

Star Dust

Newsletter of National Capital Astronomers, Inc.

capitalastronomers.org

January 2023

Volume 81, Issue 5

**Celebrating 86 Years
of Astronomy**

Next Meeting

When: Sat. Jan. 14th, 2022

Time: 7:30 pm

Where: Online (Zoom)

See instructions for joining the meeting on Page 8.

Speaker: Dr. Kenneth G. Carpenter

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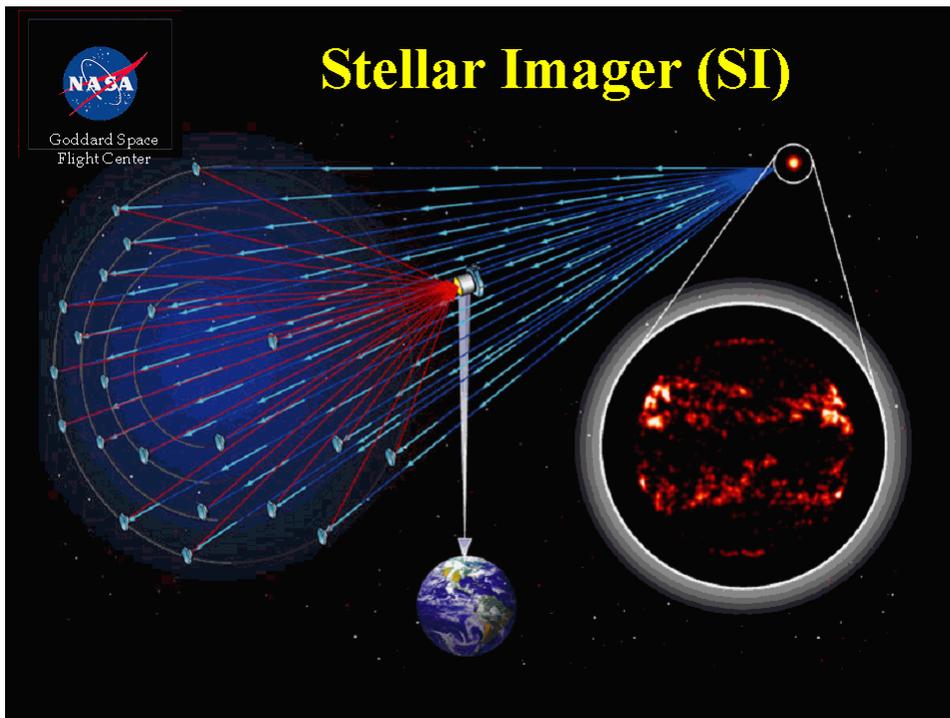


Image Credit - ESA/Webb, NASA & CSA, L. Armus, A. S. Evans

JWST captured the image above of NGC 7469, a galaxy 220 million light years from Earth. More information is available at www.nasa.gov/image-feature/starry-wreath-in-pegasus.

Imaging the Surfaces of Distant Stars

Dr. Kenneth G. Carpenter - HST Operations Project Scientist & Roman Ground System Scientist / NASA's Goddard Space Flight Center



**Artist's Concept of UV-optical Stellar Imager (SI) Vision Mission
Illustration Credit - NASA**

While we are working to develop the technologies that will bring us to the nearest star systems and beyond, astronomers continue to probe those distant planetary systems to understand better what we might find during those first visits. We often talk of the search for exoplanets, but equally important is our need to understand the central stars in those systems. Dr. Carpenter will describe the progress that has been made so far in resolving the surfaces of stars beyond the Sun, using both ground and space-based observatories, and then describe our vision of the ultimate space observatory for obtaining photographs of the surfaces of distant stars. Such a mission will consist of multiple mirrors spread out in huge, sparse arrays, such as the UV-optical Stellar Imager (SI) Vision Mission, with 30 mirrors precision formation flying with a beam-combining hub many kilometers distant. We will also discuss the alternate possibility of putting such an observatory on the lunar surface, in conjunction with the Artemis Program.

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Recent Astronomy Highlights

JWST Allows Study of Intracluster Light

Intracluster light is the light radiated by stars that have been gravitationally ejected from their home galaxies, whether through processes internal to those galaxies or because of interactions between galaxies within the cluster itself. The James Webb Space Telescope recently took infrared images of the galactic cluster designated as SMACS-J0723.3–7327, a cluster that is approximately four billion light years away. The images allowed study of the intracluster light, which could lead to a greater understanding of cluster formation as well as dark-matter distribution. A paper outlining the findings is available at iopscience.iop.org/article/10.3847/2041-8213/ac98c5/pdf

Evidence of a Mantle Plume Within Mars

Until recently, Mars was considered to be a 'dead' planet geologically, but recent evidence seems to indicate otherwise. Marsquakes in the region of Elysium Planitia a plain which is in the northern lowlands of the Red Planet, are one piece of evidence that there is a large mantle plume, approximately 2500 miles in diameter, below the surface. The plume has actually pushed the plains of Elysium Planitia up over a mile. Unlike much of the rest of the planet, this region has experienced volcanic eruptions over the past two hundred million years. In fact, there is evidence of an eruption as recently as 53,000 years ago. NASA's Insight lander, Interior Exploration using Seismic Ivestigations, Geodesy and Heat Transport, provided plentiful evidence for seismic activity in the region. Unfortunately, the lander stopped communicating recently and has been retired by NASA, but not before helping to radically change scientist's understanding of the remarkably active Martian interior. More information on these findings, and additional evidence, is available at www.sciencedaily.com/releases/2022/12/221205121545.htm

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Abstract and Biography – continued from page 1



Biography: Dr. Kenneth Carpenter is currently the Hubble Space Telescope (HST) Operations Project Scientist and the Ground Systems Project Scientist for the Roman Space Telescope (RST) at NASA's Goddard Space Flight Center in Greenbelt, Maryland. He previously led, as Principal Investigator (PI), the Stellar Imager Vision Mission Study and the Fizeau Interferometer Testbed (FIT) technology development effort. He was also the GSFC Science lead for the JPL-GSFC-JSC-STScI Optical Testbed and Integration on ISS eXperiment (OpTIIX) Team.

His scientific interests include studies of the chromospheres, transition regions, winds and circumstellar shells of cool stars, as well as the calculation of model atmospheres and synthetic spectra and investigations of line fluorescence processes, chemically peculiar stars, and the masses of Cepheid variables; hardware interests include development and operations of UV spectroscopic instruments and large baseline space interferometers.

He is currently a member of the "Exoplanets and Stellar Astrophysics Laboratory" at NASA's Goddard Space Flight Center. Carpenter earned his Bachelor of Arts and Master of Arts degrees in astronomy from Wesleyan University in Middletown, Connecticut, USA and earned his Ph.D. in astronomy from The Ohio State University. During his NASA career, Carpenter has received nine Special Act Awards and seven Group Achievement awards. He has also published more than 70 peer-reviewed papers in astrophysical literature and has more than 90 other publications.

He enjoys photography and is an enthusiastic fan of all things Star Trek and Disney. Carpenter credits both Star Trek and the 1964-'65 New York World's Fair, which he attended as a child, with fueling his desire to work for NASA.

Exploring the Sky



The Exploring the Sky program will take a hiatus until April of 2023.

Exploring the Sky is a joint public observing program between the National Capital Astronomers and the National Park Service. We have been holding these sessions for more than 70 years. We supply the telescopes and you supply the eyes. We meet in the field just south of the intersection of Military and Glover Roads, NW, near the Rock Creek Park Nature Center. A parking lot is located next to the field. The sessions will be canceled in the event of rain or cloudy skies.

Although this is not an optimal observing site, many of the objects people are interested in looking at are visible. At times we can see some of the planets, double stars, open clusters, globular clusters, the occasional comet or asteroid, nebulae and fuzzy galaxies. The latter two will never look like the magazine pictures!

More information can be found at NCA's web site, www.capitalastronomers.org or the Rock Creek Park web site, www.nps.gov/rocr/planyourvisit/expsky.htm. You can also call the Nature Center at (202) 895-6070. For general information on local astronomical events visit www.astronomyindc.org.

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

Clear Skies!

President's Corner

Guy Brandenburg

HAPPY NEW YEAR! It's newer than you might think! Most people around the world recently celebrated the start of another New Year. We often think that our planet has simply traced another orbit around the Sun, but in fact our path through space is more like a complicated and twisted helix, since the Sun itself is traveling at about 230 km/s around the center of the Milky Way galaxy. [This link](#) to an article by Ethan Siegel gives a schematic illustration of what I mean. I calculate that at our latitude of about 39 degrees we move at a speed of about 360 m/s as we rotate around the North-South polar axis of our planet, and that the Earth orbits around the Sun at a speed of about 4.7 km/s, both of which pale in comparison to that 230 km/s around the galactic center. And of course, we feel almost none of this, protected as we are by our nice, warm, moist atmosphere and our safe magnetic shield.

Most of the planets are well-placed for viewing this month, except for Mercury. Mars is higher in the sky than I've ever seen it, and dark markings on its surface are quite visible if seeing conditions are favorable and one's optics are good.

On October 14, there will be a partial solar eclipse (42% as seen from DC), but it looks like we in the DMV area will miss the partial lunar eclipse two weeks later.

At the NCA Telescope Making, Modification, and Maintenance Workshop, Alan Tarica, Tom Crone, and Pratik Tambe are building a small (4.25") and short (f/5) alt-az telescope that they will motorize using the OnStep system that you can read about [here](#), which will be similar to, but simpler than, the stepper motors and drivers that members of the Hopewell Observatory built and installed in their venerable Ealing telescope mount. A few months ago, at the TMMMW, some of us helped David and Joan Dunham pinpoint a drive backlash problem they were having with one of the Schmidt-Cassegrain telescopes they use for timing occultations. I also helped Milt Roney with a problem he was having with the focuser on one of his SCTs.

Since the NCA solar telescope is now back in operation, and since the Sun is entering a new period of activity, it is incumbent on us to use this significant investment to let the public know about this dynamic ball of plasma – that our lives depend on – only 8 minutes away. We need a display on an A-frame to let folks know what we are up to, and we need volunteers to help out Jay Miller, its long-time custodian.

Several great things about solar observing, as opposed to the nocturnal type:

1. You do it in the daytime, so you don't lose any sleep.
2. You can do it on ANY sunny day that you have time.

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Sky Watchers

January/February

Mercury will be in the morning sky throughout the end of January and beginning of February, reaching Greatest Western Elongation on January 30th (see below). Venus will remain in the evening sky. Saturn will be visible in the early evening sky. Jupiter will be viewable in the evening sky as well, setting before midnight. Mars will be viewable most of the night. Comet C/2022 E3 (ZTF), is currently visible in telescopes in the northern sky (see below).

1/22	Conjunction of Venus and Saturn. The pair will be within 21 arcminutes (a little over the two-thirds of the diameter of the Moon) of each other at their closest at 2:36 p.m.
1/30	Mercury reaches Greatest Western Elongation and will be 25° from the Sun in the predawn sky.
2/1	Comet C/2022 E3 (ZTF) reaches perigee, closest approach to Earth. (See Page 6 for more details.)
2/5	Full Moon at 1:30 p.m.

All times are in EST (Eastern Standard Time).

President's Corner – continued from page 3

3. You can observe from anywhere – no need to travel to remote locations with dark night skies.
4. No fancy eyepieces needed. Cheap Plossl eps work just fine.
5. When you observe in Hydrogen-alpha wavelength, the markings on the Sun are different every time you look, and you can even watch prominences change in real time, while you are looking at them!
6. No fancy equatorial motorized and computerized mount is needed. Any equatorial or alt-az camera head or mount on almost any tripod will do. Slow motion knobs do help.
7. It is much easier to find one's target compared with nocturnal star-gazing!
8. You can see the face of the person with whom you are talking if you're doing outreach with it.
9. No worries about dark adaptation!
10. This is our best and closest look at the type of fusion furnaces that cooked up all of the atoms in all of the molecules in our bodies – except for the hydrogen, which was created in the Big Bang.

Again, we need additional volunteers to help Jay Miller staff this excellent resource. Remember, this telescope can be used on any sunny day, anywhere, and having a decent display to go along with it will help raise the profile of our club!

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

• JWST Image Provides Evidence of Protostars



• **Image Credit - NASA, ESA, CSA, STScI**

• One of the first images released from the James Webb Space Telescope, known as the "Cosmic Cliffs", the image above proved to be more than just a pretty picture. The infrared light which JWST specializes in collecting passes through clouds of dust more easily than visible light, allowing astronomers the opportunity to look deep into regions such as those in which new stars are forming. Looking more closely at a portion of the image of a star-forming region in the star cluster designated NGC 3324, a team of astronomers discovered two dozen regions where molecular hydrogen was flowing out from young protostars. Such outflows take place for a very brief period, only thousands of years, when protostars are accreting significant amounts of material. Further study of these regions should allow for advances in the understanding of protostar formation. More information about the discovery can be found at www.sciencedaily.com/releases/2022/1/20221216142633.htm.

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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	EST	Star	Mag.	Asteroid	dmag	dur. s	Ap. "	Location
Jan 14	Sat	17:57	4UC57033030	13.6	Angelina	0.1	6 10	SNJ,CMD,DC,n+cVA	
Jan 16	Mon	0:16	4UC60735862	13.0	Robelmonte	2.3	2 8	SMD,CVA,CWV,SOH	
Jan 17	Tue	20:55	4UC45300627	13.6	Doris	0.5	8 9	MD,c+nVA,DC,sePA	
Jan 18	Wed	19:20	4UC59644525	13.9	Heidelberg	0.4	6 10	CMD,nVA;DC,cVA?	
Jan 20	Fri	1:42	4UC51035547	14.0	Herba	1.9	2 10	SNJ,CMD,nVA;DC?	
Jan 22	Sun	19:01	SAO 172063	8.3	Pallas	0.5	41 5	eBR,NE,NY,e+nPA	
Jan 23	Mon	1:47	TYC13281049	12.2	Oriola	1.8	4 6	SNJ,neMD,sPA,nOH	
Jan 24	Tue	20:55	4UC56140107	13.7	Heiskanen	3.0	2 9	CNY,sPA,nwMD,SOH	
Jan 25	Wed	20:58	TYC18800137	12.1	Alanhale	4.5	2 5	SNJ,CMD,nVA;DC?	
Jan 30	Mon	20:40	4UC45801087	12.3	Gudula	3.3	1.5 7	SOK,SKY,CVA,SMD	
Feb 3	Fri	2:49	SAO 181576	7.0	Lugano	9.1	3 2	CNY,ePA,SNJ	
Feb 3	Fri	19:43	4UC42933120	13.1	Henrietta	2.3	6 8	SNJ,neMD,swPA,OH	
Feb 6	Mon	2:40	TYC18490685	11.2	Oskar	4.8	8 6	swNY,nw-sePA,CNJ	
Feb 6	Mon	6:32	TYC55900416	11.4	Austria	3.1	2.1 5	nIL,nOH,nVA,CT	
Feb 7	Tue	5:02	4UC30485953	13.6	Lysistrata	2.0	0.9 9	COH,c+seVA,neNC	
Feb 8	Wed	1:31	TYC49150193	10.6	Phaeo	3.5	5 4	nOK,KY,CVA,SMD	
Feb 10	Fri	3:38	4UC33467927	13.6	Lugano	2.5	4 9	CPA,CMD,eVA;DC?	
Feb 11	Sat	3:09	TYC08161634	10.1	Franklina	5.2	2 4	se+cVA,soH,cIL	
Feb 15	Wed	20:27	TYC06930729	10.0	Bilkis	4.5	6 4	eTX,seOH,sw-nePA	

Lunar Grazing Occultations

2023 Date	Day	EST	Star	Mag	% alt	CA	Location, Notes
Jan 29	Sun	20:19	SAO 75982	8.4	64+ 64	11S	Aden,Newington,VA;OxonHill,MD
Feb 9	Thu	3:00	SAO 119171	8.8	89- 54	21S	McClellan,VA;Potomac,OxnHill,MD

Lunar Total Occultations

2023 Date	Day	EST	Ph Star	Mag	% alt	CA	Sp. Notes
Jan 12	Thu	23:57	R 10 Vir	6.0	68- 14	23S	K3 Azimuth 100, ZC 1749
Jan 14	Sat	6:57	R PX Vir	7.7	56- 42	28N	G5 Sun-6,ZC1874,close dbl?
Jan 17	Tue	4:08	R ZC 2212	6.2	26- 11	41N	A3 Azimuth 128 degrees
Jan 18	Wed	4:35	R 22 Scorpii	4.8	16- 3	55S	B3 Azimuth 126, ZC 2371
Jan 18	Wed	6:01	R SAO 184466	8.2	16- 15	5N	K0 Azimuth 141 deg.
Jan 23	Mon	18:14	D SAO 165065	7.9	6+ 14	64S	G8 Az. 237, Sun alt. -11
Jan 23	Mon	18:36	D SAO 165066	8.0	6+ 10	46N	K0 Az. 242, close double??
Jan 24	Tue	16:48	D psi2 Agr	4.4	13+ 37	41N	B5 Sun+5,ZC3425,close dbl?
Jan 24	Tue	18:12	D SAO 146650	7.9	13+ 27	84N	A0 Sun alt. -10
Jan 24	Tue	18:42	D ZC 3434	7.5	14+ 22	59N	A2
Jan 24	Tue	19:55	D ZC 3446	7.2	14+ 10	85S	K0 Az. 251, close triple?
Jan 24	Tue	19:55	D X185486	7.6	14+ 10	84S	Az.251,ZC3446B,dT +5s
Jan 25	Wed	19:31	D SAO 128654	7.2	23+ 27	48S	K0 close double??
Jan 26	Thu	20:59	D 77 Piscium	6.4	33+ 24	58N	F4 ZC 155,dbl, dTime +50s
Jan 26	Thu	21:00	D SAO 109667	7.3	33+ 24	59N	F6 77 Piscium companion
Jan 27	Fri	20:24	D SAO 92688	6.8	43+ 43	83S	F5
Jan 29	Sun	21:34	D SAO 76000	8.1	64+ 53	25S	K5
Jan 30	Mon	0:06	D ZC 525	6.5	65+ 25	88N	A*
Jan 30	Mon	17:25	D SAO 76552	7.6	72+ 56	15N	A0 Sun alt. -1 deg.
Jan 31	Tue	1:35	D SAO 76651	7.8	74+ 20	89S	F0
Feb 2	Thu	0:32	D ZC 958	6.7	89+ 52	88S	K1 Spectroscopic binary
Feb 2	Thu	3:17	D SAO 78309	7.4	89+ 21	70N	A0
Feb 2	Thu	17:40	D ZC 1067	7.1	93+ 32	10N	K2 Sun -3,dbl??,TermDist4"
Feb 2	Thu	23:57	D 47 Gem	5.8	94+ 68	78N	A4 ZC 1088
Feb 3	Fri	1:03	D SAO 79164	7.4	94+ 56	47S	G8 close double??
Feb 3	Fri	3:31	D SAO 79243	7.3	94+ 28	75S	K1
Feb 3	Fri	3:37	D ZC 1105	6.5	95+ 27	14N	G7 TermDist7",close double
Feb 3	Fri	21:31	D omega Cnc	5.9	97+ 65	66N	G8 ZC 1206
Feb 3	Fri	22:37	D 4 Cancri	6.3	98+ 74	46S	A1 ZC 1211
Feb 8	Wed	23:58	R ZC 1728	6.7	89- 37	48N	M4
Feb 9	Thu	5:33	R SAO 119212	7.5	88- 39	15N	K0
Feb 10	Fri	1:51	R ZC 1828	6.8	82- 42	86N	A2
Feb 12	Sun	3:16	R MZ Vir	7.4	63- 31	55N	M2 SAO 158493
Feb 13	Mon	4:37	R iota Lib	4.5	52- 29	65N	A* ZC2172,mg2 6, dT +0.24s
Feb 14	Tue	3:06	R SAO 184098	7.7	42- 10	66N	B9 Az. 132,mg2 10,dT -0.4s
Feb 14	Tue	3:15	R ZC 2305	5.9	42- 12	33N	B8 Az.134,dbl 0,dbl 0

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

David Dunham, dunham@starpower.net

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Comet C/2022 E3 (ZTF) May Become Visible to the Naked Eye in Late January/Early February 2023

Astronomers and astronomy enthusiasts are abuzz about Comet C/2022 E3 (ZTF), which is currently viewable through small telescopes, one of the brightest comets since Comet NEOWISE was prominent in the skies in 2020. All indications are that C/2022 E3 (ZTF) will not be as bright as Comet NEOWISE was, but there has been some speculation in recent days that the comet will become naked-eye visible in dark skies.

The comet's perihelion, closest approach to the Sun will be on January 12th and perigee, its closest approach to Earth, will take place on February 1st when it comes within 42 million kilometers of Earth. At that time it will appear near the North Celestial Pole in the Camelopardalis constellation. A finder chart for January into February can be found at britastro.org/wp-content/plugins/baa-frontend-tweaks/baa-check-file.php?filename=2022/11/2022e3_Jan23.pdf. A light curve, last updated in late December 2022, shows that the comet may reach 5th magnitude toward the end of January, which should make it naked-eye visible in dark skies. That light curve and more information about the comet can be found at britastro.org/section_news_item/comet-c-2022-e3-ztf-now-an-impressive-morning-object.

As the name implies, the comet was originally discovered by astronomers at the Zwicky Transient Facility, the discovery taking place on March 2, 2022. The ZTF is located at the Palomar Observatory in California and uses a wide-field camera to image the night sky once every two days, looking for transient events, such as supernovae.

Estimates are that Comet C/2022 E3 (ZTF) has an orbit of approximately 50,000 years with its farthest point from the Sun, aphelion, being approximately 2800 AU (AU – astronomical unit, the average distance between the Sun and Earth) and its perigee being 1.1 AU.

NASA and HAARP Image the Interior of an Asteroid

September 2022 saw the spectacular impact of a probe from the DART mission, Double Asteroid Redirection Test, with the asteroid Dimorphos as part of an exploration of means by which to redirect asteroids that might threaten Earth in the future.

In December 2022, NASA and the National Science Foundation took another step in this effort to develop such a defense program. HAARP, High-frequency Active Auroral Program, an NSF facility located in Gakona, Alaska, beamed long-wavelength radio signals at asteroid 2010 XC15 when it passed about twice as far from the Earth as the Moon orbits. The asteroid is estimated to be about 500 feet in diameter. Some of the radio waves bounced back from the asteroid and were received by radioastronomy facilities on Earth. Longer radio waves were used because they can more easily penetrate the interior of an asteroid, providing information that might help in designing optimal impactors for diverting such asteroids from Earth in the future. Scientists will now study the data received from the experiment. More information can be found at www.gi.alaska.edu/news/nasa-and-haarp-conclude-asteroid-experiment.

Recent Astronomy Highlights – continued from page 4

Tidal Forces Doom an Exoplanet

The first exoplanet independently discovered by the Kepler mission is apparently doomed to be consumed by its star. Designated Kepler-1658b, the hot Jupiter is spiraling slowly in toward that star, a demise that will likely take place within the next three million years. The discovery of this fate came from thirteen years of records of transits of Kepler-1658b across its star. The timing of those transits indicates that the orbital period of the exoplanet, which orbits each 3.8 days, is decreasing by 131 milliseconds per year. Tidal forces are the cause of this decrease. The star itself has begun to expand, having exhausted the hydrogen fuel at its core. Scientists have theorized that stars in this phase will more efficiently dissipate tidal energy, leading to a faster inspiraling of such exoplanets. More information about the discovery can be found at www.eurekaalert.org/news-releases/974893.

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 gfbrendenburg@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: 11 February 7:30 p.m.** Thaddeus Komacek (UMD), **Hot Jupiters**
- **The APS Mid-Atlantic Senior Physicists Group: (Zoom Meeting)** January 18th at 1:00 p.m., Dr. Andrew Cheng, Johns Hopkins Applied Physics Lab, will give a talk entitled “DART: The First Planetary Defense Test Mission”. You can register for the Zoom meeting at apsphysics.zoom.us/j/85993456020?pwd=SW5CY09tdTBDM2Vnb2dPY3JtWXBjdz09. Meeting ID: 859 9345 6020 Passcode: 646006 Dial in access - 301 715 8592 US (Washington DC)

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.....\$__

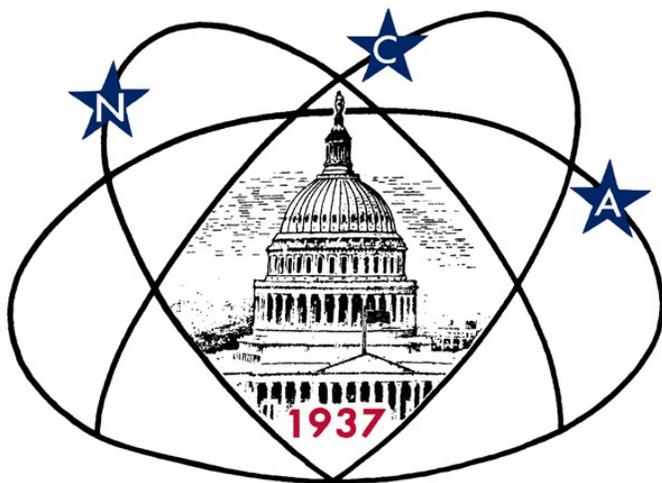
Please indicate which activities interest you:

- 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: ESA/Hubble & NASA, S. Kulkarni, Y. Chu

The Hubble Space Telescope captured the above image of the supernova remnant designated DEM L 190. More info about the remnant is at www.nasa.gov/image-feature/goddard/2022/hubble-homes-in-on-a-celestial-fireworks-display.

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 January 14th

7:30 pm

(On Zoom)

Dr. Kenneth G. Carpenter

To join the Zoom meeting, use the following link:

umd.zoom.us/j/98702044833?pwd=UTg1bFJpMmxvcXpEUgtUcDNmZnNrdz09

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

Please note that NCA Zoom meetings are often recorded.

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