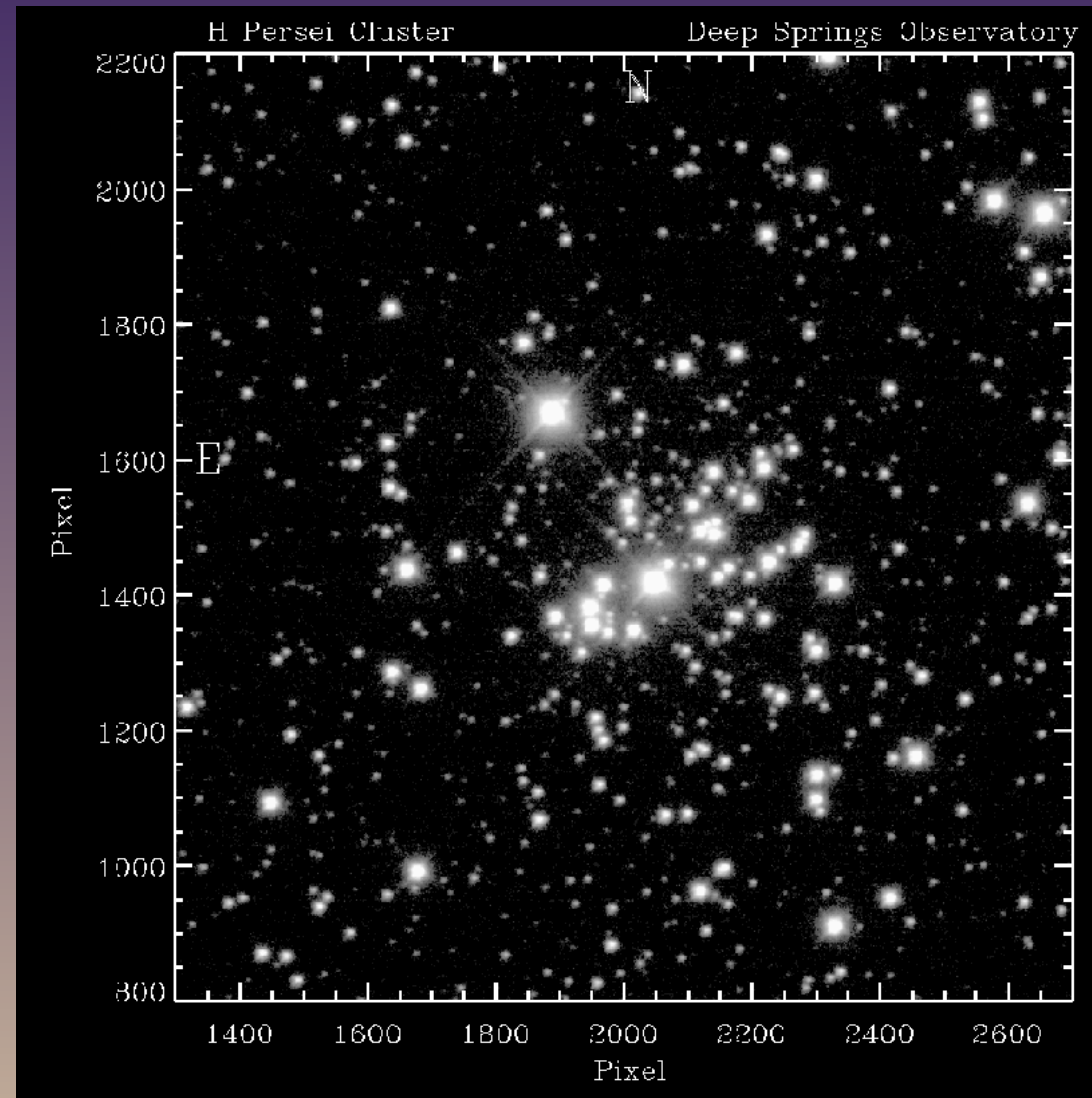
Oct. 18, 2022

10" CFF Telescopes Ritchey-Chrétien

H Persei cluster

CBB filter

30-second exposure



Push small telescope operation under dark skies

<https://skyview.gsfc.nasa.gov/current/cgi/runquery.pl> with query parameters DSS2 Red, Coordinates = 02 18 51.89, +57 08 59.2, Image Size (degrees) = 0.25

Palomar Observatory

DSS2 Survey

48" Oschin Schmidt Telescope

H Persei cluster

Red filter

40-minute exposure



Title: The second Palomar Sky Survey

Authors: Reid, I. N., Brewer, C., Brucato, R. J., McKinley, W. R., Maury, A., Mendenhall, D., ,

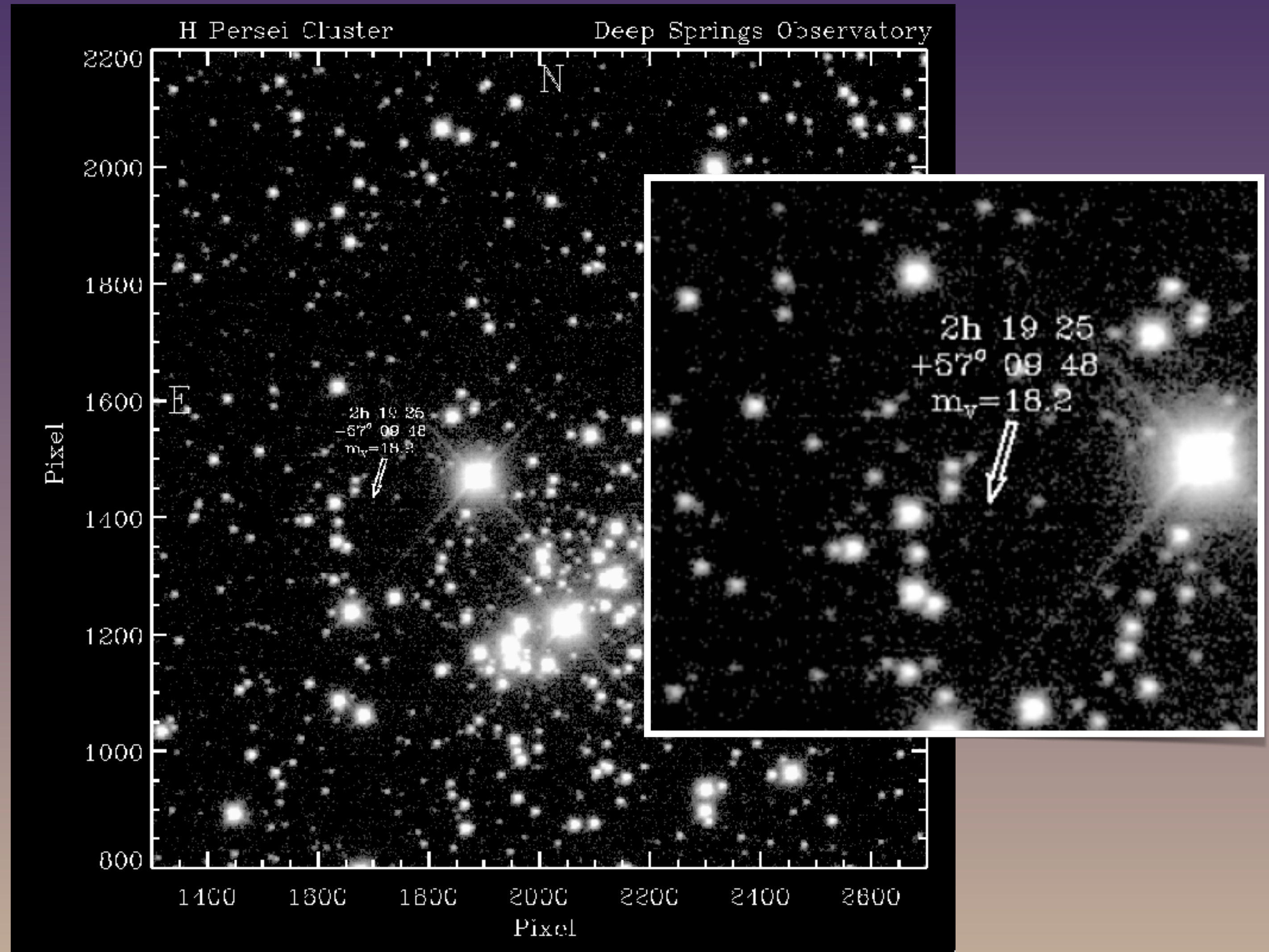
Journal: Astronomical Society of the Pacific, Publications (ISSN 0004-6280), vol. 103, July 1991, p. 661-674. Research supported by California Institute of Technology, NSF, National Geographic Society, et al.

Bibliographic Code: 1991PASP..103..661R

Push small telescope operation under dark skies

Reporting on work done in collaboration with Geoff Marcy, Sofia Mikulasek, and Luke Sues

Magnitude 18 stars are
present in our image with
3- σ confidence



Teaching and Research Objectives

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Contribute to transient astronomy

<https://www.physics.purdue.edu/brightsupernovae/>

Name	Mag	Type	Host
2022zut	13.5	la	NGC 3810
AT2022zfb	14.1	unk	none
ASASSN-22jp	14.2	la	NGC 4415
AT2022zxb	14.7	unk	none
2022xkq	15.0	la-91bg	NGC 1784
2022xxf	15.2	lc-BL	NGC 3705
2022wsp	15.4	ll	NGC 7448
AT2022aagp	15.8	unk	NGC 2777
2022yqv	15.9	la-91T	UGC 10984
AT2022znu	16.0	unk	none
2022yvv	16.0	la	anonymous
2022wwt	16.0	la	anonymous
AT2022zyr	16.1	EGN	M31
AT2022zjo	16.1	unk	NGC 2152
2022yvw	16.1	llb	NGC 1359
2022ypd	16.1	la	MCG +0-52-30
2022mt	16.1*	la	IC 4790
2022aaad	16.1	ll	none
AT2022xyq	16.2*	unk	ESO 271-G26
AT2022xss	16.2*	unk	none
AT2022wic	16.2*	unk	none
2022ypb	16.2	la-91T	LEDA 918265
AT2022zks	16.3	unk	none
AT2022ynz	16.3*	unk	none
ASASSN-22my	16.3	la	NGC 946
AT2022zue	16.4	unk	LEDA 1021768
AT2022ztk	16.4	unk	LEDA 924001
2022xzm	16.5	lc-BL	CGCG 478-048

All active supernova over mag 17.0 A long time ago, in a galaxy far far away, a star exploded. This star exploded so violently that for a few weeks the star outshone its parent galaxy. This type of explosion is called a [Supernova](#). The [last one in our galaxy](#) was 400 years ago, making us about 300 years overdue for the next one. On this web page you will find a list of the currently observable supernovae, along with information on their location, reference images, and their last reported brightness. The data on this page comes from [TNS](#) and [ATEL](#) circulars. These web pages have brought you the latest in supernovae data and images since April 1997. 25 years and counting.

Web page last modified on 11/14/2022 13:59:41 . For yesterday's updates, go to the [updates page](#).

- Created entries for [19 ZTF supernovae](#), [12 PS1 supernovae](#) 2 PS1 supernovae, [11 Gaia supernovae](#), [2 ZTF supernovae](#)
- Updated the entries for [2022wqo](#) (Type II), [2022wqs](#) (Type II), [2022wtm](#) (Type II), [2022xae](#) (Type IIb), [2022xzc](#) (Type Ic-BL), [2022yoz](#) (Type II), [2022yzz](#) (Type Ia), [2022zmb](#) (Type II), [2022yll](#) (Type Ia), [2022yus](#) (Type Ia), [2022zdn](#) (Type Ia)
- Added images of [2022wpy](#), [2022wsp](#) (Mag 15.4), [2022xkq](#) (Mag 15.0), [2022zut](#) (Mag 14.0), [2022zzz](#) (Mag 17.9)

News: [Robert Evans](#), discoverer of several supernovae (visually) has died. [2022zut](#) just popped up at Mag 14.6 in [NGC 3810](#). [2022xlp](#) in [NGC 3938](#) is rising rapidly. [2022pul](#) is out of solar conjunction. I now have a program which finds the names of galaxies. You will notice that the magnitudes of the brighter objects (< 17.0) are now updated more often. We now have an image of [2021afdx](#) taken by the [JWST](#). For the year 2022, 16883 supernovae (1772 CBAT, 15111 unconfirmed, and 0 other sources) have been reported. (21098 [last year](#)). The brightest SN of the year 2022 are [2022hrs](#) (Mag 12.3) followed by [2022ffv](#) (Mag 13.3) and [2022fw](#) (Mag 13.5)

TNS has moved to a new URL: <https://www.wis-tns.org/>. To post your discoveries, go to the [TNS getting started page](#). The [Open supernova Catalog](#) has died, links will be removed eventually. Latest Supernovae is now supported by [Purdue University](#) and maintains a new [mirror](#) hosted in the [Department of Physics and Astronomy](#) that is overseen by [Dan Milisavljevic](#). Purdue mirror page: <http://www.physics.purdue.edu/brightsupernovae/>. **New features:** Modified the [sorted by name list](#) to include removed objects and mark "non public" objects. All galactic objects (CV novae, etc) will be banished on a weekly basis to the [boneyard](#). Thanks for all of the images, I have been posting them on [flickr](#). Join the discussion! [Facebook Supernova Enthusiasts Group](#). The [Active supernovae page](#) is a version of this page which is designed to be easier to read. I've done extensive work recently in the [Archives](#). If anybody knows who some of the "unknown" discoverers are, please let me know. *Does anybody know of a grant that I could apply to for supporting this page?* I probably spend about 2 hours a night working on it. Please note my backup e-mail address: dbishopx@gmail.com. To turn off the icons, use this [link](#). With the demise of Yahoo Groups, I am moving isn_chat to [Google groups](#). Please sign up if interested. [LOSS](#) ask people who discover supernovae to provide an offset from a nearby star to make spectroscopy easier.

Some groups are not reporting all of their discoveries to CBAT.

- [ASAS-SN: Supernovae](#)
- [ATLAS](#) (no published list)
- [Catalina Real-Time Transient Survey:](#)
 - [MLS search page](#) (Supernovae only, Possible supernovae)
 - [Supernova hunt page](#)
- [Dark Energy Survey](#)
- [Gaia Photometric Science Alerts programme Alert index](#)
- [La Silla-QUEST](#) (no published list)
- [MASTER robotic Net List of optical transients, Supernovae](#)
- [OGLE-IV wide field survey Discovery images Rapid Transient Detection system](#)
- [Intermediate Palomar Transient Factory](#) (no published list)
- [PS1 Science Consortium Discoveries](#)
- [ROTSE collaboration: Discoveries page](#)
- [SkyMapper Supernovae search Zooniverse supernova sighting Results from Supernova Sighting](#)
- [SNAD Catalog](#)
- [Zwicky Transient Facility \(ZTF\) Alert archive ZTF Bright Transient Explorer](#)

Other versions of this list, going back 18 months (see the [archives](#))

- [Active objects](#) (Machine readable version of main page)
- [Sorted by Location \(R.A.\)](#)
- [Sorted by Location \(Decl\)](#)
- [Sorted by Date](#)
- [Sorted by Magnitude](#)
- [Sorted by Red Shift](#)
- [Sorted by Host name](#)
- [Sorted by Name](#)
- [Statistics](#)

Watch list (list of dimmer objects that may turn into something interesting)

- [2022vxf](#) in [UGC 11693](#) at Mag 17.6 Type Ia-91bg
- [AT2022ydu](#) in [NGC 3383](#) at Mag 17.9 Type unk
- [2022ydv](#) in [IC 4885](#) at Mag 18.0 Type Ic-BL
- [AT2022xhg](#) in [UGC 10216](#) at Mag 18.2 Type unk
- [2022zic](#) in [NGC 7620](#) at Mag 18.2 Type Ib
- [AT2022zia](#) in [NGC 3859](#) at Mag 18.3 Type unk
- [2022ybd](#) in [UGC 10717](#) at Mag 18.4 Type Ia
- [AT2022zhz](#) in [IC 2023](#) at Mag 18.5 Type unk
- [2022ydr](#) in [UGC 10949](#) at Mag 18.7 Type Ia-91bg
- [AT2022yms](#) in [NGC 7038A](#) at Mag 18.8 Type unk
- [2022vyc](#) in [UGC 3057](#) at Mag 18.9 Type IIP
- [AT2022xuw](#) in [UGC 3104](#) at Mag 19.0 Type unk
- [AT2022xkw](#) in [IC 632](#) at Mag 19.0 Type unk
- [AT2022yyz](#) in [UGC 11404](#) at Mag 19.3 Type unk
- [AT2022yma](#) in [MCG -1-9-6](#) at Mag 19.5 Type unk
- [AT2022xod](#) in [UGC 4958](#) at Mag 19.7 Type unk
- [AT2022zea](#) in [IC 260](#) at Mag 19.9 Type unk
- [AT2022yvg](#) in [anonymous](#) at Mag 19.9 Type unk
- [2022ywf](#) in [NGC 493](#) at Mag 20.0 Type Ia-02cx
- [AT2022ymh](#) in [NGC 673](#) at Mag 20.5 Type unk

Other versions of this list, For the year 2022 (see the [archives](#))

- [Sorted by Location \(R.A.\)](#)
- [Sorted by Location \(Decl\)](#)
- [Sorted by Date](#)
- [Sorted by Magnitude](#)
- [Sorted by Red Shift](#)
- [Sorted by Host name](#)
- [Sorted by Name](#)
- [Statistics](#)

Spectra targets (updated 11/5)

- [AT2022mtr](#) in [ESO 44-G22](#) at Mag 19.3* (zhost=0.010193)
- [AT2022qwl](#) in [NGC 3250](#) at Mag 18.3* (zhost=0.009420)
- [AT2022qqo](#) in [NGC 3078](#) at Mag 18.5* (zhost=0.008606)
- [AT2022zjo](#) in [NGC 2152](#) at Mag 16.5 (zhost=0.028430)
- [AT2022ylu](#) in [ESO 351-G28](#) at Mag 17.5 (zhost=0.011628)
- [AT2022zjj](#) in [ESO 89-G19](#) at Mag 17.8*
- [AT2022wvj](#) in [IC 62](#) at Mag 17.8* (zhost=0.038643)
- [AT2022ydu](#) in [NGC 3383](#) at Mag 17.9 (zhost=0.012172)
- [AT2022zjc](#) in [NGC 2650](#) at Mag 18.2 (zhost=0.012762)
- [AT2022zlj](#) in [LEDA 90023](#) at Mag 18.3 (zhost=0.014417)
- [AT2022zia](#) in [NGC 3859](#) at Mag 18.3 (zhost=0.018240)
- [AT2022xav](#) in [NGC 2944](#) at Mag 18.7 (zhost=0.022749)
- [AT2022znt](#) in [ESO 314-G4](#) at Mag 18.5 (zhost=0.005159)
- [AT2022zhz](#) in [IC 2023](#) at Mag 18.5 (zhost=0.032676)

Other versions of this list, For the year 2021 (see the [archives](#))

- [Sorted by Location \(R.A.\)](#)
- [Sorted by Location \(Decl\)](#)
- [Sorted by Date](#)
- [Sorted by Magnitude](#)
- [Sorted by Red Shift](#)
- [Sorted by Host name](#)
- [Sorted by Name](#)
- [Statistics](#)

Contribute to transient astronomy

Reporting on work done in collaboration with Geoff Marcy, Sofia Mikulasek, and Luke Suess

Deep Springs Observatory

Oct. 24, 2022

10" CFF Telescopes Ritchey-Chretien

SN 2022vqz

CBB filter

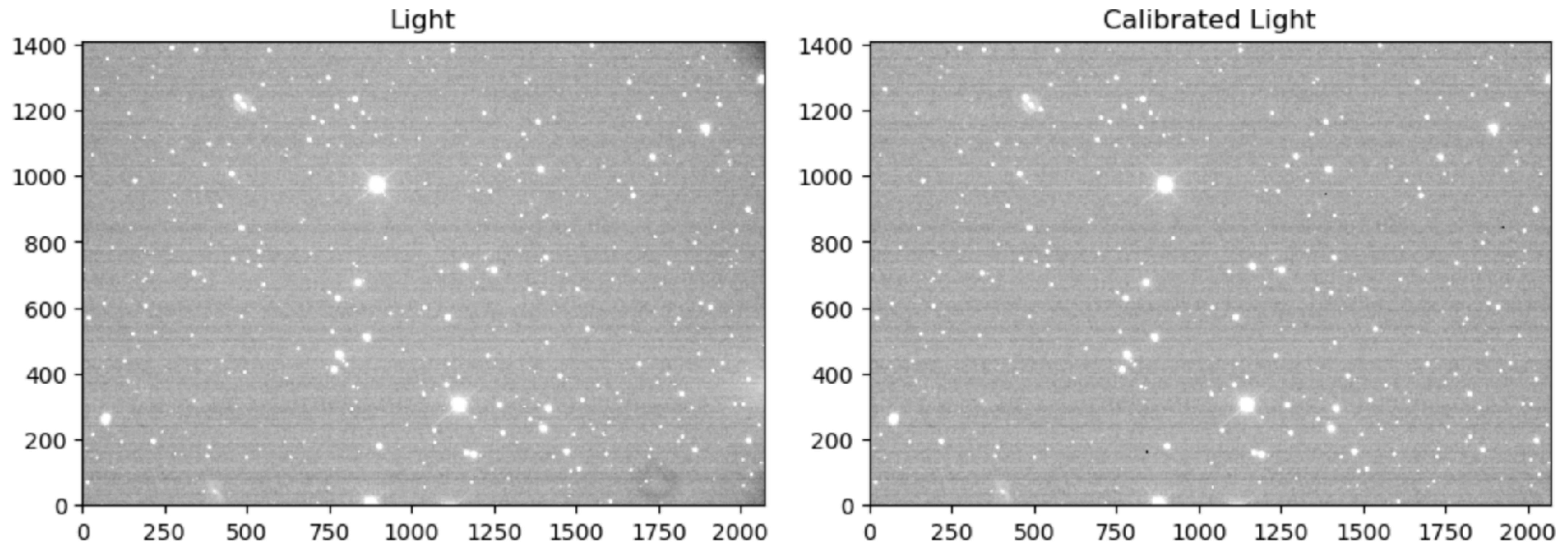
30-second exposure



Contribute to transient astronomy

Since the observations on Oct. 24th (for the last three weeks) we have been building a data-processing pipeline in Python:

http://github.com/brianhill/transient-astronomy/blob/master/analyses/2022-10-2425-SN_2022vqz/analysis-brian.ipynb



Our calibrated images appear to have both vignetting and the shadows of dust motes well-removed.

Conclusion

- Thank you for keeping the basin and range skies dark!!
- We can collaborate with BRDSC researchers to measure zenith brightness at our location (and also the brightness in the west in the direction of Bishop's or Fresno's light dome?).
- Astronomers: arrange a visit and kibbitz. We always appreciate pointers, and we built our observatory so that it is easy to set up other equipment in it (tripods currently — no permanent pier — yet!).
- Expect quality supernovae photometry from us in a few months.
- Geoff, Sofia, Luke, and I will be continuously updating our progress during this winter and the spring of 2023 here:

<https://brianhill.github.io/transient-astronomy>

- To contact me prior to visiting: brianhill (at) deepsprings (dot) edu

