

Star Dust

National Capital Astronomers, Inc.
October 2012 Volume 71, Issue 2
<http://capitalastronomers.org>



Celebrating 75 years 1937-2012

Next Meeting

When: Sat. Oct. 13, 2012
Time: 7:30 pm
Where: UMD Observatory
Speaker: Roopesh Ojha
(NASA / GSFC)

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Directions to Dinner/Meeting

Members and guests are invited to join us for dinner at the Garden Restaurant located in the UMUC Inn & Conference Center, 3501 University Blvd E. The meeting is held at the UM Astronomy Observatory on Metzert Rd about halfway between Adelphi Rd and University Blvd.

Need a Ride?

Please contact Jay Miller, 240-401-8693, if you need a ride from the metro to dinner or to the meeting at the observatory. Please try to let him know in advance by e-mail at rigel1@starpower.net.

Observing after the Meeting

Following the meeting, members and guests are welcome to tour through

October 2012: Roopesh Ojha
NASA Goddard Space Flight Center

When Fermi met Jansky: a romance across the electromagnetic spectrum

Abstract: Though gamma-rays and radio waves are at opposite ends of the electromagnetic spectrum, they play a vital and complementary role in addressing the many outstanding questions about the physics of Active Galactic Nuclei (AGN). The Fermi Gamma-ray Space telescope, various X-ray satellites and ground based facilities from TeV to radio energies provide, for the first time ever, the opportunity to study AGN quasi-simultaneously across the spectrum. This has long been a dream of AGN theorists and observers alike. The radio observing technique of Very Long Baseline Interferometry (VLBI) plays a particularly indispensable role, as it is the only astronomical technique that can directly observe parsec scale structure in AGN jets. Thus it is the only means of obtaining (among other things) the kinematic information and high-resolution spectra essential to modeling the energetics of these objects. In this context, we will discuss observations of the closest AGN, Centaurus A. The observations have a linear resolution of 13 milliparsecs, which is less than the distance between the Sun and our nearest neighboring star.

Biography: Dr. Roopesh Ojha is a Senior Fellow at NASA's Goddard Space Flight Center. He works with the Fermi Gamma-ray Space Telescope's Large Area Telescope (LAT) team, leading the TANAMI program, which monitors Active Galactic Nuclei (AGN) in the southern third of the sky at radio wavelengths, at multiple resolutions. TANAMI includes Very Long Baseline Interferometry (VLBI) observations, which provide the greatest spatial detail of any technique in astronomy. Roopesh's principal research interest lies in addressing some of the outstanding conundrums of AGN physics, using any and all available techniques. After completing his graduate studies from Brandeis University, Roopesh worked at the Harvard Smithsonian Center for Astrophysics, during which he operated a submillimeter telescope at the South Pole, alone through an Austral winter. He has since worked at the Australia Telescope National Facility in He has since worked at the Australia Telescope National Facility in Sydney, Australia, and at the United States Naval Observatory in Washington DC, before moving to Goddard.



the Observatory. Weather-permitting, several of the telescopes will also be set up for viewing.

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Editor: Michael Chesnes

Editorial Advisors:

Elizabeth Warner
Jeffrey Norman
Wayne Warren
Harold Williams
John D. Gaffey, Jr.
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PDF Distributor: Jay Miller

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Thank you!

Reminder

After the meeting, everyone is invited to join us at Plato's Diner in College Park. Plato's is located at 7150 Baltimore Ave. (US Rt. 1 at Calvert Rd.), just south of the university's campus. What if it's clear and you want to stick around and observe? No problem -- just come over when you're through. This is very informal, and we fully expect people to wander in and out.

Farewell to Dr. Jaylee Mead

from Sept. 2012 *Nebula*

George Gliba

Goddard Astronomy Club

We have lost another of the great pioneers of the Space Age, and a dear friend, Jaylee Mead. She was one of the first women scientists hired by NASA back when Goddard Space Flight Center opened in 1959. She was also one of the founding members of the Goddard Astronomy Club, when it formed in 1961.

I was lucky to have a nice talk with her about this when she gave her last talk at Goddard last year. She told me, in her very enthusiastic voice, that was the trademark of her great character, that back in the early days of Goddard: "Astronomy was considered a big deal, even though there was not much official astronomy going on as yet at NASA." The GAC was a reflection of this.

I was able to also thank her for the grant for the City of Greenbelt Observatory at that time. She was a patron of the performing arts, and a champion to the Astronomical Society of Greenbelt (ASG), giving us a matching grant with husband Gil for the City of Greenbelt Observatory, which was dedicated in 2009 during the International Year of Astronomy. Montgomery College had donated an observatory dome and 14-inch SCT telescope to the ASG in March, 2001. With the help of the City of Greenbelt, and this much needed grant from the Mead Family Foundation, the City of Greenbelt Observatory has become a reality.

The ASG was spawned by members of the GAC in 1992, which Jaylee was a founding member of. So, it is probably fair to say that in more ways than one she has helped foster growth in amateur astronomy in the Greenbelt area in a big way. She was a giant among our citizens, and a lover of the performing arts, music, science, and Nature.

Invitation to an Astronomical Open House at the Hopewell Observatory on October 20, 2012

Guy Brandenburg

All NCA members, their families, coworkers, neighbors and friends are cordially invited to an open house at the Hopewell Observatory near Haymarket, Virginia, on the evening and night of October 20-21, 2012. Come near sunset and stay as long as you like.

The Hopewell Observatory is a small observatory with a roll-off roof, built and maintained by its members on about four acres of land on a ridge of the Bull Run 'Mountain' at about 1160 feet elevation. Because of the altitude, it receives much less dew than other viewing fields down in the valleys.

Sunset will be at about 6:30 pm EDT. Civil twilight will end at about 6:50 pm, nautical twilight at around 7:20 pm, and astronomical twilight will end around 7:50 pm – which is when we astronomers really like it.

The Moon will be about 38% illuminated, i.e. a few days away from first quarter, which will make it a most attractive sight before it sets at about 11 pm. Mars, Saturn and Mercury are unfortunately very low on the horizon and close to the sun, so might be impossible to see. However, Jupiter will rise around 9 pm and will come up out of the trees around 10 pm, if you care to wait.

2012-2013 Officers

President:

Joseph C. Morris
j.c.morris@verizon.net
 703-620-0996 (h)
 703-983-5672 (w)

Vice-President:

John Hornstein
ishgwave@yahoo.com
 301-593-1095 (h)

Secretary:

Manjunath Rao
kurchi@hotmail.com
 571-272-0939

Treasurer:

Henry Bofinger
hbofinger@earthlink.net
 202-675-1075

Asst. Secretary-Treasurer:

Jeffrey B. Norman
jeffreynorman@comcast.net

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Appointed Officers and Committee Heads:

Exploring the Sky
 Joseph C. Morris
j.c.morris@verizon.net

Telescope Making
 Guy Brandenburg
gfbrendenburg@yahoo.com
 202-635-1860

NCA Webmaster
 Harold Williams
Harold.Williams@montgomerycollege.edu
 240-567-1463 (w)
 301-565-3709 (h)

Meeting Facilities
 Jay H. Miller
rigel1@starpower.net
 240-401-8693

Star Dust Editor
 Michael Chesnes
m.chesnes@verizon.net
 301-313-0588

Our current main telescopes are an interesting 12" Wright-Newtonian that was entirely built by one of our members on one pier, and a commercial C-14 SCT and a 6" f/15 refractor on a second pier.

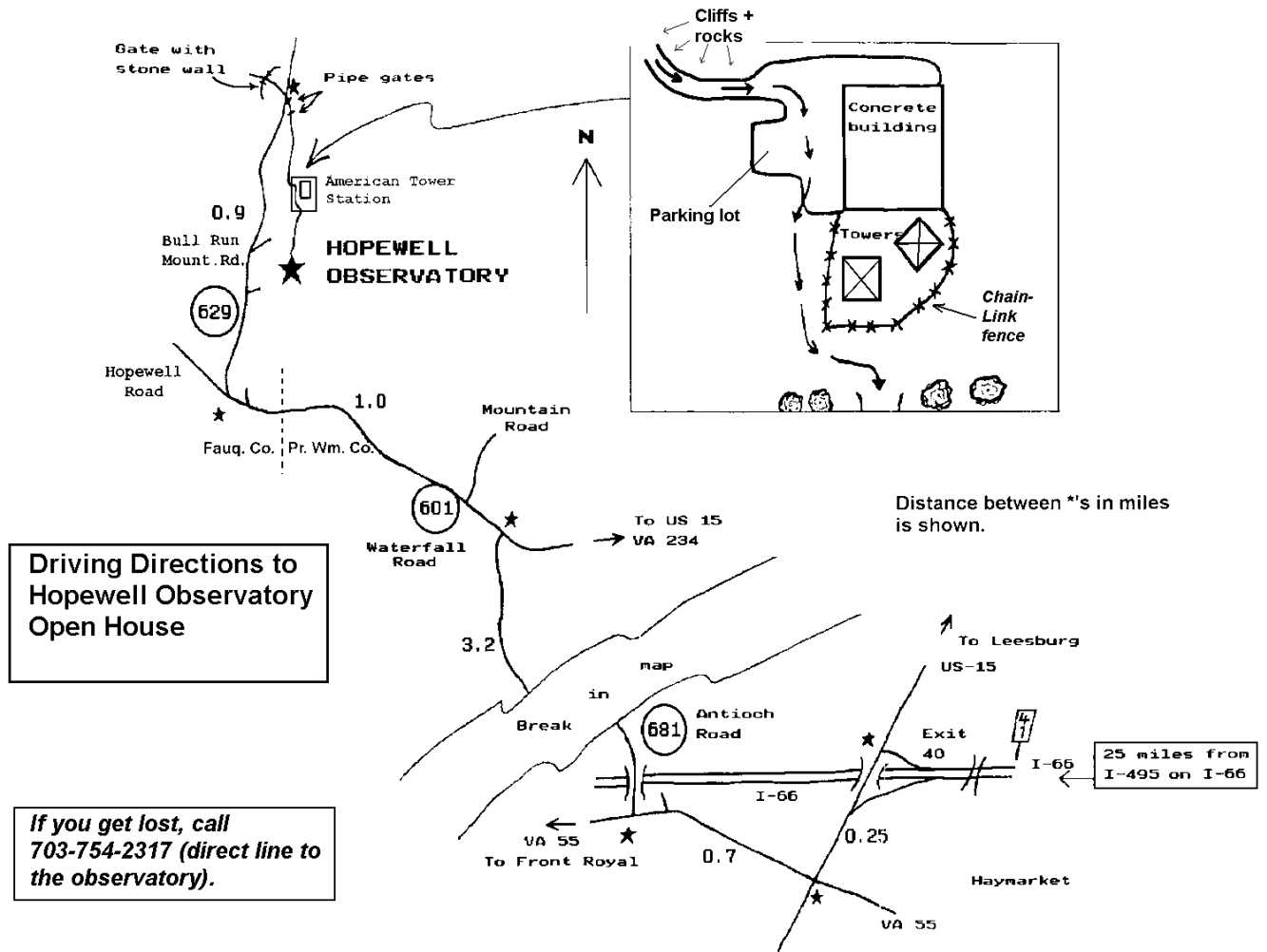
Thanks to the efforts of one of our members in bringing light pollution issues to their attention, our neighbors have been quite good about installing full-cutoff lights. We are mostly surrounded by parks and nature preserves, so we probably have the darkest skies anywhere this close to DC. If you bring a flashlight, we have translucent red plastic tape and rubber bands that you can wrap around the light so that we all can preserve our visual purple.

We do have electricity, but no running water. There is a self-composting outhouse (and lots of bushes), and we will have bottled water along with hot water for tea, coffee, and hot chocolate. Parking is a bit tight, and most visitors will need to walk 250 yards or so from their cars to the scopes. If you have a handicapped driver or passenger, or if you are bringing your own telescope, you can drive right up to the yard right next to the observatory building itself. Please do not park in such a way as to block access!

Here are directions that assume you are driving west on I-66 from the DC metro area. There will be signs once you get off the main roads.

1. Get off at the Haymarket exit and turn south (left) on US 15 for about 200 yards.
2. Turn right (west) on US 55. Follow that for about ½ mile to Antioch Road.
3. Turn right (north) and follow Antioch road, passing over the interstate, passing Camp Snyder and LaGrange winery, about 3.3 miles all told, dead-ending at Waterfall Road.
4. Turn left (west) onto Waterfall road, which is paved but narrow and winding. Go about 1.0 mile and change counties; turn slightly right (north) onto Bull Run Mountain Road (NOT Mountain Road, which comes much earlier).
5. Follow BRMR north for about 0.9 mile; it becomes gravel and rises fairly steadily.
6. On the left you will see a well-built metal, padlocked gate with stone pillars. That is NOT the observatory entrance, which is directly opposite that gate; our gate is a long cylindrical yellow-orange bar that is labeled "American Tower." it will be unlocked and open when you arrive. There is a steep paved road and a sharp right hand turn. You will pass under a power line.
7. Follow this road (South(!)), gaining altitude. If your car has very low clearance, it may bump on some of the asphalt.
8. In about 0.3 mile the road will climb sharply make a left turn around a large rock formation and debouch onto a parking lot in front of a concrete building that is next to a huge radio/microwave tower. This is NOT the observatory!
9. This parking lot is one of the best places to park, although there are some more places further on, around the fences around the towers. We do NOT recommend parking on steep slopes or in very tall grass. Do NOT drive along the power line unless you like broken axles!
10. Walk past the radio building and tower and follow the gravel road and tracks, turning left around the fence around the tower.
11. Follow the unpaved road through the trees, heading south for about 800 feet until you come to a yellowish grayish pink building with a steep gray shingle roof, our control cabin.
12. The observatory is the white cinder block building with a roll-off roof in back of (south of) the first building.

If you get lost, feel free to call the observatory itself at (703)754-2317. If you have any further questions, you may email this writer at gfbrendenburg@gmail.com.



Dobsonian Telescope Built at ATM Class



Last month we profiled a Crayford focuser built by Prasad Agrahar, a student at the NCA Amateur Telescope Making class. Here is Prasad's focuser again, during first light on his assembled 8 inch Dobsonian-mounted Newtonian reflecting telescope.

50 Years and the Dr. Niels Wieth-Knudsen Award

It began on June 28th, during the MIEM 50th anniversary celebration, when David Dunham was asked to say a few words. He thought, "1962, that was an important year for me, too", and he said that both MIEM and his astronomical career began in that year. Although the idea of a lunar grazing occultation had occurred to Dunham five years before, it was in 1962 when he actually did something about it, deriving the formulae and writing the first computer program to compute predictions for these phenomena. He began trying to observe grazing occultations, and started encouraging other amateur astronomers to observe these "grazes", first around California where he then lived, then across the USA and the world. It was a new activity that he established in 1962.

Dunham had already made plans to attend the 31st European Symposium on Occultation Projects (ESOP-31), the annual convention of the European Section of the International Occultation Timing Association (IOTA/ES), held this year in Pescara, Italy. Dunham sent the organizers of ESOP-31 an abstract titled "50 Years of Grazing Occultations" and gave a corresponding presentation, describing the early years when the work first blossomed, up to the latest developments. The recent work included Dunham's first successful use of small stationary telescope systems, normally used robotically for occultations of stars by asteroids, for the observation of grazes, and the first analysis of graze observations this year using lunar profile data derived from Lunar Reconnaissance Orbiter laser altimeter observations, showing better agreement (smaller residuals) than use of previously-available lunar profile information.

Seeing Dunham's abstract, the officers of IOTA/ES decided to give him their Dr. Niels Wieth-Knudsen Award. Dr. Niels Knudsen was an avid occultation observer who lived in Denmark; during the 1970's and 1980's, he observed more lunar occultations than any other European observer, in spite of the usually poor Danish weather. He observed grazes around Europe and attended most ESOP meetings until he died in 1993. In 1996, IOTA/ES established their award named in his honor. The award given to Dunham is special, since the plaque is fixed to a plate that was cut from a stone that had fallen from a Roman aqueduct in Italy, found by Eberhard Bredner, the secretary of IOTA/ES, during a grazing occultation trip. You can see the presentation about the award, and Dunham's about grazing occultations, on the Web site of ESOP-31 at

http://www.icranet.org/index.php?option=com_content&task=view&id=626 .

Mid-Atlantic Occultations and Expeditions David Dunham

Asteroidal and Planetary Occultations

Date	Day	EDT/EST	Star	Mag.	Asteroid	dur. dmag	Ap. s "	Location
Oct 8	Mon	6:42	ZUC40000398	10.9	Metis	0.5 12	6	MD,DC,nVA;Sun -6
Oct 16	Tue	6:47	SAO 55124	8.2	Tina (Sun-6)	5.8 2	2	sNJ,sPA,nOH;nMD?
Oct 21	Sun	3:40	ZUC31634154	12.0	Prokne	1.0 21	8	wPA,cVA,eNC;DC?
Oct 26	Fri	5:51	SAO 92997	9.7	Aoluta	4.3 2	4	eMD,DC,nVA,sOH
Oct 28	Sun	19:27	PPM 722389	10.3	Susi	6.7 2	5	sw-nVA,DC,MD,sNJ
Oct 30	Tue	4:02	TYC24951361	11.9	Egeria	0.5 10	7	WV,nVA,MD,DC,PA
Nov 3	Sat	5:38	TYC12880498	9.8	Russell	6.1 2	4	nOH,sPA,nNJ

*** Dates and times above are EDT, those below are EST ***

Nov 10	Sat	21:06	TYC12091621	11.0	Pierretta	2.5 4	7	sNJ,DE,MD,VA;DC?
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Lunar Grazing Occultations (*, Dunham plans no expedition)

Date	Day	EDT/EST	Star	Mag.	% alt	CA	Location
Oct 18	Thu	19:21	SAO 184657	9.0	16+ 13	10S	*Cumberland,MD; Duncannon,PA

*** Dates and times above are EDT, those below are EST ***

Nov 9	Fri	5:18	ZC 1605	6.0	25- 39	9S	*nRoanok&Skipsrs,VA;OR-Inl,NC
Nov 17	Sat	17:56	SAO 162699	7.3	22+ 27	10S	*ChplHL,NC;Jarrat&Wilmsbg,VA

Interactive detailed maps at <http://www.timerson.net/IOTA/>

Total Lunar Occultations

DATE	Day	EDT	Ph	Star	Mag.	% alt	CA	Sp.	Notes
Oct 13	Sat	6:50	R	ZC 1662	6.4	6- 19	25N	K2	Sun -6,mg2 8, sep. 0.2"
Oct 18	Thu	19:30	D	ZC 2415	7.3	16+ 13	48S	M2	Azimuth 228 degrees
Oct 20	Sat	19:32	D	SAO 161947	7.0	37+ 28	85N	K2	
Oct 20	Sat	20:17	D	X 45011	7.7	37+ 24	71N	K0	
Oct 20	Sat	21:52	D	SAO 162024	8.0	38+ 11	43S	K2	Azimuth 233 deg.
Oct 20	Sat	22:36	D	ZC 2763	6.5	38+ 5	65N	M3	Az.241,mg2 10,sep. 0.1"
Oct 21	Sun	20:07	D	ZC 2903	7.7	48+ 32	63N	K3	may be a close double
Oct 26	Fri	3:29	D	kappa Psc	5.0	88+ 10	79N	A0	Az.264, ZC3453, double?
Oct 26	Fri	3:35	D	9 Piscium	6.3	88+ 8	66S	G7	Az.265, ZC3455, spec.bin.
Oct 28	Sun	19:06	D	pi Piscium	5.5	99+ 18	72N	F0	Sun-11,ZC 240,TmDst 11"
Oct 31	Wed	22:35	R	omega Tau	5.5	95- 36	57S	K2	AxisAng 241 deg., ZC 614
Nov 2	Fri	3:41	R	106 Tauri	5.3	89- 71	36S	A5	ZC 765, close double?
Nov 3	Sat	0:07	R	ZC 892	6.7	84- 35	67N	B9	
Nov 3	Sat	0:47	R	chi 1 Ori	4.4	83- 43	76N	G0	ZC894,mg2 7,s".04,PA121
Nov 3	Sat	7:20	R	chi 2 Ori	4.6	82- 47	51N	B2	Sun -4, ZC 915, double?
Nov 4	Sun	1:35	R	ZC 1038	7.1	76- 42	69S	B9	spectroscopic binary

*** Dates and times above are EDT, those below are EST ***

Nov 4	Sun	21:52	R	ZC 1141	5.5	68- 2	32N	K2	Azimuth 69 degrees
Nov 5	Mon	0:42	R	BN Gem	6.9	67- 33	47N	O8	SAO 97083
Nov 6	Tue	5:43	R	ZC 1281	6.3	56- 64	69N	K0	Sun -11, close double?
Nov 7	Wed	3:05	R	ZC 1384	7.2	46- 38	86N	K0	maybe close double
Nov 8	Thu	1:52	R	14 Sex	6.2	36- 13	78S	K1	Az. 93,ZC 1482,double??
Nov 8	Thu	4:22	R	SAO 118150	7.3	36- 40	85N	K0	maybe close double
Nov 9	Fri	5:37	R	62 Leonis	6.0	25- 40	41S	K3	ZC 1605
Nov 9	Fri	5:57	R	SAO 118640	7.8	25- 43	50S	F8	Sun alt. -9 deg.
Nov 10	Sat	6:12	R	ZC 1726	6.7	16- 34	67N	F5	Sun alt. -7 deg.

Explanations & more information are at <http://iota.jhuapl.edu/exped.htm> .
David Dunham, dunham@starpower.net ,
phone 301-526-5590 or +7-916-0929487

On p. 6 of last month's Stardust, I described the successful remote station observations of the small cusp-angle grazing occultation of 4.9-mag. omega2 Tauri by the waning crescent Moon from Grant, Minnesota. The video from the northern remote station that shows 6 disappearances and 6 reappearances of the star can now be seen at <http://www.youtube.com/watch?v=FS9ukZ4qbl8>. Also, some additional information about the graze can now be found at <http://iota.jhuapl.edu/OMEGA2TA.HTM>. David Dunham

Thank you Nancy Grace Roman for finding this article.

Chinese Observatories

Based on articles in September 7 *Science* by Richard Stone and in the advertizing supplement to that issue by Hou Zhengchi

The Chinese have built an impressive quasi-meridian reflecting Schmidt telescope at the Xinglong Station. Called the Large Sky Area Multi-Object Fiber Spectrogram Telescope (LAMOST), the optical system consists of a segmented spherical primary mirror 6.67m X 6.05m and a 5.72m X 4.40m segmented correcting reflector. The spherical mirror is 75 mm thick; the correcting mirror is 25 mm thick. The focal plane accommodates up to 4000 fibers, allowing several tens of thousands of spectra per night. The pilot survey began on October 23, 2011. By the end of 2011, 230,000 spectra across 117 observation areas were released. The spectra cover the wavelength range 370-900 nm with a resolution ($r/\Delta r$) of 1,800.

Asian astronomers have long yearned for a premier mountaintop observatory rivaling Mauna Kea and Chilean observatories. After a 2-decades-long search, astronomers have identified a summit on the Ngari Plateau in southwestern Tibet near the border with Kashmir as the likely site for an international observatory. At 5100 meters, Shiquanhe Observatory would be the highest permanent astronomical perch on the surface of the earth. But Shiquanhe is not yet ready for prime time. The critical test of weather and seeing is to begin this year. Chinese astronomers are drafting plans for a pair of megafacilities at Shiquanhe: their own version of Europe's Extremely Large Telescope (ELT) and a supersized edition of LAMOST.

The site in Ngari was selected after a ten-year search in which other initially promising sites proved disappointing. So far, the team has recorded about 1 mm of precipitation per year, about half that at Mauna Kea and slightly more than in Chile. Transparency is pretty good but light pollution from Shiquanhe, 25 kilometers to the north might pose problems. Also, Ngari is often cloudy during the summer monsoon season so the number of nights in which the heavens are fully observable is fewer than at Mauna Kea. Nevertheless, the site would be formidable for infrared and submillimeter observations. It is estimated that the mid-infrared transparency is 30% greater than at Mauna Kea at 4200 meters.

APS Mid-Atlantic Senior Physicists Group

<http://www.aps.org/units/maspg/>

October 2012 Event

Date: Wednesday, October 17, 2012

Speaker: Robert M. Hazen, Carnegie Institution of Washington and George Mason University

Topic: The Co-evolution of the Geosphere and Biosphere

Time and Location: 1:00 PM, with Q&A to follow; in a 1st floor conference room at the American Center for Physics (www.acp.org), 1 Physics Ellipse, College Park, MD-- off River Rd., between Kenilworth Ave. and Paint Branch Parkway.

Abstract: The near-surface environment of terrestrial planets and moons evolves as a consequence of selective physical, chemical, and biological processes—an evolution that is preserved in the mineralogical record. Mineral evolution begins with approximately 12 different refractory minerals that form in the cooling envelopes of exploding stars. Subsequent aqueous and thermal alteration of planetesimals results in the approximately 250 minerals now found in unweathered lunar and meteorite samples. Following Earth's accretion and differentiation, mineral evolution resulted from a sequence of geochemical and petrologic processes, which led to perhaps 1500 mineral species. According to some origin-of-life scenarios, a planet must progress through at least some of these stages of chemical processing as a prerequisite for life. Once life emerged, mineralogy and biology coevolved and dramatically increased Earth's mineral diversity to >4000 species.

Sequential stages of a planet's near-surface evolution arise from three primary mechanisms: (1) the progressive separation and concentration of the elements from their original relatively uniform distribution in the presolar nebula; (2) the increase in range of intensive variables such as pressure, temperature, and volatile activities; and (3) the generation of far-from-equilibrium conditions by living systems. Remote observations of the mineralogy of other terrestrial bodies may thus provide evidence for biological influences beyond Earth.

Recent studies of mineral diversification through time reveal striking correlations with major geochemical, tectonic, and biological events, including large changes in ocean chemistry, the supercontinent cycle, the increase of atmospheric oxygen, and the rise of the terrestrial biosphere.

Biography: Robert M. Hazen, Senior Staff Scientist at the Carnegie Institution's Geophysical Laboratory and Clarence Robinson Professor of Earth Science at George Mason University, received the B.S. and S.M. in geology at the Massachusetts Institute of Technology (1971), and the Ph.D. at Harvard University in earth science (1975). He is author of 380 scientific articles and 24 books, including *Genesis: The Scientific Quest for Life's Origin* and *The Story of Earth*. The Past President of the Mineralogical Society of America, Hazen's recent research focuses on the role of minerals in the origin of life, the co-evolution of the geo- and biospheres, and the development of complex systems. He is also Principal Investigator of the Deep Carbon Observatory, a 10-year project to study the chemical and biological roles of carbon in Earth's interior (<http://dco.ciw.edu>). Hazen is active in presenting science to nonscientists through writing, radio, TV, public lectures, and video courses. In October 2010 Hazen retired after a 40-year career as a professional symphonic trumpeter.

National Capital Area Skeptics

John B. Carlson
2012 Apocalypse and the Maya Calendar

Saturday, Oct. 13, 2012, 1:30pm

Bethesda Regional Library
7400 Arlington Rd
Bethesda, MD

What started the torrent of books, magazine articles, television documentaries, and web sites claiming that the world will end on December 21, 2012? Archaeoastronomer John B. Carlson, Ph.D. will discuss the "2012 Phenomenon," separate fact from fiction about the Maya calendar, and critically examine the apocalypse claims.

Dr. Carlson is Director of the Center for Archaeoastronomy and Senior Lecturer at University Honors College, University of Maryland, College Park. He is also editor of the journal *Archaeoastronomy*.

FREE admission – Everyone welcome, members and non-members. Refreshments and socializing after the talk.

Calendar of Events

NCA Mirror- and Telescope-making Classes: Tuesdays Oct. 2, 9, 16, 23, 30 and Fridays, Oct. 5, 12, 19, 26, 6:30 to 9:30 pm at the Chevy Chase Community Center, at the northeast corner of the intersection of McKinley Street and Connecticut Avenue, N.W. Contact instructor Guy Brandenburg at 202-635-1860 or email him at gfbrendenburg@yahoo.com. In case there is snow, call 202-282-2204 to see if the CCCC is open.

Exploring the Sky Oct. 20 7:30 pm Rock Creek Park Nature Center. Astronomy Day; Orionid meteor shower. <http://www.nps.gov/rocr/playourvisit/expsky.htm>

Open house talks and observing at the University of Maryland Observatory in College Park on the 5th and 20th of every month at 8:00 pm (Nov.-Apr.) or 9:00 pm (May-Oct.). Details: www.astro.umd.edu/openhouse

Dinner: Saturday, Oct. 13 at 5:30 pm, preceding the meeting, at the [Garden Restaurant](#) in the University of Maryland University College Inn and Conference Center.

Montgomery College Planetarium:
7621 Fenton Street, Takoma Park, MD (240) 567-1463.
Saturday, 20 Oct. 2012 at 7:00 pm. "When was Creation" In the Planetarium.
<http://www.mc.cc.md.us/Departments/planet/planet/EstimateOfAgeOfUniverse.html>

Owens Science Center Planetarium: "How the World Will Really End"
Fri. Oct. 12 at 7:30 pm. <http://www1.pgccps.org/howardbowens>

Upcoming NCA Meetings at the University of Maryland Observatory

Oct. 13, 2012	Roopesh Ojha (NASA / GSFC) – When Fermi met Jansky
Nov. 10 2012	Michael Lowenstein (UMD / GSFC) – What X-Rays Tell Us about Dark Matter and Clusters of Galaxies
Dec. 8, 2012	Dennis Bodewitz (UMD) – Ultra-Violet Observations of Asteroids

National Capital Astronomers Membership Form

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

Address: _____ **ZIP Code:** _____

Home Phone: ____ - ____ - ____ **E-mail:** _____ **Print / E-mail Star Dust (circle one)**

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:
Henry Bofinger, NCA Treasurer; 727 Massachusetts Ave. NE, Washington, DC 20002-6007

National Capital Astronomers, Inc.

If undeliverable, return to

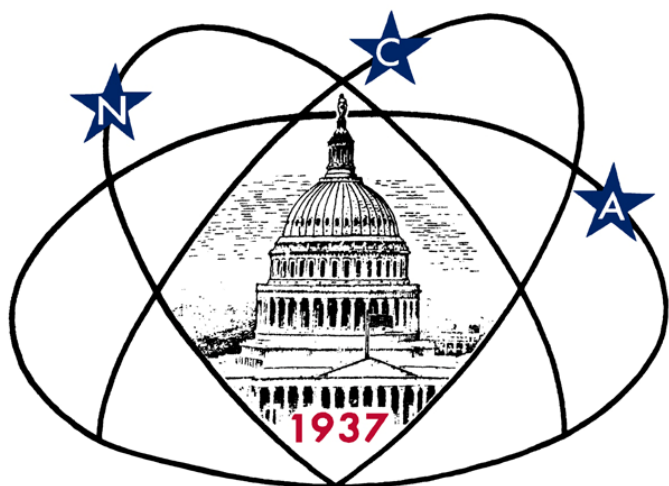
NCA c/o Elizabeth Warner

400 Madison St #2208

Alexandria, VA 22314

First Class

Dated Material



Next NCA Mtg:

Oct. 13

7:30 pm

@ UMD Obs

**Roopesh Ojha
(NASA/GSFC)**

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