

Star Dust

Newsletter of National Capital Astronomers, Inc.

capitalastronomers.org

December 2023

Volume 82, Issue 4

**Celebrating 86 Years
of Astronomy**

Next Meeting

When: Sat. Dec. 9th, 2023

Time: 7:30 pm

Where: In-Person and Online (Zoom)
See instructions for joining the meeting via Zoom on Page 8.

Speaker: Deborah Shapley

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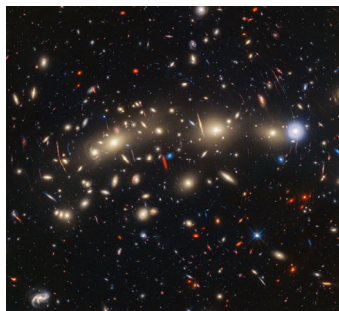


Image Credit - NASA, ESA, CSA, STScI, J. Diego (Instituto de Física de Cantabria, Spain), J. D'Silva (U. Western Australia), A. Koekemoer (STScI), J. Summers and R. Windhorst (ASU), and H. Yan (U. Missouri)

The Hubble and JWST Telescopes captured the image above of galaxy cluster MACS0416. More info is at www.nasa.gov/missions/webb/nasas-webb-hubble-combine-to-create-most-colorful-view-of-universe/.

Who Really Won the Great Debate?

Deborah Shapley



Harlow Shapley. Image Credit: USNO-Harwood Collection

The Great Debate (the Shapley-Curtis Debate between astronomers Harlow Shapley and Heber Curtis) in 1920 tried to decide between the view that the Milky Way was the entire Universe, and Andromeda was merely a nebula within the Milky Way, and the view that Andromeda was an independent galaxy, like the Milky Way. Thus, the debate concerned the structure of our Universe.

Deborah Shapley is the daughter of Willis Shapley (1917-2005). Willis was the eldest son of the five children of Harlow Shapley (1885-1972) and Martha Betz Shapley (1890 - 1981). Deborah (b. 1945) grew up in Washington DC and attended local schools. After graduating from Harvard in 1967 she began a 30-year career as a journalist, including ten years as a reporter for Science. She has had articles in The New York Times and other outlets. Of her four historical books the best known is her biography of Robert S. McNamara, Promise and Power (Little, Brown, 1993).

Deborah began the Harlow Shapley Project in 2020 when she realized she is one of the few left who knew him well. She is not a scientist (and is grateful for scientific help). On the project hub, harlowshapley.org/, she is publishing segments of Shapley's story that need filling out, and also original content. (For example, the site has a complete Bibliography compiled by a volunteer expert. The webmaster maintains an image database including family photos. A new section for her Nobel laureate uncle Lloyd Shapley adds unpublished material and videos.)

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Recent Astronomy Highlights

Discovery of Distant Supermassive Black Hole



Image Credit - X-ray: NASA/CXC/SAO/ Ákos Bogdán; Infrared: NASA/ESA/ CSA/STScI; Image Processing: NASA/CXC/SAO/L. Frattare & K. Arcand

Astronomers have recently discovered the farthest supermassive black hole detected with X-rays. Located in a galaxy designated UHZ1, the light from the region is 13.2 billion years old, meaning that the supermassive black hole was already formed when the Universe was only four percent of its current age. The discovery, using the Chandra X-ray Telescope, was only possible because the image of UHZ1 was gravitationally lensed and magnified by the galaxy cluster Abell 2744, which lies approximately 3.5 billion light years away. Meanwhile the James Webb Space Telescope was able to capture lensed images of UHZ1. Based on the X-ray emissions, it is estimated that the black hole is between 10 and 100 million times the mass of the Sun. This is believed to be on a par with the mass of all of the stars within the host galaxy. Having such a large mass in a supermassive black hole so early in the Universe seems to lend credence to the theory that such black holes formed from the direct collapse of enormous clouds of gas soon after the Big Bang instead of initially forming from the cores of massive stars that have gone supernova. More information on the discovery can be found at chandra.harvard.edu/press/23_releases/press_110623.html, and an indepth explanation of the image shown above is available at chandra.harvard.edu/photo/2023/uhz1/.

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Abstract and Biography – continued from page 1



Deborah Shapley - Portrait by Bob Cullen

She finds many of Harlow Shapley's scientific and other contributions are omitted or elided over in the standard summaries. So, her posts and talks aim to provide a more complete and accurate picture of a one-time farm boy from the Ozarks. Shapley "evolved from a brilliant man dedicated to science to a great scientist dedicated to man," as The New York Times wrote (October 21, 1972).

Shapley's life story (en.wikipedia.org/wiki/Harlow_Shapley) shows how very remarkable he was, including his courageous active support of human rights and peace, his role in the formation of the National Science Foundation, his presidency of the American Association for the Advancement of Science, and his fight against pseudoscience. Wikipedia notes that "Shapley (1885-1972) was the most famous US astronomer of [his] era." Shapley argued that life existed around at least some other stars, because there were so many, and that at least a fraction of them would have a belt around them in which planets would have liquid water. In this, he was far ahead of his time.

Many summaries of the Shapley-Curtis Great Debate need a wider perspective, Deborah thinks. She will present this idea informally to the National Capital Astronomers and looks forward to the Q and A.

President's Corner

Guy Brandenburg

Our last Exploring the Sky event for this calendar year (November 18) was quite a success, and lots of fun! Every single EtS event we held this year had more attendees than the previous one, according to Ranger Renee Maher and the other National Park Service rangers who helped co-host the event. Ranger Renee runs the planetarium end of the show.

The November viewing event had nice, clear skies and warm weather. Between 150 and 200 people got to look through around five or six telescopes, and we who were operating them were very busy for about two hours giving views of Saturn, Jupiter, the Moon, star clusters, double stars, galaxies, and even a comet.

It is always so much fun to see the smiles on the faces of people who are seeing ANY celestial object for the first time, with their own eyes, even

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Exploring the Sky



The Exploring the Sky program will take a hiatus until April of 2024.

Exploring the Sky is a joint program between the National Capital Astronomers and the National Park Service Rock Creek Park Nature Center and has been run since 1948 at this location, the field at the corner of Glover and Military Roads in the District. There is an adjacent parking lot. It is free and all are welcome who have an interest in observing the heavens. It's not an ideal dark sky location but we can still see solar system objects (even the occasional comet), open and globular clusters and maybe a fuzzy galaxy or two.

Next year, as an added feature, you can come one hour early and see a planetarium program in the Nature Center and then come to the field to observe. Also, if the sky is cloudy or it's raining there will be a planetarium program at that one-hour-earlier time so Exploring the Sky will no longer be canceled! Planetarium programs can be found at:

www.nps.gov/rocr/planyourvisit/calendar.htm. You can also search "astronomy", "dark skies" or call the Nature Center at: (202)-895-6070.

The article-submission deadline for January's issue of Star Dust, is December 18th.

Clear Skies!

• *President's Corner – continued from page 2*

• though the skies anywhere inside the Beltway are horribly light-polluted.

• NCA owes a tremendous thank you to Jay Miller for running *Exploring the Sky* all these years and for taking his various telescopes to the Air and Space Museums both on the Mall and out in Chantilly, and many other venues, for many years running.

• Come and join us at Military Field in NW DC in the spring. Our tentative dates for this event for 2024 are as follows: April 6, May 4, June 1, July 13, August 10, September 7, October 5, and November 2. We have some plans to make it even better next year.

• When I show people things in the sky, I really want them to realize how lucky we are to live on a nice, warm, wet little planet in a relatively safe part of a medium-large galaxy. I want them to realize that if we aren't careful, we could turn this planet into one of those many varieties of deadly hell that they are viewing in the eyepiece.

• We should be very thankful that this planet got formed in a solar system that had sufficient oxygen, silicon, iron, nitrogen, and carbon for life as we know it. We are fortunate that all of those 'metals' I just listed (as astronomers call them) got cooked up in cycle after cycle of stars that went boom or whooshed their outer layers into the Milky Way. We are lucky to be alive at the far multicellular side of the timeline of life on Earth, and that no star has gone supernova in our neighborhood recently or aimed a gamma-ray burst directly at us.

• We are exceedingly lucky that a meteorite wiped out the dinosaurs 65 million years and allowed our ancestors, the mammals, to take over. We can rejoice that most of us in the USA can have our physical needs (food, shelter, clean water, clean air, and communication) taken care of by just turning a knob or a key, or pushing a button, instead of hauling the water or firewood on our backs. (There are, obviously, many folks here and abroad who live in tents and who have essentially none of those nice things. We could do something about that, as a society, if we really wanted to.)

• I am often asked whether there is life elsewhere. My answer is that I am almost positive that there are lots of planets with some form of life in every single galaxy visible in an amateur telescope. But there is no possible way for us humans to ever visit such a planet. Period. Nor can aliens from any exoplanet have ever visited us, whether they be single-celled organisms or something you would see in a Sci-Fi movie.

• Yes, it is possible to send a handful of people to Mars, if we are willing to spend enormous sums of money doing so, and if the voyagers are willing to face loss of bone and muscle mass, and the dangers of lethal radiation, meteorites, accidental explosions, and freezing to death. If they do survive the voyage, then by all means, let them pick up some rocks and bring them back for analysis before they die.

• But wait. We already have robots that can do that! Plus, robots won't leave nearly as many germs behind as would a group of human beings. And we already know a lot about how Mars looks, because of all the great photos sent back by ESA, JAXA, NASA and others for some decades now. You can see photos taken by NASA at JMARS, which I highly recommend. (jmars.asu.edu/)

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Sky Watchers

December/January

Mercury drops lower in the western evening sky with each passing day, beginning its transition to the morning sky at the end of December, reaching Greatest Western Elongation on January 12th (see below). In doing so, our innermost planet joins Venus in the predawn sky. Jupiter will rise higher in the eastern evening sky as the period progresses. Saturn will be high in the sky at sunset, setting before midnight. Mars will be very low in the predawn sky throughout the period and probably not very visible.

12/13-14	The Geminids Meteor Shower peaks on the evening of the 13 th into the morning of the 14 th with approximately 120 meteors/hour. With the Moon nearly new, conditions should be ideal for viewing. Best viewing conditions will be in the early morning hours.
12/21	Winter Solstice - At 10:21 p.m. EST, the Sun will shine directly over the Tropic of Capricorn at 23° 26'.
12/21-22	The Ursids Meteor Shower peaks on the 21 st into the morning of the 22 nd with 5-10 meteors/hour. A waxing gibbous Moon unfortunately will cause less-than-ideal viewing conditions.
12/26	Full Moon – 7:34 p.m.
1/3-4	The Quadrantids Meteor Shower peaks with approximately 40 meteors/hour. Unfortunately, a waning gibbous Moon will interfere with viewing.
1/12	Mercury reaches Greatest Western Elongation and will be 23.5 degrees from the Sun in the morning sky.

All times are in EST (Eastern Standard Time).

Observing the 2023 October 14 Annular Eclipse from the Southern Limit in New Mexico

David and Joan Dunham

On p. 4 of last month's Stardust, there was one image and a short mention of our observations of the October annular eclipse that we video recorded near Mentmore, New Mexico, about halfway between Gallup and the Arizona border and about a 4-hour drive from our home near Phoenix. We have observed a few annular eclipses before, including in Mexico in Dec. 1973, in S. Carolina in May 1984, in China in Sept. 1987, and in Texas in May 1994. We have observed more total solar eclipses, but good displays of Bailey's beads occur also during annular eclipses, especially near the edges of the path of annularity. We tried to observe the annular eclipse of May 2012 in Nevada, but we missed that show due to misinterpretation of our

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• [Recent Astronomy Highlights – continued from page 2](#)

• **New Theory Explaining Why Dwarf Galaxies Often Have the Most Active Star-Forming Regions**

• Even though large, older galaxies usually still maintain some star formation, they don't seem to do so with the rates displayed by dwarf galaxies. A new theory seems to explain this. When galaxies first form, they have very low concentrations of elements beyond hydrogen and helium. Heavier elements are called metals by astronomers. In star-forming regions of such young galaxies, stars of all different sizes can come into existence, including very large stars with masses 20 to 200 times the mass of the Sun. Such stars live short lives, but at the end of those lives, instead of collapsing and becoming supernovae, they can collapse directly into black holes. This means that there is no violent outflow of gas, creating interstellar winds that can blow additional interstellar gas out of the galaxy. Such ejection of gas from the galaxy tends to choke off additional star formation which is what happens in older, metal-rich galaxies. The proposers of the theory posit that there is a 10-million-year delay when a galaxy forms before stars start going supernovae and blowing away their excess gas. This theory not only seems to explain the high star-formation rate in young dwarf galaxies, but also the vigorous star formation seen in the Universe's early galaxies. More information is available at www.eurekaalert.org/news-releases/1008844.

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Occultation Notes

- D following the time denotes a disappearance, while R indicates that the event is a reappearance.
- The times are for Greenbelt, MD, and will be good to within +/-1 min. for other locations in the Washington-Baltimore metropolitan areas unless the cusp angle (CA) is less than 30 deg., in which case, it might be as much as 5 minutes different for other locations across the region.
- Some stars in Flamsteed's catalog are in the wrong constellation, according to the official IAU constellation boundaries that were established well after Flamsteed's catalog was published. In these cases, Flamsteed's constellation is in parentheses and the actual constellation is given in the notes following a /.
- Mag is the star's magnitude.
- % is the percent of the Moon's visible disk that is sunlit, followed by a + indicating that the Moon is waxing and - showing that it is waning. So 0 is new moon, 50+ is first quarter, 100+ or - is full moon, and 50- is last quarter. The Moon is crescent if % is less than 50 and is gibbous if it is more than 50. E indicates a lunar eclipse is in progress, and the value is the percent of the Moon's disk that is NOT in the umbra. So 0E means during the total phase.
- Cusp Angle is described more fully at the main IOTA Web site.
- Sp. is the star's spectral type (color), O,B,blue; A,F,white; G,yellow; K,orange; M,N,S,C red.
- Also in the notes, information about double stars is often given. "Close double" with no other information usually means nearly equal components with a separation less than 0.2". "mg2" or "m2" means the magnitude of the secondary component, followed by its separation in arc seconds ("), and sometimes its PA from the primary. If there is a 3rd component (for a triple star), it might be indicated with "mg3" or "m3". Double is sometime abbreviated "dbl". Often, rather than the separation, I give "dTime" or "dT", the time difference of the secondary star occultation relative to the primary star's occultation.
- Sometimes the Axis angle (AA) is given. It is the angle measured around the Moon's disk, from the Moon's axis of rotation. It can be used with a lunar map to tell where a star will reappear relative to lunar features.

Mid-Atlantic Occultations

David Dunham

Asteroidal Occultations

2023/24	Date	Day	EST	Star	Mag.	Asteroid	dmag	dur. s	Ap. " Location
Dec 9	Sat	22:18	4UC54501325	12.0	Vibeke	4.7	12	6	nVA,DC,CMD,SOH
Dec 10	Sun	19:03	4UC54506777	10.4	McCoy	6.3	1.0	4	SNJ,CMD,nDC,nVA
Dec 11	Mon	20:24	Betelgeuse	0.5	Leona	2.9	12	1	SES,BS,SFL,ecMX
Dec 15	Fri	20:21	4UC53609262	13.6	Imperatrix	2.5	3	8	SNJ,CMD,DC,n-wVA
Dec 16	Sat	4:49	4UC64330060	13.1	Higson	1.9	3	7	CVA,SOH,ID;seVA?
Dec 18	Mon	21:09	SAO 111070	7.6	Eichsfeldia	6.3	9	2	SNJ,MD,nDC,nVA
Dec 21	Thu	5:24	SAO 78013	8.4	2001 CC21	8.4	0.1	3	CNC,wVA,swOH,nIN
Dec 23	Sat	2:22	4UC51232477	12.1	Thessandrus	4.6	3	5	SNJ,SPA,nOH,nIL
Dec 26	Tue	21:52	TYC48042408	10.8	Carina	3.0	7	4	nNJ,c+nwPA,nOhio
Dec 30	Sat	5:43	4UC49443579	12.6	Itzigsohn	2.2	4	6	SNJ,nMD,SPA,COH
Dec 31	Sun	22:45	4UC51720125	13.7	Mombasa	1.0	4	8	SMD,DC,nVA,COHio
*** Dates and times above are 2023, those below are 2024 ***									
Jan 1	Mon	22:23	4UC64316698	13.7	The NORC	2.9	4	8	CNJ,CMD,nDC,nVA
Jan 2	Tue	5:58	4UC34675352	13.7	Etheridgea	2.6	2.0	9	neOH,sCPA,MD,DC
Jan 3	Wed	18:05	4UC55227113	11.0	Alagasta	3.3	5	4	SNJ,CMD,DC,nVA
Jan 3	Wed	19:30	4UC53924887	12.8	Euryanthe	2.1	4	6	SMD,c-swVA,nwTN
Jan 4	Thu	0:33	TYC13130067	11.7	Liberatrix	1.8	4	4	SMD,DC,nVA,SOH
Jan 4	Thu	0:36	TYC23900255	9.5	2001 CC21	7.8	0.1	4	SSC,CGA,nAL,CCO
Jan 7	Sun	21:49	4UC5323720	12.3	Smuts	3.1	4	5	SMD,c-swVA,nwTN
Jan 9	Tue	19:33	4UC58241611	12.5	Centenaria	2.3	4	6	SNJ,SMD,CVA,WNC
Jan 10	Wed	23:25	SAO 77208	8.1	Berbericia	3.5	15	2	s.e. VA, N. Car.
Jan 12	Fri	20:16	4U430121092	13.2	Aglaja	1.0	5	9	COH,PA,nwMD,nNJ

Lunar Grazing Occultations

2023/24	Date	Day	EST	Star	Mag	% alt	CA	Location, Notes
Dec 19	Tue	16:52	29	Piscium	5.1	52+	44	15S Husvil,Owings,MD(Sun-2); n.NJ
*** Dates and times above are 2023, those below are 2024 ***								
Jan 1	Mon	2:16	53	Leontis	5.3	75-	52	15S Hagrstwn,Woodstck,Catnsvil,MD

Lunar Total Occultations

2023/24	Date	Day	EST	Ph Star	Mag	% alt	CA	Sp. Notes
Dec 8	Fri	3:36	R	SAO 139246	8.1	21-	10	73S G5 Azimuth 109 deg.
Dec 9	Sat	6:42	R	ER Vir	6.6	13-	27	46N M4 Sun alt. -6, ZC 2021
Dec 16	Sat	17:10	D	SAO 190252	7.2	19+	27	12N F2 Sun alt. -5 degrees
Dec 16	Sat	18:19	D	33 Cap	5.4	19+	21	68S K0 ZC 3130
Dec 18	Mon	18:31	D	SAO 146570	7.9	41+	41	90N F0 close double
Dec 18	Mon	18:57	D	SAO 146577	7.7	41+	39	60S F9 A star of wide double
Dec 18	Mon	18:58	D	SAO 146578	8.3	41+	38	58S G3 B star, 20s after A
Dec 19	Tue	16:46	D	29 Psc	5.1	51+	43	26S B7 Sun -1, ZC3535
Dec 19	Tue	16:47	D	BU Psc	6.9	51+	44	84S A3 Sun-1,ZC3537,close dbl?
Dec 19	Tue	16:59	R	29 Psc	5.1	52+	45	6S B7 Sun -3, MD-NJ graze
Dec 20	Wed	17:46	D	SAO 109522	7.3	63+	51	64S F0 Sun-11, close double
Dec 21	Thu	17:06	D	HU Psc	7.3	73+	44	60S A2 Sun -4, ZC 252
Dec 22	Fri	23:34	D	AM Ari	7.3	84+	48	83S M* SAO 93073
Dec 23	Sat	0:06	D	36 Arietis	6.4	84+	42	68N K2 ZC 402
Dec 23	Sat	2:48	D	40 Arietis	5.8	85+	12	10N K1 Az.284,ZC 415,dbl??
Dec 26	Tue	1:03	D	ZC 840	6.3	99+	67	51N K0 spec.bin., TermDist 9"
Dec 30	Sat	21:51	R	ZC 1462	7.3	84-	14	61S K0 Azimuth 80 deg.
Dec 31	Sun	3:27	R	ZC 1479	6.4	83-	67	63N F2
Dec 31	Sun	5:24	R	ZC 1485	7.1	82-	57	70S G0
*** Dates and times above are 2023, those below are 2024 ***								
Jan 3	Wed	5:23	R	13 Vir	5.9	57-	50	19N A5 ZC 1770
Jan 4	Thu	3:38	R	ZC 1865	7.3	47-	32	54N A2
Jan 5	Fri	5:51	R	SAO 158148	8.0	37-	37	75S K2
Jan 5	Fri	6:07	R	X127100	8.4	37-	37	80S B star of dbl; A next
Jan 5	Fri	6:07	R	86 Vir	5.5	37-	37	80S G8 ZC1971, time B +2.2s
Jan 7	Sun	5:37	R	X 39461	7.5	19-	17	10N K0 mag2 10,sep 10", dT+44s
Jan 7	Sun	5:51	R	ZC 2204	7.7	19-	19	53N K0
Jan 8	Mon	5:38	R	Al Niyat	2.9	11-	7	22N B1 Az.131,ZC2349,sigma Sco
Jan 8	Mon	9:33	D	Antares	1.1	11-	25	-77N M1 Sun alt. +18, AxisA 72
Jan 8	Mon	10:49	R	alpha Sco	1.1	10-	22	51N M1 Sun +26, ZC 2366
Jan 9	Tue	6:34	R	43 Oph	5.3	5-	5	51N K4 Sun-10, Az. 133, ZC2505

More information at iota.jhuapl.edu/exped.htm.

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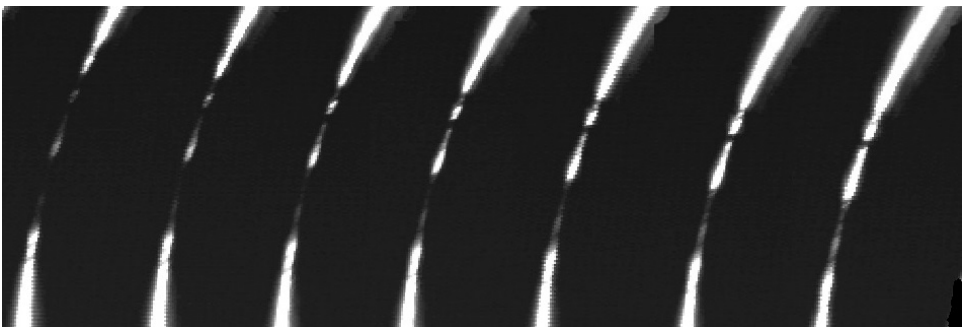
• *Observing the 2023 October 14 Annular Eclipse...— continued from page 4*

• hand-held GPS that led us to a location 15 miles north of the northern
 • limit. We were pleased to have done so well with this year's eclipse,
 • probably our best recording of Baily's beads during an annular eclipse.
 • We don't plan to travel overseas for future annular eclipses and will be
 • well over 100 when the next annular eclipse in North America occurs on
 • June 11, 2048; we hope younger astronomers will be able to observe that
 • one.



• Figure 1 (left) - Our 127mm Schmidt-Maksutov telescope with Orion solar
 • filter; David is sitting and Joan is standing. Figure 2 (right) - View of our
 • recording laptop showing the partially eclipsed Sun's image. The small
 • orange Night Eagle Astro Runcam camera can be seen at the end of the
 • telescope behind David's right wrist. Image Credit for both figures - Joan
 • Dunham

• Fig. 1 shows the Celestron NexStar SLT 127 that we used, while Fig. 2
 • shows how we put the recording laptop in a roller bag, with a black towel
 • giving additional shading to view the screen.



• Figure 3. A sequence of Baily's beads at 1-second intervals shortly before
 • the 21 seconds of annularity that we recorded. As the sunlight increased
 • after the central eclipse, nearby roosters announced the "second dawn."
 • Image Credit - Joan Dunham

• Figure 3 shows a sequence of Baily's beads, but you should view the
 • main 3-minute video to see how the beads evolved in a section about the
 • eclipse at occultations.org/publications/rasc/2023/nam23grz.htm. That
 • also has links to a presentation that has many more pictures, and a link to
 • Fred Bruenjes's great recording of the 2017 total solar eclipse from his
 • home less than 2 km north of the southern limit; the display of the
 • chromosphere, prominences, and dynamic Baily's beads may convince
 • some to travel to places just inside the limits of the path of next year's
 • total solar eclipse. Further details of our observations will be published in
 • the next issue of IOTA's *Journal for Occultation Astronomy*.

President's Corner – continued from page 3

While one can justify sending a few brave folks to Mars, it is completely insane to think that we can avoid our terrestrial problems by sending large populations there. Mars is often colder than Antarctica, is close to waterless, has perchlorates in its soil, no vegetation whatsoever, and no atmosphere to speak of. How would millions or billions of exiles from Earth possibly live there? Do you seriously think they can gather enough solar energy to melt sufficient water to drink and cook and bathe and help to compost their own poop with poisonous Martian dirt and then grow potatoes in it, as in the book and movie The Martian? All the while living in huge, pressurized, aluminum cans?

It took billions (with a B) of years for Earth to become hospitable to multicellular life as we know it. If life ever began on Mars at some point in the past, it's not doing well now. The ideas of Elon Musk and some others about setting up a colony by 2050 and terraforming it in a few decades are completely nuts.

I wish there was some way to get around the laws of physics, and that we could actually visit other exoplanets. But there isn't, and we can't. I've seen estimates that accelerating a medium-sized spaceship to a mere 1% of the speed of light would require the entire energy budget of the entire human population of the planet for quite some time.

Let us assume, for the sake of argument, that you generate enough energy to accelerate that spaceship with nuclear fusion or something. The next problem is the distance. It's a bit over 4 light years to the nearest known exoplanet in a straight line (as opposed to a straight-line distance of about half an hour for Jupiter), which means that a one-way trip to Proxima or Alpha Centauri for however many people, at one percent of the speed of light, (300,000 km per second), in a straight line, and pretending that you don't need years and years to both accelerate and decelerate, would take over four centuries.

Do you seriously think that a score or so generations of humans would agree that they, and their descendants for the 400 years, would live in a large metal box with no gravity to speak of, subject to who knows how many blasts of gamma rays, x-rays, and super-high-energy cosmic particles? What are the chances that each single generation would agree to stay the course and that nothing would go wrong? Solar panels would not produce any energy to speak of for most of the trip!

The argument is made that perhaps the travelers would be put into suspended life. If that were possible, and nothing went wrong, upon arrival, they could send some radio message back to Earth saying, "Hi, we made it, wish you were here..." That reply will of course take four years to reach Earth. Would people back on Earth still remember the few dozen who began the trip out, started over 4 centuries earlier, at an absolutely prodigious expense? And the return trip would take another 400 years, if they can find a proper power source...

But that's just for the very closest exoplanet. The others are all much, much farther away, so one-way trips for ones within 10 parsecs, i.e., in our tiny corner of our galaxy, at one percent of the speed of light, would require a thousand to three thousand years to reach. Each way. Forget it. Just send a radio message and see if we get a reply. Oh, wait – we've been doing that for a while. No reply so far.

Speaking of radio – it's only 120 years since Marconi first sent a very crude radio message from a ship to a station on land, and now we routinely use enormous parts of the entire electromagnetic spectrum for all sorts of private and public purposes, including sending messages like this one. Astronomers are able to gather amazing amounts of information via the longest radio waves to the very shortest gamma rays and make all sorts of inferences about worlds we have never seen at optical wavelengths. In addition, we have begun detecting gravity waves from extremely distant and powerful events with devices whose accuracy is quite literally unbelievable.

There is no planet B. We must, absolutely must, take care of this one, lest we turn it into one of those freezing or burning variations of hell that we see through our eyepieces. Think I'm being alarmist? We now know this nice little planet Earth is more fragile than we once believed. It has been discovered that life was almost completely wiped out on this planet several times. The Chicxulub impact, the Permian extinction, and Snowball Earth are just three such events.

More recently, folks thought it was impossible for people to cause the extinction or near-extinction of the unbelievably huge flocks and herds and schools that once roamed the Earth: passenger pigeons, buffaloes, cod,

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President's Corner – continued from page 7

salmon, redwoods, elms, chestnuts, elephants, rhinos, tropical birds, rainforests, and so on, but we did, and continue to do so. The quantities of insects measured at site after site around the world have plummeted by 30% to 70% and more, over just a few decades, and the numbers of migratory birds observed on radar feeds as well. Light pollution, the bane of us amateur and professional astronomers, seems to be partly responsible for both the insect and bird population declines.

In addition, we are dumping incredible amounts of plastic into the oceans, and rising water temperatures are causing coral reefs around the world to bleach themselves and die, while melting glaciers are causing average sea levels to rise and threaten more and more low-lying cities.

What's more, only a very tiny fraction of our planet's mass is even habitable by humans: the deepest mine only goes down a few miles, and people die of altitude sickness when they climb just a few miles above sea level. Most of the planet is covered by ocean, deserts, and ice caps. By volume, the livable part of this planet is infinitesimal, and the temperatures on it are rising at an alarming rate.

Will we be able to curb the burning and leaking of fossil fuels sufficiently so as to turn around the parts of global warming caused by increases in carbon dioxide and methane? I am not optimistic, given that the main emitters have kept essentially none of the promises that they have been making to those various international gatherings on climate, and looking at graphs like this one:

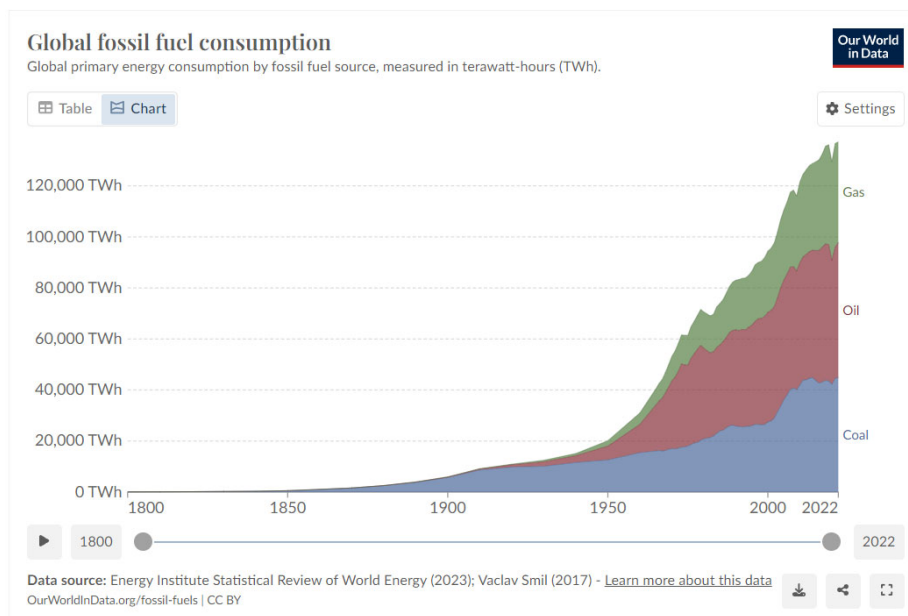


Image Source - ourworldindata.org/fossil-fuels. Data source - Energy Institute Statistical Review of World Energy (2023); Vaclav Smil (2017). Used with permission by Creative Commons licensing. Licensing details are available at creativecommons.org/licenses/by/4.0/.

I have been wondering whether we may need to reduce temperatures more directly, by putting enough sulfur compounds into the stratosphere. We have excellent evidence that very violent volcanic eruptions have the power to lower global temperatures with those sulfates. It would not be great for ground-based astronomy if such compounds were artificially lofted high into the atmosphere to lower global temperatures, and we won't know for sure exactly which areas of the planet would benefit and which would be harmed, but at least it's an experiment that can be stopped pretty easily, since the high-altitude sulfates would dissipate in a few years, and do not seem to cause the obvious harm that SO₂ does at the typical altitude of a Midwestern, Indian, or Chinese coal-burning power plant.

Adding iron to the oceans to increase biomass has been tried a number of times, but doesn't seem to have a very large effect.

I agree that large-scale injection of sulfates into the stratosphere is scary.

But -- does anybody have a better solution? Can we engineer our way out of this mess?

Recent Astronomy Highlights – continued
from page 4

Dinkensh Encounter Full of Surprises



Image Credit -

NASA/Goddard/SwRI/Johns Hopkins APL
On November 1st, the Lucy spacecraft had its first flyby of an asteroid on its way to study Jupiter’s Trojan asteroids. The flyby was actually designed to be a test of Lucy’s systems before encountering the Trojans. Yet the encounter was anything but routine. Images showed that the asteroid had an orbiting satellite, named Selam. In addition, it turned out that the Selam was actually a contact binary, made up of two bodies, the first satellite contact binary ever encountered. More info is at science.nasa.gov/missions/lucy/nasas-lucy-surprises-again-observes-1st-ever-contact-binary-orbiting-asteroid/.

Calendar of Events

- **NCA Telescope Making, Maintenance, and Modification Workshop (TM3W) (previously the NCA Mirror- or Telescope-making Classes):** The Chevy Chase Community Center has reopened and classes have resumed. Classes will be Tuesdays and Fridays, from 6:00-9:00 pm at the Chevy Chase Community Center (intersection of McKinley Street and Connecticut Avenue, N.W.) **Please note there will be no meetings on Dec. 22nd or Dec. 26th.**
- **Whether there will be a meeting on Dec 29th remains TBD.** Please contact instructor Guy Brandenburg at 202-635-1860 (leave message) or at gfbrandenburg@yahoo.com if you plan to attend. Info is at guysmathastro.com.
- **Open house talks and observing at the University of Maryland Observatory in College Park are temporarily suspended.** When they resume, they will be on the 5th and 20th of every month at 8:00 pm (Nov.-Apr.) or 9:00 pm (May-Oct.). Updates are posted at www.astro.umd.edu/openhouse.
- **Next NCA Meeting: VIRTUAL ONLY! 13 January 7:30 p.m.** Shubham Kanodia (Carnegie Earth & Planets Lab), **Giant Exoplanets Around Low-Mass Stars**
- **The APS Mid-Atlantic Senior Physicists Group: (Zoom Meeting)** December 20th at 1:00 p.m., Dr. Igor Andreoni, University of Maryland and NASA’s GSFC, will give a talk entitled “Seize the night: Catching rare astronomical transients with optical telescopes”. A link to the meeting via Zoom is at apsphysics.zoom.us/j/88608645258?pwd=YT48Hjb8Tnur8qIT2PxbkaTX0xNQav.1#success.

National Capital Astronomers Membership Form

Name: _____ **Date:** ___/___/___

Address: _____ **ZIP Code:** _____

Home Phone: ___ - ___ - ___ **E-mail:** _____ (necessary for delivery of Star Dust)

Membership (circle one): Student..... \$ 5; Individual / Family.....\$10; Optional Contribution.....\$__

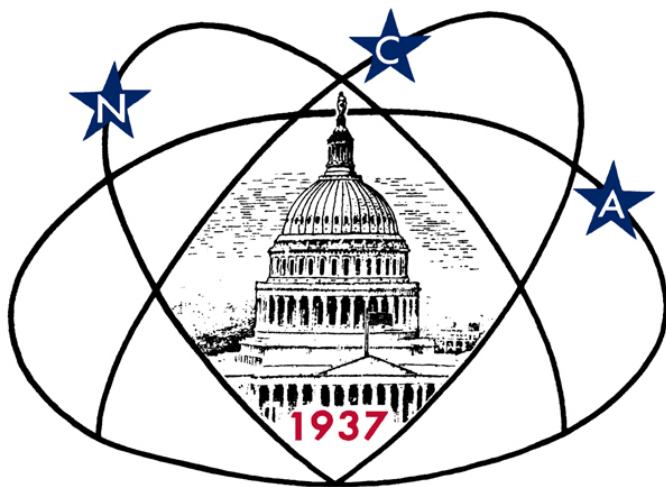
Please indicate which activities interest you:

- Attending monthly scientific lectures on some aspect of astronomy _____
- Making scientific astronomical observations _____
- Observing astronomical objects for personal pleasure at relatively dark sites _____
- Attending large regional star parties _____
- Doing outreach events to educate the public, such as Exploring the Sky _____
- Building or modifying telescopes _____
- Participating in travel/expeditions to view eclipses or occultations _____
- Combating light pollution _____

Do you have any special skills, such as videography, graphic arts, science education, electronics, machining, etc.?

Are you interested in volunteering for: Telescope making, Exploring the Sky, Star Dust, NCA Officer, etc.?

Please mail this form with check payable to **National Capital Astronomers** to:
Jim Simpson, NCA Treasurer; 3845 Wayson Road, Davidsonville, MD 21035



Celebrating 86 Years of Astronomy

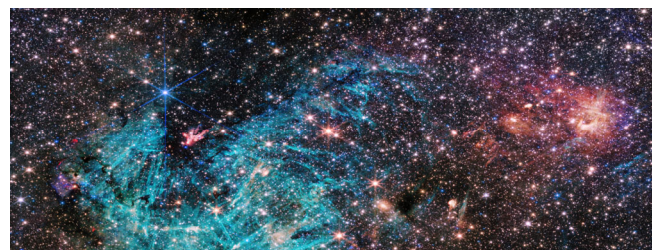


Image Credit - NASA, ESA, CSA, STScI, and S. Crowe (University of Virginia)

NASA recently released the image above, captured with JWST's NIRCam (Near Infrared Camera), of a region in the heart of the Milky Way. It features over 500,000 stars and many other objects. More information about the image is at www.nasa.gov/missions/webb/nasas-webb-reveals-new-features-in-heart-of-milky-way/.

To join or renew online, visit capitalastronomers.org and look in the right column for the Membership Form and PayPal links.

Next NCA Meeting:
2023 December 9th
7:30 pm
(In Person and On Zoom)
Deborah Shapley

To join the meeting via Zoom, use the following link:
umd.zoom.us/j/95154535739?pwd=cERBUE9XM3AvNE40TXYrNUptVETzUT09

Please download and import the following iCalendar (.ics) files to your calendar system:

umd.zoom.us/meeting/tJEscu2trT4tGd1QOonrqcTNP3fs8VY-
[InJt/ics?icsToken=98tyKuCtrz4uH9eQtxqORowMBY_4LOztiVajacMrTDqDTJCYTfyBrFElepJKZX5](https://umd.zoom.us/j/95154535739?pwd=cERBUE9XM3AvNE40TXYrNUptVETzUT09)

Please note that NCA Zoom meetings are often recorded.

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