

The Bays Mountain Astronomy Club Newsletter

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Cosmic Reflections

William Troxel - BMAC Chair



reetings and welcome to March fellow BMAcCers!

First, let me say “thank you” to everyone for logging in last month. I really enjoyed hearing about the process of searching for supernovae. I hope you enjoyed it as well.

Before I write about the upcoming meeting, I wanted to remind each of you that I need your help with ideas for upcoming programming you would like to hear. I know I sound like a broken record , however I really hope you will share your ideas with me. This is your club as well as mine. I feel sure that there are some of you that have great ideas and even programs that you would like to share. I have written this before and I still stand behind it. And, I will be happy to help you prepare with the presentation if you like. Please consider it and let me know. Either way, your ideas and thoughts would really help me out as I look for ideas, themes, fun things to do or games we could play.

Don't forget to get your new, or new to you, equipment that you would like to share during our Show & Tell (I still have not come up with a really cool name for this. Maybe one of you can think of something cool.) Also, If you have had a chance to get out and take any pictures, be sure and share them with Adam so he can add them to the monthly newsletter. I also wanted to remind you about the new format of the magazine. I personally think it is really very cool.

I am very excited to have for this month's Zoom meeting, Luci Finucan, of the Green Bank Observatory Science Center. We will be given a virtual tour of the campus and also an overview of the public programs that are offered to the general public. I think you'll really like to see what they have.

Until next time, this is your chairman saying...

Clear Skies!

BMAC Notes



Astro Resources



reetings! I receive the occasional e-mail with some interesting astronomy resources. I'd thought I'd share some with you here. The following content is from Andrew Fraknoi's February message for the Astronomical Society of the Pacific.

Free Resource Guide about Light Pollution and Other Environmental Issues

For astronomers, trying to collect the faint light of distant objects, the "light pollution" from human activity has become a serious problem. This guide lists a selection of introductory, non-technical resources that describe the problem and our efforts to safeguard the dark. There is a separate section on the new threat posed by swarms of satellites in low orbit through which commercial companies are competing to provide internet service. These may ruin all astronomical photographs in the future. And there is a section on the crowding of radio channels needed for radio astronomy. The **guide** is available free.

Free NASA Manual on Astrophotography with a Smartphone

This free, illustrated 189-page **guide** features instructions and information for how to use your smartphone to take photographs of the night sky and a variety of astronomical objects. It is written by astronomer/educator Sten Odenwald (with input from 50 amateur astrophotographers) and published by NASA's Goddard Space Flight Center in PDF format.

Free OpenStax Astronomy Textbook Used by 1,100+ Instructors in North America

OpenStax is a non-profit project at Rice University to provide a high-quality, free, open-source textbook in every introductory college subject. Their **astronomy book**, written by Andrew Fraknoi, David Morrison, and Sidney Wolff, with help from some 70 other astronomers and educators, is now used by more than 1,100 instructors and more than

160,000 students each year. An associated Open Education Resource Hub lists more than 35 free ancillary materials, including free short videos, free lab exercises, free PowerPoint slides, and much more. The publisher estimates that students have saved over \$39 million in astronomy textbook costs since the book appeared.

Updated Resource Guides

The following resource guides on a range of topics have been updated in the recent past. Each has a handy short URL to make it easier to convey to students.

- **The Contributions of Women to Astronomy**
- **Black Lives in Astronomy**
- **Responding to Astronomical Pseudo-Science**
- **This Day in Astronomical History** (158 events)

- **Source:**
- © 2021 Astronomical Society of the Pacific, All rights reserved.
- Mailing address:
 - Astronomical Society of the Pacific, 390 Ashton Ave, San Francisco, CA 94112-1722

BMAC February 2021 Meeting Quiz Review

2020 Discoveries in Astronomy - Questions & Choices

1. The Arecibo Observatory collapsed after serving for 90 plus years in the jungles of Puerto Rico in December 2020. True or False.
2. On Sept. 14, 2020, a team of astronomers announced that they had detected the chemical fingerprint of phosphine. Where? A: Surface of Mars, B: Venus's Atmosphere, C: Asteroid Ryugu, D: None of the above.
3. The glassy substance from the Yutu-2's panoramic and hazard avoidance and VNIS instrument, what was first thought to be gel-like, now is believed to have formed in an impact or a volcanic eruption. True or False.
4. The solar orbiter's heat shield that is studying the heliosphere around our star, is designed to withstand temperatures of: A: 140,000°C, B: 1,000°F, C: 970°F 56%, D: $(160 \times 10^{10})^2$.
5. The Spitzer Space Telescope was put into permanent hibernation on Jan. 30, 2020. The team announced that the telescope will be recovered in the future and repurposed for future missions. True or False.
6. The Event called the "Great Conjunction" happen on December 21, 2020, which happened on the same day as the northern hemisphere's winter solstice. They were separated by: A: 105', B: 0.1°, C: 1,500 ly, D: 1,000,000 miles.
7. In a story published in the Harvard-Smithsonian Center for Astrophysics Journal and the Astronomical Journal, two high school students discovered four new exoplanets about 200 light years away from Earth. True or False.

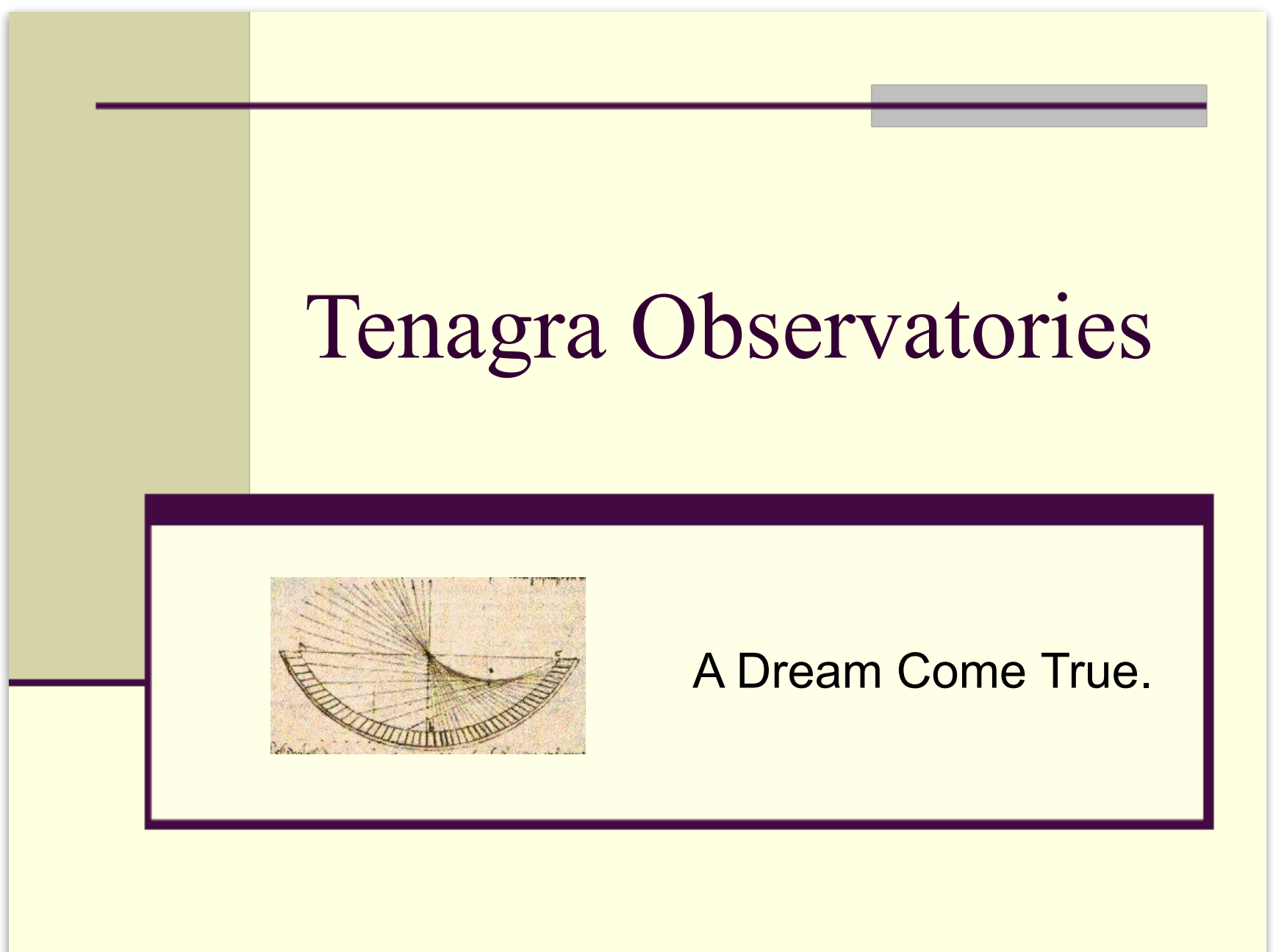
Choices with Answers Key

Q	Choices with Percent Response								Correct Answer
	A	%	B	%	C	%	D	%	
1	TRUE	67%	FALSE	33%					False. Served only 57 years.
2	Surface of Mars	0%	Venus's Atmosphere	89%	Asteroid Ryugu	11%	None of the above	0%	B
3	TRUE	78%	FALSE	22%					True. In an impact or volcanic eruption
4	140,000°C	44%	1,000°F	0%	970°F	56%	$(160 \times 10^{10})^2$	0%	C
5	TRUE	33%	FALSE	67%					False. Will most likely break apart as a debris field.
6	105'	0%	0.1°	100%	1,500 ly	11%	1,000,000 miles	11%	B (Someone or two persons chose more than one answer.)
7	TRUE	100%	FALSE	0%					True. On January 28, 2020.

"Searching for Superstars" Presentation Slides - February 2021 Speaker

Michael Schwartz from Tenagra Observatories LTD in Nogales, AZ

Our speaker from last month's Zoom meeting was gracious enough to let us share his Power Point slides. The image quality should be good enough to magnify the view to read all the tiny text.



"Searching for Superstars" - Slide 1 of 21

Where It All Started.

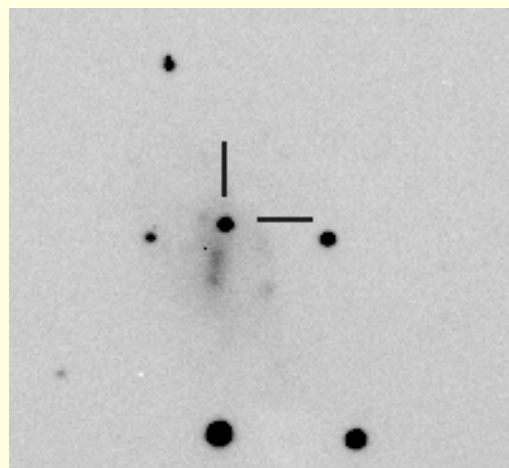
- Humble beginnings. Searches with my 8" telescope. Can supernovae be found with a "small" telescope?
- First Bisque Paramount.
- First back illuminated CCD.
- Discoveries! Three in 3 weeks!



"Searching for Superstars" - Slide 2 of 21

Supernovae 1997cx in NGC 3057.

- Two major discoveries in my life and each time I fell down.
- Other discoveries followed.
- I became obsessed with the automated telescope.
- I was hopelessly in its evil grip.



"Searching for Superstars" - Slide 3 of 21

Taking Root.

- We found the lovely little town of Patagonia, AZ. There was a great site about 20 minutes out of town.
- Construction began.
- Note that domes are done before the house.
- 32" ordered. 20" on the way.



"Searching for Superstars" - Slide 4 of 21

A Magnificent Telescope

- Designed for Automation.
- Purely experimental.
- Sort of scary looking, sort of not.
- No eyepiece.
- A genius designer.
- Spooky software.
- Big day.



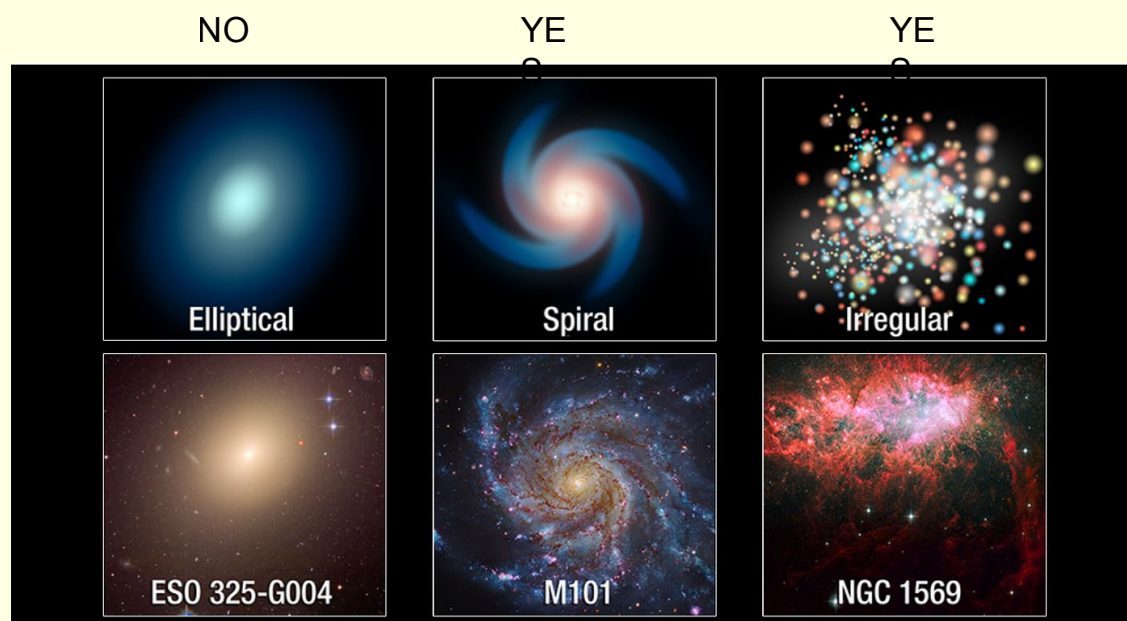
"Searching for Superstars" - Slide 5 of 21

Partial List of Discovered Supernovae

2008bq	ESO 308-G25	2008 04 02 06 41.0 -38 02	5W	10S	CBET	1328	2008bq	Lucas,Trondal,Schwartz
2007as	ESO 18-G18	2007 03 13 09 27.6 -80 11	12W	9N	IAUC	8822	2007as	Lucas,Trondal,Schwartz
2006te	Anon.	2006 12 28 08 11.7 +41 33	6W	2S	IAUC	8789	2006te	Trondal,Lucas,Schwartz
2006du	IC 1529	2006 07 18 00 05.2 -11 29	13W	45N	IAUC	8733	2006du	Lucas,Trondal,Schwartz
2006ck	UGC 8238	2006 05 20 13 09.7 -01 03	10W	3S	IAUC	8713	2006ck	Lucas,Trondal,Schwartz
2006bs	MCG +00-27-14	2006 04 19 10 26.9 -03 43	10E	4S	IAUC	8705	2006bs	Lucas,Trondal,Schwartz
2006au	UGC 11057	2006 03 07 17 57.2 +12 11	17W	18N	IAUC	8687	2006au	Trondal,Lucas,Schwartz
2006ai	ESO 5-G9	2006 02 17 07 29.9 -84 02	2W	2S	IAUC	8674	2006ai	Lucas,Trondal,Schwartz
2006Y	Anon.	2006 02 03 07 13.3 -51 41	2W	5N	IAUC	8668	2006Y	Lucas,Trondal,Schwartz
2005my	ESO 302-G27	2005 12 30 04 01.9 -41 56	16E	23N	CBET	346	2005my	Lucas,Trondal,Schwartz
2005gm	NGC 1423	2005 10 09 03 42.7 -06 23	12W	9S4	IAUC	8616	2005gm	Lucas,Trondal,Schwartz
2005dk	IC 4882	2005 08 21 19 40.4 -55 12	3E	16S	IAUC	8586	2005dk	Lucas,Trondal,Schwartz
2005dc	NGC 7107	2005 07 26 21 42.4 -44 47	41W	10N2	IAUC	8575	2005dc	Lucas,Trondal,Schwartz
2005bt	UGC 8205	2005 04 20 13 07.2 +58 08	4W	2N	IAUC	8518	2005bt	Trondal,Holvorcem,Schwartz
2005Z	NGC 3363	2005 01 31 10 45.2 +22 05	6W	4S	IAUC	8476	2005Z	Trondal,Schwartz,LOSS
2005K	NGC 2923	2005 01 15 09 36.1 +16 46	7E	10N	IAUC	8468	2005K	Trondal,Schwartz
2005J	NGC 4012	2005 01 16 11 58.5 +10 01	14E	7S	IAUC	8467	2005J	Trondal,Schwartz
2004ey	UGC 11816	2004 10 14 21 49.1 +00 27	8E	13S	IAUC	8419	2004ey	Trondal,Schwartz
2004ex	NGC 182	2004 10 11 00 38.2 +02 43	33W	25S	IAUC	8418	2004ex	Trondal,Schwartz,LOSS
2003iv	MCG +02-8-14	2003 10 17 02 50.1 +12 51	23W	8N	IAUC	8226	2003iv	LOTOSS
2003is	MCG +07-40-3	2003 10 14 19 21.1 +43 20	4W	4N	IAUC	8224	2003is	LOTOSS
2003ir	UGC 3726	2003 10 11 07 11.1 +25 55	15E	0S	IAUC	8221	2003ir	LOTOSS
2003ip	UGC 327	2003 10 01 00 33.3 +07 54	20E	1N	IAUC	8214	2003ip	LOTOSS
2003in	IC 1956	2003 09 30 03 35.6 +05 04	3E	8S	IAUC	8214	2003in	LOTOSS
2003im	Anon.	2003 09 30 00 45.0 -08 53	2E	12N	IAUC	8214	2003im	LOTOSS
2003ig	UGC 2971	2003 09 22 04 09.7 +37 01	2E	11N	IAUC	8207	2003ig	LOTOSS
2003if	NGC 1302	2003 09 20 03 19.9 -26 04	19E	12S	IAUC	8206	2003if	LOTOSS
2003id	NGC 895	2003 09 16 02 21.6 -05 32	11W	35S	IAUC	8201	2003id	LOTOSS
2003ic	MCG -02-2-86	2003 09 16 00 41.8 -09 18	2W	8S	IAUC	8201	2003ic	LOTOSS
2003ib	MCG -04-48-15	2003 09 16 20 33.5 -24 37	1E	10N	IAUC	8201	2003ib	LOTOSS
2003hz	Anon.	2003 09 14 05 48.1 +46 15	3W	2N	IAUC	8201	2003hz	LOTOSS
2003hx	NGC 2076	2003 09 12 05 46.8 -16 47	5W	3S	IAUC	8199	2003hx	LOTOSS
2003hw	Anon.	2003 09 08 03 01.8 +35 45	3E	2N	IAUC	8198	2003hw	LOTOSS
2003hv	NGC 1201	2003 09 09 03 04.2 -26 05	17E	57S	IAUC	8197	2003hv	LOTOSS
2003ht	UGC 2457	2003 09 01 02 59.9 +24 14	4E	5N	IAUC	8192	2003ht	LOTOSS
2003hs	UGC 11149	2003 08 31 18 11.2 +49 52	11E	16N	IAUC	8191	2003hs	LOTOSS

"Searching for Superstars" - Slide 6 of 21

Choosing Your Galaxies



"Searching for Superstars" - Slide 7 of 21

- (1) Use a scheduler if you have one.
- (2) Adjust exposure to go to V-mag < 19.
- (3) Find all spirals and irregulars visible during observing session.
- (4) Choose galaxies relatively nearby. Hubble recession velocity.
- (5) Image as many galaxies as possible.
- (6) Access reference image. Compare.
- (7) Check for “anomalies” (Known SN, MP ..)
- (8) REPORT!

Bright Supernova Page
<http://www.rochesterastronomy.org/snimages/>

"Searching for Superstars" - Slide 9 of 21

Is it a Minor Planet?

<http://www.rotse.net/temp/CheckMP2.html>

MPChecker: Minor Planet Checker

Use the form below to prepare a list of known minor planets in a specified region. Notes on using this form are given at the bottom of this page.

You are strongly urged to use the [NEOChecker](#) (or another of the checker forms) for checking NEO candidates.

If you wish to report the non-functioning of (or errors in) this service, please use [this feedback form](#). But ensure that you have seen the note on computing limits at the bottom of this page before reporting anything.

[Produce list](#) [Clear/reset form](#)

Date : 2021 02 04.76 UT

Produce list of known minor planets around:

☒ this J2000.0 position: R.A. = Decl. =

or around ☐ these observations:

Radius of search = 5 arc-minutes

Limiting magnitude, V = 24.0 Observatory code = 500

"Searching for Superstars" - Slide 10 of 21

Is Your Supernova Candidate Real?

1. Have you found something and is it new?

Please check the following to verify that you have made a discovery:

- **Is it an image artifact?** Can you confirm that what you have seen is real and not an instrumental artifact? "Ghost images" caused by nearby bright objects can be deceptive. Have you confirmed your observation on a second night and obtained multiple CCD or photographic exposures?
- **What type of object is it?**
 - **Motion:** How much does the object move?
 - Definitely detectable movement — it could be a comet or minor planet.
 - Some movement — it could be a comet or minor planet.
 - No detectable movement — it could be a supernova or a nova.
 - **Brightness:** If the object's brightness fluctuates, but it is neither a nova nor a supernova it could be:
 - An outburst of an unusual variable star (for example, a fading R CrB-type star, or an outburst from a cataclysmic variable for the first time in more than two years).
 - A normal variable or new variable star.
- **Check the location.** Have you checked whether there is an existing object at the location? Put the coordinates into a good sky atlas, for instance:
 - [WIKISKY](#)
 - [The Digitized Sky Survey](#)
- **Check lists:** Please consult a list of known objects, for instance:
 - Nebulae and galaxies: the [Sesame](#) name resolver is a good service for an overview of objects in the vicinity.
 - Comets and minor planets/asteroids:
 - [Minor Planet Circulars](#)
 - The annual [Comet Handbook](#) of the [International Comet Quarterly](#)
 - [The online ephemerides of the Minor Planet Center](#)
 - The annual [Handbook of the British Astronomical Association](#)
 - It is also a good idea to contact a local observatory (or one or more experienced amateur astronomers) privately (not publicly) to ask for confirmation before reporting your discovery.
 - Supernovae:
 - [Transient Name Server \(TNS\)](#)
 - [Online form to check for minor planets](#)
 - [General Catalogue of Variable Stars](#)
 - [The AAVSO's online list of variable stars](#)
 - Novae or variable stars:
 - [Online form to check for minor planets](#)
 - [General Catalogue of Variable Stars](#)
 - [The AAVSO's online list of variable stars](#)

"Searching for Superstars" - Slide 11 of 21

2. What to include when reporting a new object

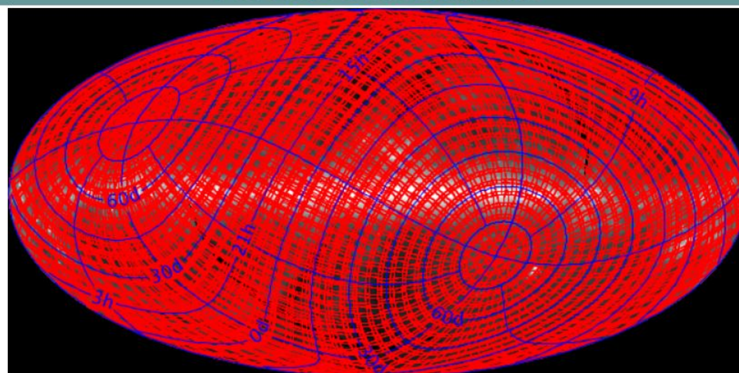
General reporting information should include:

- An accurate position and time (especially for comets and minor planets).
- A reasonable description of the object including (where possible) its magnitude.
- A precise position for the suspect.
- Your full name and contact details.
- Information on your observing location, the instrument used to detect the object and the sources you have checked to rule out alternative explanations.
- Information on how you have determined that the object is new.
- For more detail on what to report for a specific object please go to:
 - For comets: [The Central Bureau for Astronomical Telegrams comet discovery page](#)
 - For novae and outbursts of unusual variable stars: [The Central Bureau for Astronomical Telegrams discovery page](#)
 - For astronomical transients (ATs) such as supernova candidates: [Transient Name Server \(TNS\)](#)
 - For minor planets: [The Minor Planet Centre](#)

"Searching for Superstars" - Slide 12 of 21

<https://irsa.ipac/Caltech.edu>

DSS Data Collection Atlas



You can get a close-up map of a region by clicking on any area in red on the above image, or by typing a coordinate below.

The Digitized Sky Survey (DSS) is a ground-based imaging survey of the entire sky in several colors. The survey, performed with Palomar and UK Schmidt telescopes, produced photographic plates that were later digitized at the Space Telescope Science Institute (STScI) to produce the Hubble Guide Stars Catalog (GSC).

Each plate produced by the Survey covers 6.5 x 6.5 degrees of the sky, and the plates have been digitized using a modified PDS microdensitometer. The digital images have a pixel size of either 25 microns (1.7 arcsec per pixel) or 15 microns (1.0 arcsec per pixel), and are 14000 x 14000 or 23040 x 23040 pixels per side. The images are stored on 12-inch optical media and are difficult to access quickly.

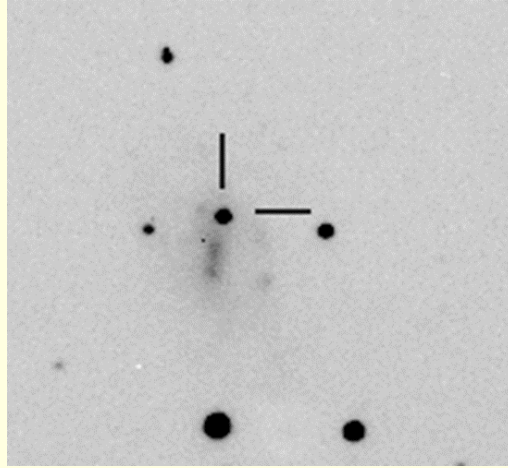
The [DSS FAQ](#) is available at STScI, where these data originated. Additionally, please see the [Schmidt Plate Summary](#), [Transmission Curves for Photometric Bandpass](#) plots and DSS [Photometric Calibration](#) information. A list of tiles with known problems is available [here](#).

DSS images are represented as overlays in red on the ISSA all-sky composite image above. Either type in a coordinate or click on any red region to get a close-up of the area; the size of the search is adjustable.

DSS cutouts can be accessed [here](#).

"Searching for Superstars" - Slide 13 of 21

Sample Image – 1997cx
RA = 10h 05m 39s DEC = 80° 17' 07" 5"



"Searching for Superstars" - Slide 14 of 21

<http://www.rotse.net/temp/CheckMP2.html>

MPCChecker: Minor Planet Checker

Use the form below to prepare a list of known minor planets in a specified region. Notes on using this form are given at the bottom of this page.

If you wish to report the non-functioning of (or errors in) this service, please use [this feedback form](#). But ensure that you have seen [this note on computing limits](#) before reporting anything.

Date : UT

Produce list of known minor planets around:

☒ this J2000.0 position: R.A. = Decl. =

or around ☐ these observations:

Radius of search = arc-minutes

Limiting magnitude, V = Observatory code =

Output matches in order of:

☒ increasing distance from specified position ☐ increasing Right Ascension

Display motions in arcseconds per ☐ minute or ☐ hour
or ☒ degrees per day

Display ☐ total or ☒ separate motions

Output designations in ☒ unpacked or ☐ packed form

"Searching for Superstars" - Slide 15 of 21

Check a single or batch galaxies.

Digital Sky Survey Atlas (DSS) Cutouts

Cutouts Instructions

Program Interface

DSS Archive

The Digitized Sky Survey copyright © 1994, Association of Universities for Research in Astronomy, Inc. The Digitized Sky Surveys were produced at the Space Telescope Science Institute under U.S. Government grant NAG W-2166. DSS participating organizations: [Royal Observatory \(ROE\)](#), [Anglo-Australian Observatory \(AAO\)](#), [The Association of Universities for Research in Astronomy \(AURA\)](#), [Space Telescope Science Institute \(STScI\)](#)

Single Location

Coordinate/Object:

UGC 11816

Cutout Size:

240

(arcsec) [range: 1-1600 arcsec]

Coordinate Examples:

• 270.92194 -24.38017 eq

• 18h 03m 41.27s -24d 22m 48.6s

• 5.97109 -1.17751

• M 8

Default: Equatorial J2000

NOTE: For single cutouts of DSS data larger than 1600 arcsec, you can use [Atlas](#), where the search size acts as your cutout size, up to 6.5 degrees.

Multiple Positions
(User Table Upload)

Table

Browse...

No file selected.

Uniform Cutout size (arcsec) [range: 1-1600 arcsec]:

240

Or, specify a non-uniform cutout size here for each position in the table using a cutout size column name:

Cutout size column name:

Submit

Reset

Select All Data Sets

De-select All Data Sets

Select	DSS Data Set
<input checked="" type="checkbox"/>	DSS red images
<input type="checkbox"/>	DSS blue images
<input type="checkbox"/>	DSS IR images

"Searching for Superstars" - Slide 16 of 21

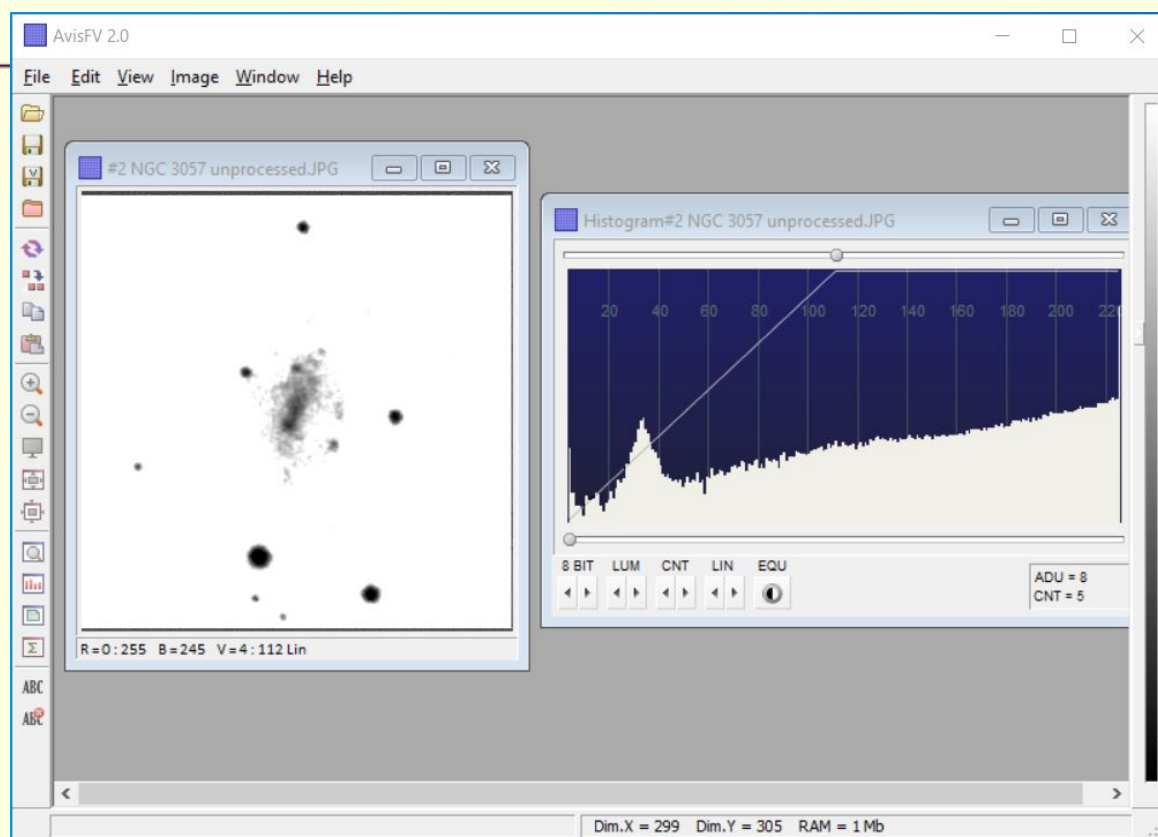
"Searching for Superstars" - Slide 17 of 21

March 2021

The Bays Mountain Astronomy Club Newsletter

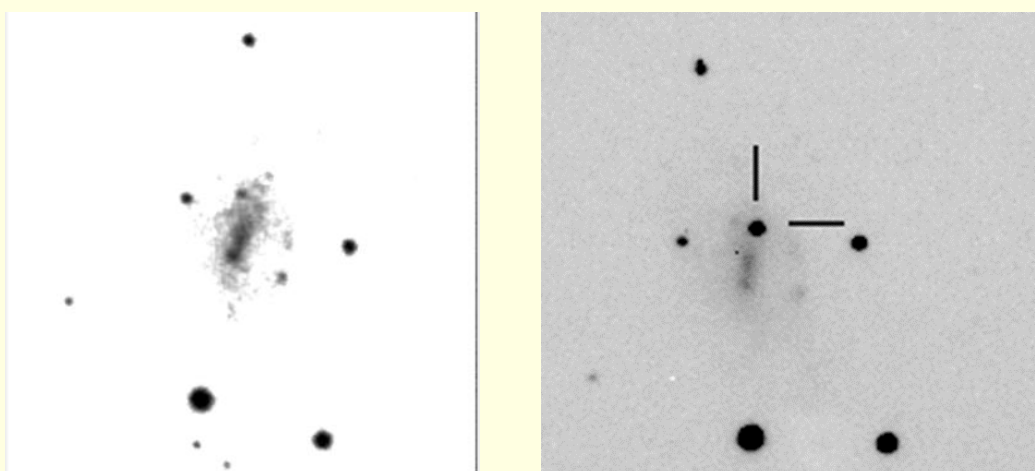
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Process using your favorite program.



"Searching for Superstars" - Slide 18 of 21

Compare.
CHECK!



"Searching for Superstars" - Slide 19 of 21

It's Real? REPORT!

2. What to include when reporting a new object

General reporting information should include:

- An accurate position and time (especially for comets and minor planets).
- A reasonable description of the object including (where possible) its magnitude.
- A precise position for the suspect.
- Your full name and contact details.
- Information on your observing location, the instrument used to detect the object and the sources you have checked to rule out alternative explanations.
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 - For astronomical transients (ATs) such as supernova candidates: [Transient Name Server \(TNS\)](#)
 - For minor planets: [The Minor Planet Centre](#)

When you have collected this information proceed to Section 3 for information on where to report your object.

3. Where to report your object

- Astronomical transients (ATs) such as supernova candidates: [Transient Name Server \(TNS\)](#)
- Comets, novae and outbursts of unusual variable stars: [Central Bureau for Astronomical Telegrams \(CBAT\)](#)
- More routine or new variable stars:
 - [American Association of Variable Star Observers](#)
 - The International Astronomical Union's Commission on Variable Stars, [Konkoly Observatory](#), Budapest.
- Minor planets/asteroids:
 - [The Minor Planet Center](#)

"Searching for Superstars" - Slide 20 of 21

SUCCESS!
YOU DISCOVERED YOUR FIRST
EXTRAGALACTIC SUPERNOVA!



"Searching for Superstars" - Slide 21 of 21

Celestial Happenings

Jason Dorfman





With the arrival of March, we begin a month of transition. In the night sky, Orion and Taurus of the winter sky are heading down towards the western horizon while the constellations of our spring sky, such as Leo and Virgo, are rising in the east. The seasons will officially transition on the 20th at 5:37 a.m., the time of the Vernal Equinox when the Sun crosses the Celestial Equator moving from south to north along the ecliptic. We'll also experience a transition of time as we set our clocks ahead an hour on the morning of the 14th for Daylight Saving Time.

As we leave winter behind us, we'll continue to see the daylight hours lengthen and the nights come later. The Sun will rise at 7:00 a.m. as the month begins and, even though it will rise 45 minutes earlier by the end of the month, the sunrise time at the end of March will be 7:17 a.m. due to the shift to Daylight Saving Time. The time of sunset is even more exaggerated due to this shift as it changes from 6:25 p.m. to 7:51 p.m.

Planets

We begin our exploration of planetary targets with one that has been in the forefront of space news this week, the Red Planet - Mars. I'm writing this after having watched a press briefing for the Mars 2020 Perseverance Rover after it successfully landed yesterday (February 18, 2021) in Jezero Crater on the surface of Mars. The briefing showcased an image taken from the descent stage looking down onto the rover suspended from its support cables about two meters above the surface of the planet (See Celestial Happenings - Image 1). In the coming weeks, we should see video from the landing and also hear audio from Mars for the first time! This will come from several GoPro-type cameras that were mounted on the capsule and descent stage. As an audio person, I'm really curious what it will sound like on Mars. More amazing firsts for NASA, JPL and all their partners are still to come as they continue to push the boundaries of what we can achieve as we explore the Solar System.

As you take your next (or maybe your first) view of the Red Planet through your scope, realize that you are seeing a similar view as what others have seen for hundreds of years. Think about all the different imaginations that people have had over the years for what (or

who) might be on the surface of Mars. And appreciate the awesomeness that you can now go and see actual imagery of that surface. And, hopefully soon, hear what it sounds like!



Celestial Happenings - Image 1

The Perseverance Rover as it descends to the Martian surface February 18, 2021. Image from NASA.

If I've inspired you to gaze upward at Mars, then look towards the SW an hour after sunset and you'll find it almost 62° high floating amongst the background stars of Taurus. It starts out the month at magnitude $+0.9$ and about 3° south of the Pleiades star cluster. Mars will move slowly eastward through Taurus, passing north of the Hyades star cluster through the bull's horns (See Celestial Happenings - Image 2). Take a gaze on the 18th and you'll catch the bright, red giant star Aldebaran about 7° south of Mars with a wide crescent Moon 3° to its southeast.

The telescope views of Mars remain underwhelming as the distance between our two planets continues to increase. The disk of the planet spans a small 6" as March begins and will decrease by about 1" by month's end. On the 31st, Mars will still sit fairly high an hour after sunset at 50° above the western horizon, though its brightness will have faded a bit to magnitude +1.3. On this night, Betelgeuse, the brighter, red giant star in Orion, sits to the left of Mars at a similar altitude.



Celestial Happenings - Image 2

The planet Mars as it travels eastward (right to left) through the constellation of Taurus the Bull for the month of March, 2021. Image from Stellarium.

To continue our exploration of planetary targets, we must turn now to the early morning skies. We begin with swift Mercury that made a brief appearance in both the evening and morning skies last month as it moved from the east to the west side of the Sun. On the 1st,

Mercury sits just 5° high in the ESE about 45 minutes before sunrise. At magnitude +0.15, the earlier you can spot it, the better, as you'll soon be competing with the brightening morning twilight. Saturn glimmers dimly at magnitude +0.7 about 5° to the right and above Mercury and mighty Jupiter shining brightly at magnitude -1.98 sits about 3° just to the lower left of Mercury. On the morning of the 5th, the smallest planet and the largest planet in the Solar System will rise together separated by less than half a degree. By then, Mercury, which lies to the left of Jupiter, will have brightened slightly to magnitude +0.07.

Mercury will reach its greatest western elongation the next day. It will stand 27.3° west of the Sun. However, with the ecliptic at a lower angle to the horizon, Mercury will still not rise too high before the morning sky begins to brighten. If you're able to catch a glimpse in a telescope, you'll find the disk spanning 7" and looking slightly gibbous at 57% illuminated. Over the next week, Mercury will continue to brighten as it continues around in its orbit revealing more of its sunlit side to us. However, you'll be competing more and more with the dawn twilight as its path brings it closer and closer to the Sun.

From the second week and onward, Jupiter and Saturn will become the prominent morning targets as they continue to climb higher each morning. On the 9th, about 2 hours before sunrise, Saturn rises just after a thin, waning crescent Moon sitting about 8° to its right. Jupiter appears a half hour later rising roughly 9° to the lower left of Saturn (See Celestial Happenings - Image 3). Just as the sky is beginning to brighten, about 45 minutes before sunrise, Jupiter will be roughly 5° high and Saturn will have climbed up to about 10° . By month's end, Jupiter will have increased its separation from Saturn to almost 12° as it moves more quickly eastward. On this final March morning, a half hour before sunup, Jupiter now stands roughly 16° high and Saturn about 21° above the SE horizon.



Celestial Happenings - Image 3

A great planetary conjunction to enjoy on the morning of March 9th, 2021, about 45 minutes before sunrise. Image from Stellarium.

Luna

Our Moon will appear nearly full at the start and end of March. With a full Moon near the end of February, March begins with a waning gibbous Moon rising shortly after 9 p.m. New Moon occurs on the 13th, a day before daylight saving time begins. The Moon rises as a full, bright orb on the evening of the 28th.

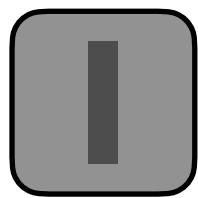
Good luck observing and thanks for reading!

The Queen Speaks

Robin Byrne



Book Review: *What Stars Are Made Of*

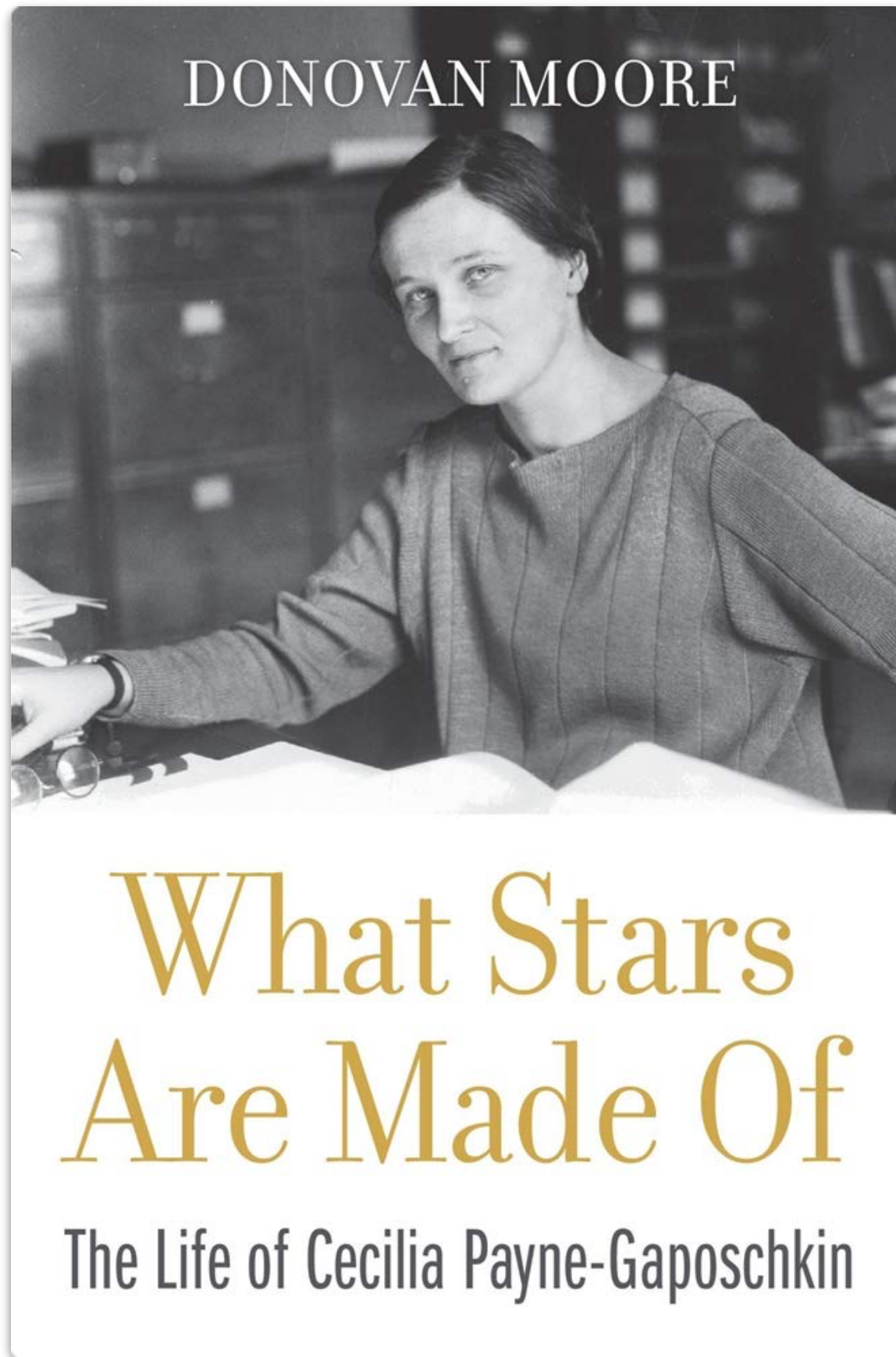


I've been reading a number of books about early female astronomers, so, of course, Amazon knows just what to recommend I should buy. *What Stars Are Made Of: The Life of Cecilia Payne-Gaposchkin* by Donovan Moore fit nicely into my collection (See Book Review: *What Stars Are Made Of* - Image 1).

In the book, we learn about the entire life of Cecilia. During her childhood, she developed an early interest in science, though it was primarily botany that fascinated her, with the other sciences of some interest. The schools she attended, however, were more focused on teaching young women how to be eloquent wives rather than scientists. Fortunately for Cecilia, she encountered a few teachers who helped nurture her interest in understanding the natural world.

In college, Cecilia was still planning to pursue botany as a career until she heard Arthur Eddington give a talk about his recent expedition to observe a solar eclipse to confirm Einstein's Theory of Relativity. After that, Cecilia knew that astronomy would be her life's passion. And she was definitely in the right place at the right time. Although she was officially attending school at Newnham College, the women's school connected to Cambridge, her science classes were all at Cambridge, which meant that Cecilia took courses from some of the greatest scientists of the time, including Bohr, Rutherford, and Eddington. The foundation for a budding astrophysicist was being solidly built.

Upon graduation in 1923, Payne knew that a woman would not find work as an astronomer in England because of the way women were viewed and expected to behave. Fortunately, she had met Harlow Shapley, the new director of the Harvard College Observatory, at a recent astronomical conference, and he implied that he might be able to use her on his staff. After much correspondence, and a lot of scraping together of funds, Payne had enough money to sail for America to a Fellowship funded by the observatory. Shapley did have an ulterior motive for bringing Payne to Harvard. He wanted to establish a graduate program in astronomy at Harvard, so he created Payne's Fellowship to support her financially while she worked toward a doctoral degree in astronomy.



Book Review: What Stars Are Made Of - Image 1

The cover to What Are Stars Made Of: The Life of Cecilia Payne-Gaposchkin by Donovan Moore

And that's just what Payne did, becoming not only the first woman to receive a doctorate from Harvard, but the very first person to earn an astronomy doctorate from the school. She combined all she had learned at Cambridge about atomic physics with the voluminous spectroscopic records kept by the Harvard Observatory. After years of effort, she discovered something unexpected. Prior to her discovery, everyone "knew" that the

entire Universe would have a composition that's the same as Earth, and in the same relative amounts. Payne's labors revealed that stars were primarily composed of Hydrogen. She was sure she had done something wrong. Henry Norris Russell was considered America's foremost expert on stars. When Payne shared with him her work, he essentially told her to include in her doctoral thesis that while these are the results of her calculations, they are most likely wrong. She did include that statement, and regretted doing so for the rest of her life. When Eddington heard of her results, he, too, was sure that she had misinterpreted her results. So here she was, with a major discovery, and the greatest astronomers of the time all dismissed it as erroneous. It took another decade for the rest of the astronomical community to accept what Payne already knew was true.

Meanwhile, now that she was Dr. Payne, her Fellowship was over and she needed an actual job. Shapley offered her a position at the observatory. The pay scale was insulting, but Payne felt a strong connection to the place and people, so she accepted it. The other down-side, she discovered, was that now that she was actually working for Shapley, instead of being a student doing research, meant that Shapley told her what projects to work on. So, instead of continuing her study of stellar spectra, Payne found herself investigating variable stars, instead. But her drive and passion for knowing and understanding the world around her meant that Payne approached the project with the same energy as she had the spectra.

As the astronomical community caught up with Payne in their understanding of the compositions of stars, her reputation grew. Now she was being invited to give talks around the country and around the world. Payne also started publishing books about stars that became popular text books at the time. It was at an astronomical conference in Germany in the 1930's that a young man approached her begging for help. Sergei Gaposchkin had been born in Russia, but attended college in Germany, only to discover he was no longer welcome in Germany with war on the horizon, but post-revolution Russia wouldn't welcome him either. He needed help to move to another country. He hoped the famous Cecilia Payne would be his savior. It turned out that she was. It took time, and a lot of help from Shapley, but Gaposchkin was eventually able to leave Germany for the United States to a job at Harvard Observatory.

With Payne and Gaposchkin now both working at the observatory, Shapley assigned them to work together on variable stars. Gaposchkin concentrated on eclipsing binary systems (the subject of his doctoral thesis), while Payne took the rest. At the same time, the two continued the friendly companionship that had begun in Germany. Eventually, they decided to run off and get married. Reportedly, Annie Cannon fainted at the news of the marriage, though that may be an “old astronomer’s tale.” Soon the Gaposchkin family began to grow, but that didn’t stop Payne from continuing to work, much to the horror of her contemporaries. She was a role model for working women, maintaining her career while still raising a family.

During all this time that Payne worked at the Harvard Observatory, and even taught classes at the university, she was not allowed to be a member of the faculty. That FINALLY changed in 1956, when she was appointed a professorship. So adding to her list of “firsts” at Harvard, now she was the first woman to become a full professor at Harvard. Very impressive accomplishments.

Sadly, Cecilia Payne-Gaposchkin died in 1979 of lung cancer, the result of a lifetime of being a very heavy smoker. Owen Gingerich was one of Payne’s graduate students, and he described her smoking during her lectures as starting with a pack of cigarettes and just a single match, literally chain smoking continuously through to the end of class.

The author, Donovan Moore, did a nice job of sharing Cecilia’s life with the reader, though there were times where I felt he was stretching to fill the book up by going into detail about the atmosphere of college life at Newnham. Once she arrived at the Harvard Observatory, the pace picked up, but that was already half-way through the book. All-in-all, though, I found the story of Cecilia Payne-Gaposchkin’s life to be very interesting and inspiring, and I would definitely recommend reading this book to learn more about this very note-worthy woman.

References:

What Are Stars Made Of: The Life of Cecilia Payne-Gaposchkin by Donovan Moore;
Harvard University Press, 2020

The Space Place - NASA Night Sky Network

David Prosper

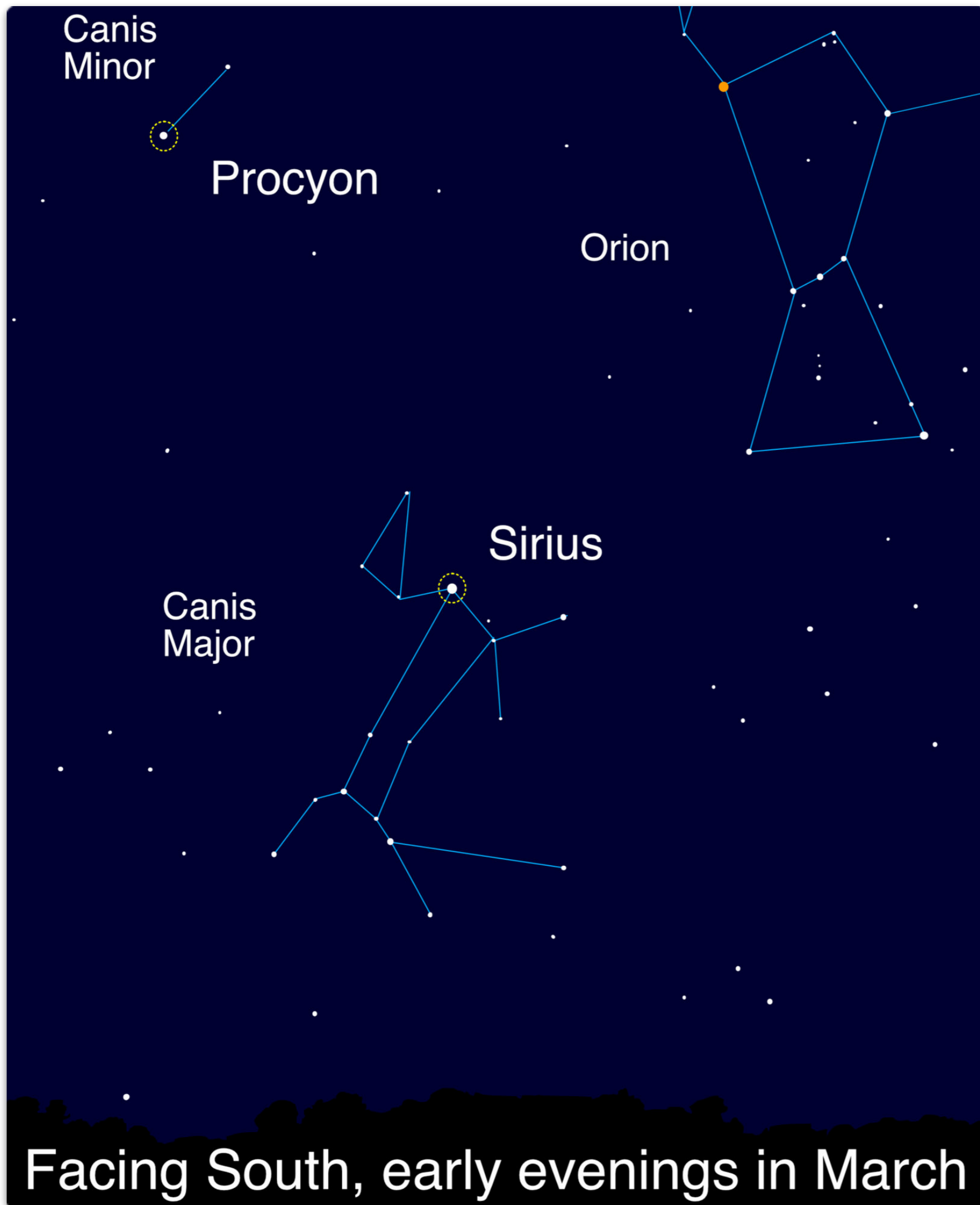
Taking the Dog Stars for a Springtime Walk: Sirius and Procyon!



arch skies feature many dazzling stars and constellations, glimmering high in the night, but two of the brightest stars are the focus of our attention this month: Sirius and Procyon, the dog stars!

Sirius is the brightest star in the nighttime sky, in large part because it is one of the closest stars to our Solar System at 8.6 light years away. Compared to our Sun, Sirius possesses twice the mass and is much younger. Sirius is estimated to be several hundred million years old, just a fraction of the Sun's 4.6 billion years. Near Sirius - around the width of a hand with fingers splayed out, held away at arm's length - you'll find Procyon, the 8th brightest star in the night sky (See Taking the Dog Stars for a Springtime Walk: Sirius and Procyon! - Image 1). Procyon is another one of our Sun's closest neighbors, though a little farther away than Sirius, 11.5 light years away. While less massive than Sirius, it is much older and unusually luminous for a star of its type, leading astronomers to suspect that it may "soon" - at some point millions of years from now - swell into a giant star as it nears the end of its stellar life.

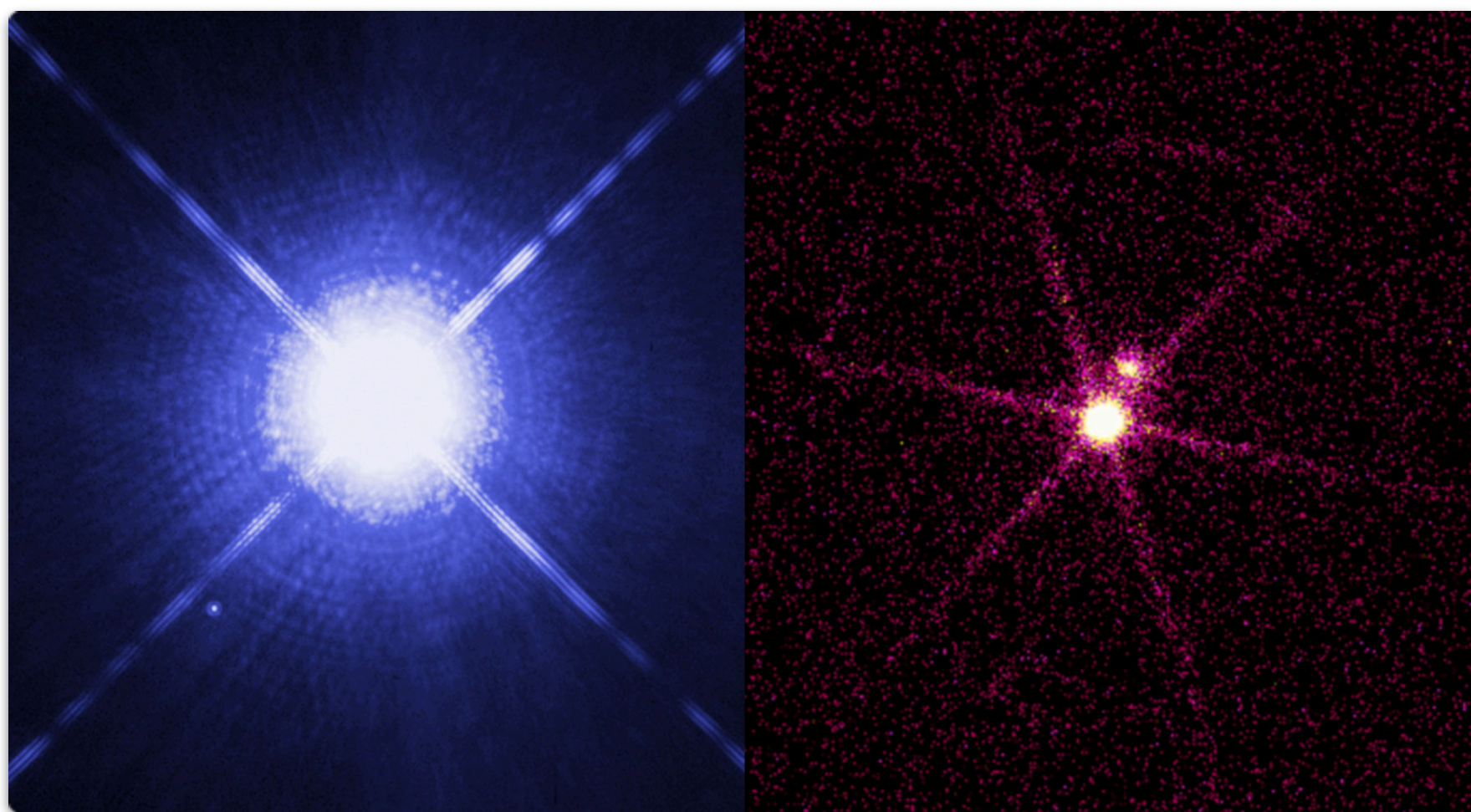
Sirius and Procyon are nicknamed the "Dog Stars," an apt name as they are the brightest stars in their respective constellations - Canis Major and Canis Minor - whose names translate to "Big Dog" and "Little Dog." Not everyone sees them as canine companions. As two of the brightest stars in the sky, they feature prominently in the sky stories of cultures around the world. Sirius also captures the imaginations of people today: when rising or setting near the horizon, its brilliance mixes with our atmosphere's turbulence, causing the star's light to shimmer with wildly flickering color. This vivid, eerie sight was an indication to ancient peoples of changes in the seasons, and even triggers UFO reports in the modern era!



Taking the Dog Stars for a Springtime Walk: Sirius and Procyon! - Image 1

Sirius and Procyon, the loyal hunting dogs of nearby Orion the Hunter! What other stories can you imagine for these stars? Learn about "Legends in the Sky" and create your own with this [activity](#). Image created with assistance from Stellarium.

Both of these bright stars have unseen companions: tiny, dense white dwarf stars, the remnants of supermassive companion stars. Interestingly, both of these dim companions were inferred from careful studies of their parent stars' movements in the 1800's, before they were ever directly observed! They are a challenging observation, even with a large telescope. Their parent stars are so very bright that their light overwhelms the much dimmer light of their tiny companions. The white dwarf stars, just like their parent stars, have differences: Sirius B is younger, brighter, and more energetic than Procyon B (See Taking the Dog Stars for a Springtime Walk: Sirius and Procyon! - Image 2). Careful observations of these nearby systems over hundreds of years have helped advance the fields of: astrometry, the precise measurement of stars; stellar evolution, the life of a star; and astroseismology, the study of the internal structure of stars via their oscillations. Discover more about our stellar neighborhood at [NASA!](#)



Taking the Dog Stars for a Springtime Walk: Sirius and Procyon! - Image 2

Sirius A and B imaged by two different space telescopes, revealing dramatically different views! The Hubble Space Telescope's image (left) shows Sirius A shining brightly in visible light, with diminutive Sirius B a tiny dot. However, in the Chandra X-ray Observatory's image (right), tiny Sirius B is dramatically brighter in X-rays! The "Universe in a Different Light" [activity](#) highlights more surprising views of some familiar objects. NASA, ESA, H. Bond (STScI), and M. Barstow (University of Leicester) (left); NASA/SAO/CXC (right)

This article is distributed by NASA Night Sky Network

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BMAC Calendar & More



Calendar:

MAC Meetings:

- Friday, March 5, 2021 - 7p - Via Zoom - Social time 30m before and after meeting. Luci Finucan, of the Green Bank Observatory Science Center. We will be given a virtual tour of the campus and also an overview of the public programs that are offered to the general public.
- Friday, April 2, 2021 - 7p - Via Zoom - Social time 30m before and after meeting. Topic TBA.
- Friday, May 7, 2021 - 7p - Via Zoom - Social time 30m before and after meeting. Topic TBA.
- Friday, June 4, 2021 - 7p - Via Zoom - Social time 30m before and after meeting. Topic TBA.

sunWatch:

- **Cancelled until further notice.**
- Every clear Saturday & Sunday - 3p-3:30p - March-October - On the Dam
 - View the Sun safely with a white-light & H α view if clear.; Free.

starWatch:

- **Cancelled until further notice.**
- March 6 & 13, 2021 - 7p
- March 20 & 27, 2021 - 8p
- April 3, 10, 17 & 24, 2021 - 8:30p

- October 2 & 9, 2021 - 7:30p
- October 16, 23, 30 & November 6, 2021 - 7p
- November 13, 20 & 27 - 6p
 - View the night sky with large telescopes at the observatories. If poor weather, an alternate live tour of the night sky will be held in the planetarium theater.; Free.
 - You must have completed the Park Volunteer Program in order to help with the public program. If you have, please show up at least 30 minutes prior to the official start time.



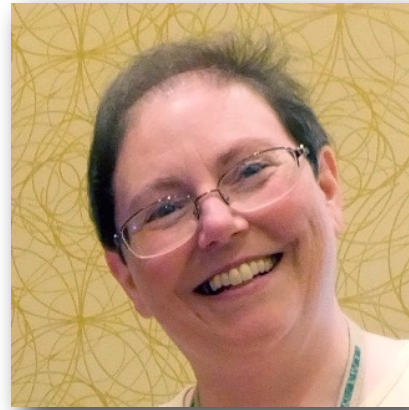
pecial Events:

- **All special events are cancelled until further notice.**
- **Astronomy Day - May 15, 2021 - 1p-4p; 8:30p-9:30p**
 - Come help share the fun of astronomy with the public. There will be tables with different themed topics plus solar and night viewing.
- **Annual Club Picnic - July 2021 - Day TBD - 6p**
 - Site location will be sent directly to full BMAC members. BMACers and their families are welcome to enjoy an evening of astronomy-themed games and activities along with a potluck dinner and observing.
 - **Please bring a dish to share and bring your own chair.**
- **StarFest 2021 - October 29, 30 & 31, 2021**
 - Our 37th annual astronomy convention / star gathering for the Southeast United States. Three days of astronomy fun, 5 meals, 4 keynote speakers, unique T-shirt, and more!
 - **Pre-registration by Oct. 8, 2021 with full payment is mandatory for attendance. Sorry, no walk-ins nor "visits."**
 - MeadowView Marriott special hotel rate.
 - **StarFest Link**

Regular Contributors:



William Troxel



Robin Byrne



Jason Dorfman



Adam Thanz

William is the current chair of the club. He enjoys everything to do with astronomy, including sharing this exciting and interesting hobby with anyone that will listen! He has been a member since 2010.

Robin Byrne has been writing the science history column since 1992 and was chair in 1997. She is an Associate Professor of Astronomy & Physics at Northeast State Community College (NSCC).

Jason Dorfman works as a planetarium creative and technical genius at Bays Mountain Park. He has been a member since 2006.

Adam Thanz has been the BMAC Newsletter Editor for all but a number of issues since 1992. He is the Planetarium Director at Bays Mountain Park and an astronomy adjunct instructor at NSCC since 2000.

Connection:

Bays Mountain Astronomy Club:

- 853 Bays Mountain Park Road; Kingsport, TN 37650
- (423) 229-9447 - [Park Site](#) - [Club Site](#)
- Newsletter edited by [Adam Thanz](#)

Dues:

- Dues are supplemented by the Bays Mountain Park Association and volunteerism by the club. As such, our dues are kept at an extremely low cost.
- \$16 / person / year
- \$6 / each additional family member
- Note: if you are a Park Association member (which incurs a separate, additional fee), then a 50% reduction in BMAC dues are applied.
- Dues can be paid in many ways. For renewals, you will be sent an e-mail with an invoice and a direct link to pay online. You can also pay by mail, over the phone or in person at the gift shop.

Chapter Background Image Credits:

- **Cover image of Southern Milky Way by Adam Thanz.**
 - Sony A7ii with Zeiss Batis 2.8/18 lens, f/2.8, 8 sec., ISO 6,400, August 9, 2020.
- **Table of Contents image of Comet NEOWISE (C/2020 F3) by Adam Thanz**
 - Sony A7ii with Sony FE 2.8/90 Macro G OSS lens, f/2.8, 8 sec., ISO 4,000, July 15, 2020.
- **Cosmic Reflections image of the Summer Triangle area of the Milky Way by William Troxel.**
 - Image captured July 23, 2016.
- **BMAC Notes painting of the Moon with moon glow by Christa Cartwright.**
 - Painting based on a photograph of the Moon Christa captured July 2020.
- **Celestial Happenings image of sunset at the Bays Mountain Park Lake during a twilight kayak program by Jason Dorfman.**
 - Image captured October 1, 2020.
- **The Queen Speaks image of a solar halo by Robin Byrne.**
 - iPhone 7, June 8, 2020.
- **The Space Place - NASA Night Sky Network image of the Rho Ophiuchi cloud complex by Brandon Stroupe.**
 - Canon 6D with Canon 2.8/70-200mm lens, f/2.8 @200mm, 20 x 120 sec. exposures, ISO 1,000, stacked in Deepsky Stacker, processed in Adobe Photoshop CC, Skywatcher Star Adventure mount, September 19, 2015.
- **BMAC Calendar & More image of the Moon by Greg Penner.**
 - iPhone shooting through a 9mm eyepiece and 12.5" Truss Tube Dobsonian @212x.
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