

Star Dust

Newsletter of National Capital Astronomers, Inc.

capitalastronomers.org

April 2023

Volume 81, Issue 8

**Celebrating 86 Years
of Astronomy**

Next Meeting

When: Sat. Apr. 8th, 2023

Time: 7:30 pm

Where: Online (Zoom)

See instructions for joining the meeting on Page 8.

Speaker: Dr. Joe Pesce

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The Atacama Large Millimeter/submillimeter Array (ALMA) and Game-changing Science

Joe Pesce – NSF and George Mason University



Part of the ALMA array on the Chajnantor Plateau at 5,100 meters in the Atacama Desert of Northern Chile. Image Credit – Joe Pesce

In this talk, we will explore one of the flagship observatories of the National Science Foundation, the Atacama Large Millimeter/submillimeter Array. ALMA is the highest-altitude observatory, and the most advanced scientific instrument, on Earth. Observing in a previously under-explored region of the electromagnetic spectrum, ALMA is making stunning astrophysical discoveries, from our Solar System to the most distant regions of the Universe. We will discuss some of these game-changing observations.

Biography: Joe Pesce is an astrophysicist whose primary area of interest is supermassive black holes. He has held research positions at the Space Telescope Science Institute and the Pennsylvania State University. He is currently a Program Officer at the US National Science Foundation, responsible for most of the US Government's ground-based radio astronomy facilities (the National Radio Astronomy Observatory - NRAO - including the Atacama Large Millimeter/submillimeter Array (ALMA, in Chile), the Very Large Array (VLA, in New Mexico), and the US component of the Very Long Baseline Array (VLBA, spread across Earth). In addition to his day job, he is a Part-time Professor at George Mason University (Fairfax, Virginia) and a Visiting Professor at the University of

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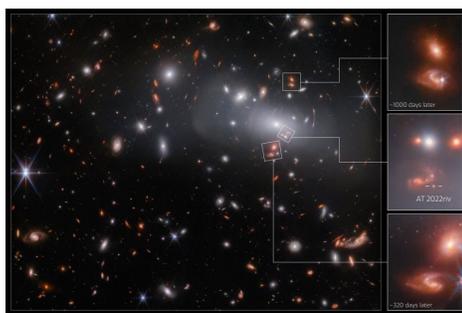


Image Credit - ESA/Webb, NASA & CSA, P. Kelly

The three magnified images to the right are all of the same galaxy, lensed by a foreground galactic cluster. The middle image even includes a supernova in that galaxy. More information, and larger copies of the JWST image, can be found at www.space.com/james-webb-space-telescope-triple-galaxy-photos.

Recent Astronomy Highlights

Astronomers Waiting For Sagittarius A* To Feed

Designated simply as X7, an 'object' approximately 50 times Earth's mass, but spread out over 3000 AUs (Astronomical Units - the average distance between the Sun and the Earth) appears doomed to be devoured by the Sagittarius A*, the 4-million-solar-mass supermassive black hole at the center of the Milky Way. Likely a cloud of gas and dust, X7's origin is still a mystery, although one theory is that it was a stream of gas thrown off during the collision of two stars. Astronomers have been studying it since 2002 using the WM Keck Observatory in Hawaii. They expect that its upcoming close approach to Sagittarius A*, in 2036, will be its last as it is ripped apart by the tidal forces of Sagittarius A* and much of it is taken in by the supermassive black hole. More information is available at

www.msn.com/en-us/news/technology/large-mysterious-object-getting-sucked-into-milky-way-s-supermassive-black-hole/ar-AA180pg0?ocid=msedgdhp&pc=U531&cvid=88dae3785b3042c9c79f594015481896&ei=14

Oumuamau's Acceleration Possibly Explained

The first detected interstellar visitor, Oumuamau, experienced some mysterious acceleration after it was detected in 2017. Wild speculation, including that the interstellar visitor was some sort of alien artifact, took place at the time. But a much simpler explanation has been put forward – that the acceleration was caused by outgassing of hydrogen gas which was created in the object's ice by cosmic-ray collisions during its long interstellar trek. That hydrogen would have been trapped below Oumuamau's surface until the Sun began heating it up, causing outgassing. The visitor's relatively small size and mass allowed this outgassing to cause enough acceleration that it was measurable. More info is available at www.sciencedaily.com/releases/2023/03/230322140338.htm

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Abstract and Biography – continued from page 1

Colorado (Boulder, Colorado). Previously, he founded, and served as CEO, of several firms specializing in high-level science and technology, critical thinking and problem-solving, consulting and education.



An important aspect of Joe's work involves public outreach, as an ambassador for science in general and astrophysics specifically. Among other activities, he has made numerous television and podcast appearances, and has served as science advisor to several science fiction series (television and online) and science fiction authors.

He is a Fellow of the Royal Astronomical Society and the Cambridge Philosophical Society; serves on the Board of Directors of The Presidents Leadership Class (University of Colorado, Boulder); is a proud alumnus of Peterhouse; is a member of the American Astronomical Society; the American Association for the Advancement of Science; Sigma Pi Sigma; the American Institute of Physics; and the Cosmos Club (Washington DC).

Joe received a B.A. degree in physics from the University of Colorado in Boulder, and M.Sc., M.Phil., and Ph.D. degrees in astrophysics from Cambridge University (Peterhouse) and the International School for Advanced Studies in Trieste, Italy.

Joe's other interests include science policy, space, leadership, interspecies communication, non-human intelligence, psychology, Star Trek, and all things British.

President's Corner

Guy Brandenburg

Seven announcements, and a commentary by me:

1. NCA's first 'Exploring the Sky' (ETS) event of the season will be Saturday, April 15 at the field in Rock Creek Park near the intersection of Oregon Avenue and Military Road, in conjunction with the National Park Service (NPS) and the nearby Nature Center and Planetarium. This will be the 75th season of Exploring the Sky in conjunction with the NPS, and the rangers will be putting on a planetarium show immediately before the viewing event and then walking the crowd over to the nearby field so that they can look at whatever they can through the telescopes of NCA members and others. We always need folks to come and help show objects in the sky to the members of the public. See Jay Miller's article on ETS in the Page 3 sidebar for more details.

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Exploring the Sky



Exploring the Sky – 2023 Sessions

- 15 Apr 9:00 P.M. Venus, Orion
- 20 May 9:00 P.M. Venus, Mars, M13
- 17 June 9:00 P.M. Venus, Mars, M13
- 15 July 9:00 P.M. Venus, Mars, M13,
Summer Triangle
- 19 Aug. 8:30 P.M. Moon, Venus, Mars,
M13, summer triangle
- 23 Sept. 8:00 P.M. Moon, M31,
Venus, Mars
- 21 Oct. 7:30 P.M. Moon, Jupiter
- 18 Nov. 7:00 P.M. Jupiter, M45,
outer planets

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.

This 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.

President's Corner – continued from page 2

2. Hopewell Observatory, an hour or so outside of DC, is holding its second free, public viewing event on Saturday, April 22. You can see details about the observatory and how to get there at this URL: guysmathastro.com/2022/10/04/open-house-at-hopewell-observatory/.
3. NCA's monthly meeting, virtual-only, will be Saturday, April 8. You can see details in this issue.
4. The monthly 'Sky Watch' column by Blaine Friedlander in the Washington Post, which detailed both what one could expect to see in the night sky and also local astronomy-related events (like NCA meetings), is no more. Mr. Friedlander has retired after 36 years, and the Post management has decided to not find a replacement. His valuable contribution to local astronomy will be greatly missed.
5. The Sun is waking up, so to speak, and its surface shows lots of interesting features. A recent solar flare, coupled with a temporary hole in our magnetic shield, caused a bright aurora event visible in both Virginia and North Carolina (which I missed) that was featured on SpaceWeather.Com on March 24.
6. We need volunteers to take the NCA's Solar Max II hydrogen-Alpha telescope out, along with our beautiful A-frame explanatory poster, to let members of the public see the fearsome splendor of the surface of the star that gives us both light and the means of life.
7. Light pollution, world-wide, is actually increasing at about 10 percent per year. This is not good! It not only interferes with the migrations of birds and other animals, but also the very metabolisms of all living things. It is both sad and ironic that now that astronomers have finally discovered a lot of information about the size, structure, and composition of the Universe, the vast majority of the population of Europe, Asia, and North America can no longer even see the Milky Way from their back yards.

My commentary:

The May issue of Sky and Telescope contains an article called 'Exoplanets Everywhere' by Knicole Colón, project scientist at Goddard Space Flight Science Center for the TESS (Transiting Exoplanet Space Telescope) and JWST (James Webb Space Telescope). She notes that thousands of exoplanets have now been discovered and confirmed by TESS, by the now-ended Kepler mission, and by numerous ground-based telescopes, using either the transit or radial-velocity methods. Many of these planets have had their mass and volumes measured, and attempts are ongoing to measure the contents of their atmospheres, as Dr Thaddeus Komacek of the University of Maryland described to NCA in his talk on February 11, which you can view here if you missed it - capitalastronomers.org/recordings/20230211_Komacek_Characterizing-the-atmospheric-circulation-and-climate-of-exoplanets-in-the-era-of-JWST.mp4

As a result of all this amazing work, we can now put some actual numbers into at least the first three terms of the famous Drake equation:

$$N = R_* \cdot f_p \cdot n_e \cdot f_l \cdot f_i \cdot f_c \cdot L$$

The rate of star formation in the Milky Way, R_* , is roughly known: about 1 to 10 new stars per year, depending on whose estimates you believe.

The fraction of stars that have planets (f_p) is now known to be quite large -- while not all stars have planets, many do have multiple planets, so much so that there are clearly more planets than there are stars.

Sky Watchers

April/May

Mercury reaches Greatest Eastern Elongation in the evening sky on April 11 (see below) and will drop lower as the month progresses then will begin transitioning to the morning sky at the start of May. Venus will continue to rise higher in the evening sky. Mars will be high above in the evening sky, setting well after midnight. Jupiter transits to the morning sky and will be difficult to view, while Saturn rises higher in the predawn sky each morning.	
4/11	Mercury at Greatest Eastern Elongation – The planet will appear 19.5 degrees from the Sun, high in the evening sky.
4/20	Hybrid Solar Eclipse (not visible in US) – The eclipse will be seen in some areas as total and in other areas as annular, with a ring of sunlight surrounding the Moon, along the path from the Indian Ocean through Australia and Indonesia.
4/22, 23	The peak of the Lyrids Meteor Shower which produces about 20 meteors/hour. The sky will be dark much of the night after the early setting of a crescent Moon, allowing for ideal viewing conditions.
5/5	Full Moon – 1:36 p.m.
5/6-7	The peak of the Eta Aquarids Meteor Shower which produces about 30 meteors/hour in the Northern Hemisphere, with more in the Southern Hemisphere. Unfortunately, the nearly full Moon will make for less-than-ideal viewing conditions throughout the night.

All times are in EDT (Eastern Daylight Savings Time)

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The **n_e** term, which stands for the average number of planets that can potentially support life per star that has planets, seems to me be quite low. Even if an exoplanet such as TOI700d is in fact located in the habitable zone around its planet, its star is an M-class red dwarf, as opposed to our G-class star, and red dwarfs have much more intense solar flares than our nice yellow star. Could life arise on such a planet? Nobody knows. It is true that both the radial-velocity and transit methods are very much biased in favor of close-in planets, simply because they are much easier to find than planets which orbit their host stars at greater distances, but with our current data, **n_e** seems to be rather close to zero.

The **f_l** term stands for the fraction of planets, that could support life, that actually do develop life at some point. What that fraction is, we have no way (yet) of telling. Will we ever? I don't know.

The other terms are:

f_i = the fraction of planets with life that develop an intelligent civilization;

f_c = the fraction of civilizations that develop a technology that releases detectable signs of their existence into space;

L = the length of time for which such civilizations release detectable signals into space.

For those terms, all we can do is guess.

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Star Dust is published ten times yearly September through June, by the National Capital Astronomers, Inc. (NCA).

ISSN: 0898-7548

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

Tycho Supernova Findings



X-ray image created by IXPE and NASA's Chandra X-Ray Observatory – Image Credit - NASA

The bright light of a supernova appeared in the sky in 1572 and was observed by the famed astronomer Tycho Brahe, and possibly by a young William Shakespeare. Described as being brighter than Venus at its peak, the 'new star' appeared in the constellation of Cassiopeia and was said to be still visible in 1574. 450 years later, the remnants of that supernova have been studied using NASA's X-ray Polarimetry Explorer (IXPE). As its name suggests, the spacecraft is able to study the polarization of the x-rays coming from the remnants, which allows for a better understanding of the magnetic fields involved in the supernova and how those fields accelerate the particles of cosmic rays. More information can be found at spacecoastdaily.com/2023/03/nasas-imaging-x-ray-polarimetry-explorer-unlocks-mysteries-of-historic-tycho-supernova/

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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	Date	Day	EDT	Star	Mag.	Asteroid	dmag	dur. s	Ap. " Location
Apr 8	Sat	1:53		4UC61044628	12.3	Scylla	3.2	3	6 ePA,CMD,DC,seVA
Apr 10	Mon	3:24		4UC37669705	12.3	Sibylla	1.5	12	6 neNC,se-cVA,Ohio
Apr 11	Tue	3:05		PPM 161245	9.6	Winchester	4.3	11	3 VA.MD.DC,WPA,OH
Apr 12	Wed	23:25		4UC62025000	10.4	Joensuu	6.5	1.5	4 WPA,C+SMD,nVA,DC
Apr 19	Wed	23:35		TYC18980682	9.8	Mars	0.0	256	? Canada,n+eUSA
Apr 23	Sun	4:00		4U302186698	13.5	Washingtonia	1.5	12	8 ePA,w+SNJ,seMD
Apr 26	Wed	3:37		4U369143101	13.6	Circe	0.7	28	9 eVA,eMD,NJ;DC?
Apr 26	Wed	20:47		4UC39745366	11.5	Zelinda	1.0	12	5 NOH,nPA,w+ecNY
Apr 27	Thu	3:42		4UC29984380	11.2	Dynamene	2.2	12	5 sPA,MD,DC,n+cVA
Apr 27	Thu	3:55		4UC52853817	12.8	Tiflis	1.1	4	9 CMD,SOH;DC,nVA?
May 12	Fri	22:30		TYC54650901	10.9	Zelinda	1.8	9	5 AZ,TX,nGA,SC,SN
May 13	Sat	1:38		4UC37670369	11.5	Euboea	2.8	3	5 SNJ,nMD,nVA,nWV

Lunar Grazing Occultations									
2023	Date	Day	EDT	Star	Mag	% alt	CA	Location, Notes	
Apr 27	Thu	22:50		SAO 80485	9.0	52+ 45	13N	Fredrk,Grnbelt,MD;WalopsIs,VA	

The best graze zone for this passes over the Greenbelt Community Center, where the Astronomical Society of Greenbelt (ASG) will hold their April meeting from 7 to 9 pm earlier that evening. So, after the meeting, skies permitting, we can set up scopes in the parking lot and other nearby areas for the graze; up to 5 D-R pairs may occur. At ASG's observatory, only the highest mountain on the profile will cover the star. The graze zone also passes over Frederick, Olney, and Woodmore, & Wallops Is., VA.

Lunar Total Occultations									
2023	Date	Day	EDT	Ph Star	Mag	% alt	CA	Sp. Notes	
Apr 9	Sun	2:09		R ZC 2216	7.2	90-	26	75S B9	
Apr 9	Sun	6:23		R ZC 2234	7.6	89-	17	57N K5 Sun alt. -4 deg.	
Apr 10	Mon	1:24		R ZC 2364	7.0	82-	13	74N A1 Aziuth 139 deg.	
Apr 11	Tue	6:17		R SAO 185562	8.0	72-	22	75S A0 Sun altitude -5 deg.	
Apr 12	Wed	3:33		R ZC 2702	6.8	62-	12	26N K0 Azimuth 142 deg.	
Apr 13	Thu	5:31		R SAO 188501	7.8	50-	18	48S K0	
Apr 13	Thu	6:16		R SAO 188524	8.3	49-	22	82N K5 Sun alt. -4 deg.	
Apr 19	Wed	13:57		D Jupiter	-1.9	0-55	-36N	Sun +60; elong. 6 deg.	
Apr 19	Wed	14:46		R Jupiter	-1.9	0-49	42N	Sun alt. +54	
Apr 22	Sat	20:51		D SAO 76545	7.9	9+21	85S G5	Sun -12,close double??	
Apr 23	Sun	20:19		D SAO 77031	8.4	15+38	4S F8	Sun -6,close double?	
Apr 24	Mon	22:06		D SAO 78108	8.4	24+29	65S F2		
Apr 24	Mon	22:53		D SAO 78128	8.3	24+20	58N K2		
Apr 25	Tue	0:27		D ZC 958	6.7	25+4	53S K1	Az. 302; spec. binary	
Apr 25	Tue	23:44		D 47 Gem	5.8	33+20	71S A4	ZC 1088	
Apr 26	Wed	21:49		D omega Cnc	5.9	42+50	67S G8	ZC 1206	
Apr 27	Thu	23:26		D ZC 1330	7.8	52+39	59S G5	close double?	
Apr 28	Fri	1:03		D ZC 1334	7.0	53+21	53S G5		
May 7	Sun	0:11		R ZC 2311	6.3	97-20	71S B8	Axis Angle 263 degrees	
May 7	Sun	1:29		R ZC 2317	6.6	97-25	82N A0	Axis Angle 289 degrees	
May 8	Mon	2:01		R ZC 2470	6.1	92-21	52S B9		
May 8	Mon	2:59		R ZC 2474	6.7	92-23	68S F2		
May 9	Tue	2:22		R ZC 2645	6.2	85-17	59N A5		
May 9	Tue	3:53		R SAO 186672	7.4	84-22	37S G5		
May 10	Wed	3:32		R ZC 2831	6.0	75-19	46N B2		
May 11	Thu	3:45		R ZC 2982	6.8	64-16	53S F8		
May 12	Fri	3:49		R 35 Cap	5.8	53-13	62N K3	Az. 131, ZC 3141	
May 13	Sat	5:19		R SAO 165062	8.4	41-22	57N F6	Sun -7, close double	
May 14	Sun	5:47		R psi3 Aqr	5.0	30-24	74S A0	Sun -2,ZC3428,dT +1.8s	

More information at <http://iota.jhuapl.edu/exped.htm>.

David Dunham, dunham@starpower.net

Occultation of IY Virginis by (697) Galilea, Mar. 21, 2023

The path for this occultation was shown on a map at the bottom of p. 6 of the March Stardust. Skies were clear across the DMV, and the event was observed from 6 locations in Maryland and 1 in Iowa. The figure (below on pg. 6) shows the observations projected onto the sky plane at Galilea; the motion was from right to left. E. Briggs was very late reacting to the star's disappearance, but did a little better for the reappearance, but the other observations, all video, provided more accurate times that defined the fit for the 76 km x 63 km ellipse well. The actual path was almost

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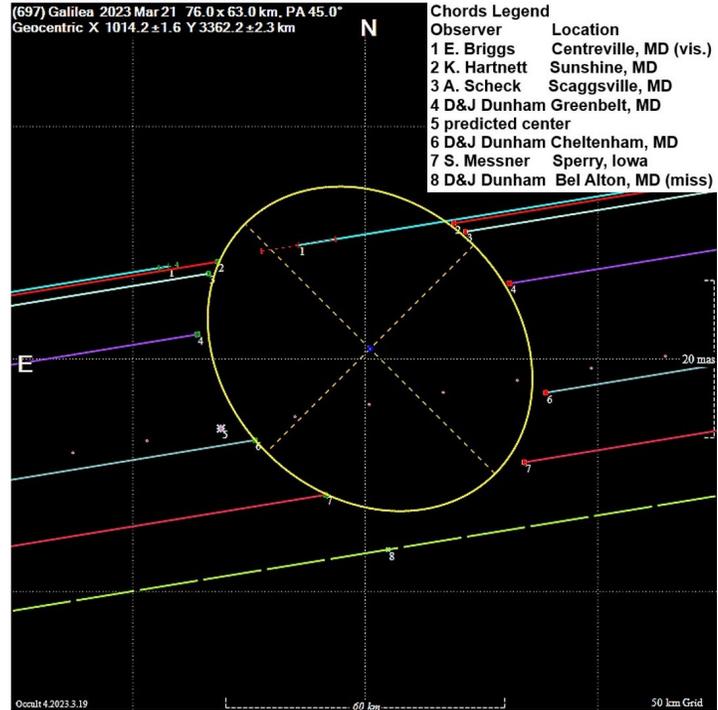
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20 km. north of the predicted path. David and Joan Dunham set up two automated stations with timers before recording the event at Bel Alton, where no occultation occurred.



President's Corner – continued from page 4

But so far, even though there are billions and billions of exoplanets out there, my estimate is that our solar system is extremely unrepresentative. It seems to be almost totally unlike all the other exoplanet systems discovered so far.

We need to thank our lucky star (Sol) that we are here – and also to thank all of the other stars that sloughed off their outer layers, or went super-nova, fertilizing the interstellar medium with the ‘metals’ like Oxygen and Carbon that later got incorporated into our Sun, and somehow allowed the miracle of life as we know it to get started and thrive on our lovely little planet.

As far as we know, we are the ONLY planet with life of any sort. Our little, tiny planet is truly an oasis of life in a vast universe that teems with places that are utterly hostile to life. Not only that, the portion of our planet that humans can live on without specialized equipment such as submarines or oxygen tanks is only a few miles deep – something like the thickness of one or two coats of paint on a soccer ball, if you do the math (and I have). The oceans are merely another couple of coats of paint on the same soccer ball.

Even if there are other intelligent civilizations out there somewhere, which is certainly quite possible, the distances are just way too vast for us to ever physically reach them, or vice versa. The idea that significant numbers of people can go and ‘terraform’ Mars or Venus, or visit a planet around another star, is ludicrous and distracting.

Our first job is to make sure that Earth, our only home, remains a wonderful place to live. Unfortunately, we are doing an amazing job of sucking up all the resources on it. “Humans account for about 36 percent of the biomass of all mammals. Domesticated livestock, mostly cows and pigs, account for 60 percent, and wild mammals for only 4 percent.”

If you are interested in astronomy, then you need to be interested in protecting our environment, and in getting our skies dark again so that people can see the universe with their own eyes.

Recent Astronomy Highlights – continued from page 4

Shockwaves in the Cosmic Web

Astronomers have previously made observations of gas in the Cosmic Web, the web of nodes and filaments gas and dust within which galactic clusters and galaxies are most often situated, but now they have observed evidence of shockwaves within the filaments of gas as they contract under the influence of their own gravity. These shockwaves give evidence of magnetic fields within the filaments because of the detection of radio waves generated by those magnetic fields. A challenge with making such a discovery is that radio waves can come from many sources such as the galaxies and galactic clusters. The solution, look for polarized radio waves which would be expected from these large-scale magnetic fields, since radio waves from smaller structures would tend to not be polarized. More information on the discovery can be found at www.space.com/cosmic-web-shockwaves-1st-radio-glow.

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 5:00 to 7:30 pm at the Chevy Chase Community Center (intersection of McKinley Street and Connecticut Avenue, N.W.) Please contact instructor Guy Brandenburg at 202-635-1860 (leave message) or at gbrandenburg@yahoo.com if you plan to attend. More 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: 8 April 7:30 p.m. Joe Pesce (GMU and NSF) The Atacama Large Millimeter/submillimeter Array (ALMA) and Game-changing Science

The APS Mid-Atlantic Senior Physicists Group: (Zoom Meeting)

April 19th at 1:00 p.m., Dr. Nat Gopalswamy, NASA. will give a talk entitled “Coronal Mass Ejections and Solar Gamma-ray Emission”. You can register for the Zoom meeting at [apsphysics.zoom.us/meeting/register/tZAvce-qgzsiGdJVdJP8yQbfG7XUIzyEaPu3](https://apsphysics.zoom.us/j/9452812345).

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:

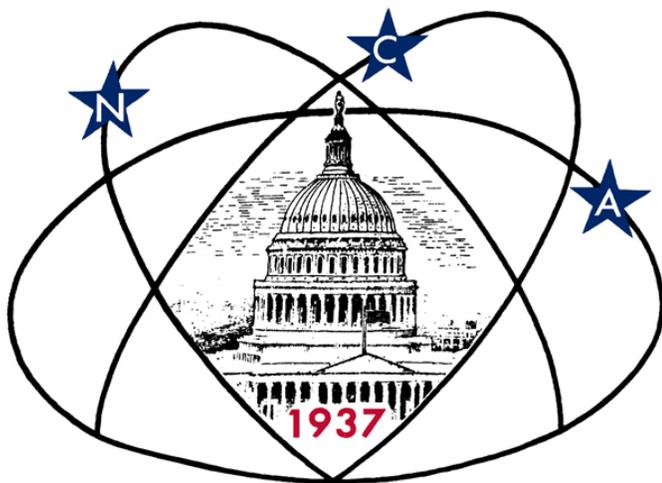
- Attending monthly scientific lectures on some aspect of astronomy _____
- Making scientific astronomical observations _____
- Observing astronomical objects for personal pleasure at relatively dark sites _____
- Attending large regional star parties _____
- Doing outreach events to educate the public, 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 – Todd Supple

It's now one year until the April 8th, 2024 solar eclipse, and only a little over six months until the October 14, 2023 annular solar eclipse, both occurring in the United States. Maps of the paths of both eclipses can be found at www.nasa.gov/feature/goddard/2023/sun/new-nasa-map-details-2023-and-2024-solar-eclipses-in-the-us.

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 April 8th
7:30 pm
(On Zoom)
Joe Pesce

To join the Zoom meeting, use the following link:
umd.zoom.us/j/98702044833?pwd=UTg1bFJpMmxvcXpEU GtUcDNmZnNrdz09

Please download and import the following iCalendar (.ics) files to your calendar system: umd.zoom.us/meeting/tJwqd-uoqj8iGdfUoJKHH8U2tt2u7IPmVFFS/ics?icsToken=98tyKu CggTsoGtCRuBqERow-B4iga_TwiCIHjadbqRDPKAh7OjaklvYQJ-VzINXm

Please note that NCA Zoom meetings are often recorded.

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