

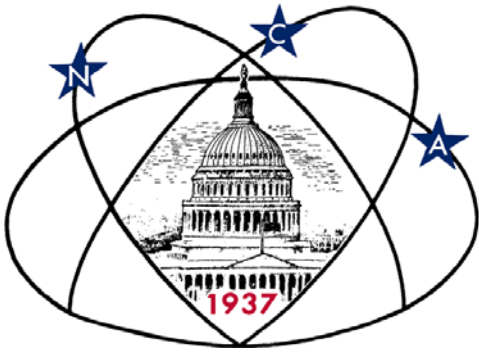
Star Dust

National Capital Astronomers, Inc.

May 2011

Volume 69, Issue 9

<http://capitlastronomers.org>



Next Meeting

When: Sat. May 14, 2011
Time: 7:30 pm
Where: UM Observatory
Speaker: Tracy Clarke, NRL

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

May 2011: Tracy Clarke
Naval Research Laboratory

Bubble, Bubble, Turbulence and Trouble: Gastrophysics and Cosmology with Clusters of Galaxies

Abstract:

Galaxy clusters have a special role in astrophysics. On one hand they are used as probes of structure formation in precision cosmology studies of the dark energy equation of state, while on the other hand they are powerful laboratories for studies of shocks, turbulence, feedback, and particle acceleration. This dual nature of cluster astrophysics reflects the status of clusters as the largest gravitationally bound objects in the Universe. I will summarize the recent rapid progress in our understanding of clusters, from the 'spherical cow' cooling flow ideas to the current complex merger/feedback paradigm. This revolution in our understanding of these systems has been driven by observational advances in low frequency radio interferometry and X-ray imaging/spectroscopy. I will discuss how these observations are revolutionizing cluster studies, and consider the potential of current and future radio and X-ray instrumentation.

Biography:

Tracy Clarke was born in New Brunswick, Canada, and obtained her Bachelors degree in physics, with honors, at the University of New Brunswick, and her Masters and PhD degrees in astronomy at the University of Toronto. Her Masters and PhD theses began her long-term involvement in research on galaxies and clusters of galaxies, including their magnetic fields. She has contributed extensively to understanding the large scale diffuse emissions in clusters of galaxies, and their relations to the mergers of clusters of galaxies and to the injections of energy by the huge relativistic jets produced episodically by the supermassive black holes at the centers of galaxies. She uses both X-ray and radio astronomy in her research. After postdoctoral research with Craig Sarazin at the University of Virginia, she worked as a contractor at the Naval Research Laboratory, where she is now an employee. In addition to being widely recognized for her scientific contributions, she has extensive hands-on experience in testing and specifying radio astronomy hardware. She is proficient at teasing out the valid information from data obtained from interferometric synthesis imaging arrays at radio wavelengths. As the System Scientist for the Long Wavelength Array, she has a prominent role in advancing the state of the art in synthesis imaging at the lower radio frequencies, where non-thermal phenomena stand out. This is a challenging task, because radio frequency interference and ionospheric distortions both become significant at the lower frequencies, but initial results show that the scientific rewards will be great.

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Editor: Michael Chesnes

Editorial Advisors:

Elizabeth Warner

Jeffrey Norman

Wayne Warren

Harold Williams

John D. Gaffey, Jr.

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.

Dark Sky Friendly legislation passes in Maryland

Milt Roney

The continuing efforts of Maryland Delegate Al Carr have paid off in the passage of Maryland bill HB643. This bill prohibits the use of State funds to install or replace a permanent outdoor luminaire for lighting on the grounds of any State building unless the luminaire meets certain energy efficiency and dark sky requirements. As with other such bills, exceptions are made for certain situations and a waiver process is created. The text of the bill can be found at <http://mlis.state.md.us/2011rs/bills/hb/hb0643t.pdf>. The formal title is: Procurement - State Buildings - Energy Efficient Outdoor Lighting Fixtures

Unfortunately, despite the efforts of many NCA members, another bill, HB906, the Marilyn Praisner Safe and Earth Friendly Roadway Act, did not pass this year. There may be some consolation in the fact that Pepco, in its testimony, said it had purchased a large number of dark sky friendly lights for its ongoing replacement program. Last year, in testimony about similar legislation, Pepco said they couldn't comply because they had already purchased other lights. The efforts of NCA members may well have helped influence that change.

The International Dark Sky Association was active in supporting both of these bills. Anyone interested in joining the fight to preserve the dark nighttime sky is encouraged to visit www.darksky.org or contact Milt Roney at milt@darksky.org.

Ominous Rise in Prices for Telescope Mirror Blanks

Guy Brandenburg

Mirror-making kits are going to go up in price astronomically in the coming months.

The reason is that ordinary Pyrex mirror blanks have become impossible to obtain, since Corning no longer makes them.

They are being replaced by something called Borofloat33 or Supremax33, made by Schott Glass. These new materials are chemically and physically very similar to old-fashioned Pyrex mirror blanks (being primarily composed of silica and boric oxide), but the new stuff costs about three times as much as the older material.

For example: our current price for an 8-inch mirror kit, including use of the tool, all of the abrasives, polishing pads, and pitch, as well as help, and a one-year subscription to Star Dust, is about \$110.

However, the new price from our main former supplier, United Lens, for JUST the mirror blank is \$165!!!

12.5-inch Pyrex mirror blanks will be replaced by a Borofloat33 blank costing \$668; our old kits cost about half that - FOR EVERYTHING!!

The NCA ATM workshop will sell our kits at the current prices until we run out, after which, our prices will unfortunately have to rise as well, by a LOT.

Unless we can find a more reasonably-priced supply of low-expansion glass. But don't hold your breath. We may end up having to carve mirror blanks from old glass table tops made out of plate glass....

2010-2011 Officers

President:

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

Vice-President:

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

Secretary-Treasurer:

Michael L. Brabanski
mlbrabanski@verizon.net
 301-649-4328 (h)

Asst. Secretary-Treasurer:

Jeffrey B. Norman
jeffreynorman@comcast.net

Trustees:

- Wayne Warren (2011)
- Walter Faust (2012)
- Benson Simon (2013)
- Andrew Seacord (2014)

Appointed Officers and Committee Heads:

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

Telescope Making
 Guy Brandenburg
gbrandenburg@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

Eta Geminorum Graze in Arizona April 10: The Rise of the Machines

David Dunham

Some warned that Judgment Day would be on April 21st this year, but for me, it came eleven days earlier as the jagged northern edge of the Moon's shadow from the grazing occultation of 3rd-mag. eta Geminorum crossed North 387th Avenue in the Arizona desert northeast of Tonopah about 50 miles west of Phoenix. It was a humiliating defeat, with the machines scoring three and humans, zero. For the first time, three stationary remote telescope systems recorded the lunar profile while human attempts in the area failed. John Connor, where were you when we needed you?

The grazing occultation occurred around 4:57 UT April 10 (9:57 pm MST Sat. April 9 in Arizona), about 90 minutes after a squall line drenched the area with heavy rain. The prediction of the narrow graze zone was accurate; there were five occultations of the star, including one about a minute long at the southern station, a good recording with an 80mm short-tube refractor "midi" system. The northern station, about 0.1 km north of the predicted northern limit, had only one occultation lasting about four seconds, by the highest mountain on the profile; the view was better than I expected, using only a binocular-based "mighty mini" video recording system. The central station recorded three occultations with a midi, but I made a time adjustment error (my pre-point charts were made for Casa Grande, about 70 miles to the southeast where the graze occurred a minute earlier, so I mentally adjusted the times on the charts to compensate) so that the first disappearance occurred only a second or so after the star drifted into the field of view; it probably missed some earlier occultations. So due to operator error, the machine successes were really about 2 1/2 rather than 3.

Between the central and southern station, I tried to observe from a fourth station with a 120-mm refractor "maxi" system, near where the most multiple events were expected from the predicted profile, but I arrived there shortly before the graze, after starting the recordings at the other stations. The machines struck back, with the camcorder giving an error message, "eject tape" (I hadn't seen that before) so it wouldn't record. By the time I switched to another camcorder and acquired the star, the graze was over, so I was disappointed; humans, zero. But I was encouraged when I reviewed the remote station recordings back at my motel. Overall, as long as the Moon is a crescent (the slimmer, the better) and the cusp angle is greater than about five degrees, the mini's can probably record grazes of stars to about 5th mag. while the midi's can probably reach 7th mag. (but with their field of view, the graze duration should be less than three minutes, precluding some slow southern-limit grazes). If I had had all the time from dusk to the graze with clear skies (instead of the approximately 70 min. that I had), I could have set up several more mighty mini stations; I look forward to a future opportunity where I'll have enough dark time for a suitable graze to do that. I thank Ernie Iverson for the pre-point charts that he prepared for the eta Gem graze.

When I arrived at Phoenix airport about 1 pm that afternoon, it was overcast with light rain and cool, unusual conditions for that area due to a front moving through. I might have changed my reservation to fly to California instead, but that would have added about \$200 to my "internet special" ticket cost, and it was not obvious that the weather forecast favored sites in northern California until after I had printed my boarding pass to Phoenix.

Continued on Page 4

Continued from Page 3

Before the graze, Wayne Thomas and I had decided to try the graze from Eagle Eye Rd., approximately a 40-minute drive farther west; the graze path crossed no paved roads between North 387th Ave. and Eagle Eye Rd. But as we drove west from Phoenix, the sky cleared well as we approached Buckeye, and Michael Collins (an observer who lives southeast of Phoenix) called me saying he could reach Buckeye to observe the graze, but not farther west, and was concerned about observing from a site on Turner Rd. (an earlier site just west of Buckeye, AZ about 30 miles west of Phoenix) without notifying the residents of the house there. So we drove there and informed the residents what we were doing. The sky looked promising; the view of the satellite loop earlier indicated that the clouds were moving mainly from south to north. At the Turner Ave. site, the sky was clear in the south; I thought the clouds in the west would move north or dissipate. We decided to set up there, but when I set up my first remote station and tried to pre-point it, the clouds in the west increased and covered the Moon and the pre-point area; the clouds were now moving eastward. Although they would likely leave the area before the graze, it would clear up farther west first, allowing more time to set up and pre-point remote stations.

So I decided to go to the North 387th Ave. sites (there were no houses along that road in the graze path) about 25 miles northwest of Buckeye, while Wayne stayed at Turner Ave. to set up his 11-inch SCT. As I was starting to deploy stations along North 387th Ave., Wayne called saying he had just been drenched by the squall line moving across Turner Ave., and wanted to know how it was where I was; he decided to try to reach North 387th Ave. But his new GPS somehow misled him (more machine mischief) and he ended up on a road about two miles farther east; we mentally tried to estimate where the path was there when we realized the problem, but we didn't have the time to locate Wayne accurately in the path, and he was too far north, having a miss. In the meantime, Michael Collins reached the Turner Ave. site, where it did clear up and he obtained a good recording, with about 8 occultations of the star during the graze there. The humans also won in two large efforts in California, in a 9-station expedition near I-80 south of Dixon, and in a 15-station expedition near Farmington east of Stockton.

Although I've had earlier successes recording lunar grazing occultations from remote stations, those were almost all with relatively large telescopes with clock drives that are harder and more expensive to transport by airplane than the small systems, designed primarily for asteroidal occultations where Moonlight interference is rarely an issue (see Scotty Degenhardt's description of them at http://scottysmightymini.com/PR/Effects_miniature_optics_occultations.html), that I used for the η Gem graze. The η Gem graze occurred the night of NCA's April meeting.

Two mid-Atlantic asteroidal occultations were observed during April. On Tuesday April 5th at 9:32 pm EDT, I video recorded an occultation of 11.7-mag. UCAC2 44279087, in Auriga near M38, by (375) Ursula from a site west of Dahlgren, VA, using a 120mm refractor. The occultation was also recorded by Bob Modic from his home east of Cleveland, OH. No occultation was observed by Andy Scheck in Laurel, MD and by Steve Conard from Gamber, MD. The observations indicated that the actual path was south of the predicted path by about 1/3rd path-width, with the northern limit approximately over Washington, DC.

On Friday April 22nd at 2:19 am EDT, the shadow of an occultation of mag. 12.1 TYC 1414-00749-1 in Leo by (17) Thetis passed over the greater Washington, DC area. Andy Scheck and Steve Conard recorded the occultation from their locations in central Maryland. I ran two remote stations with 120mm refractors at Cheltenham and Hawthorne (near La Plata), Maryland, and also recorded the appulse from Port Conway, north of Port Royal, VA, where no occultation occurred. The station at Cheltenham recorded the occultation; the recording at Hawthorne, near the predicted southern limit, hasn't been reviewed yet. Information about observed asteroidal occultations in North America can be found at

<http://www.asteroidoccultation.com/observations/Results/> .

Occultation Notes

D following the time denotes a disappearance, while R indicates that the event is a reappearance.

When a power (x; actually, zoom factor) is given in the notes, the event can probably be recorded directly with a camcorder of that power with no telescope needed.

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.

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".

Sometimes the Watts angle (WA) is given; it is aligned with the Moon's rotation axis and can be used to estimate where a star will reappear relative to lunar features. The selenographic latitude is WA -270. For example, WA 305 - 310 is near Mare Crisium.

Mid-Atlantic Occultations and Expeditions

David Dunham

Asteroidal Occultations

Date	Day	EDT	Star	Mag.	Asteroid	dmag	s "	dur. Ap.	Location
May 19	Thu	5:14	2UC25166625	13.8	Crantor	7.5	4 10		Centaur;Americas
May 21	Sat	23:22	2UC25334248	12.4C	Sibylla	0.5	11 9		VA,WV,OH;MD,DC?
May 24	Tue	3:10	2UC25584820	12.3	Kathleen	1.7	5 8		NJ,MD,WV;VA,PA?
May 27	Fri	1:43	SAO 207042	9.2	Mendel	5.7	1 4		MD,DC,PA;n&eVA?
May 29	Sun	2:36	SAO 141925	7.0	Eudora	5.9	11 2		cenFL,sMS,nLA
May 30	Mon	2:27	2UC40088506	11.2C	Ganymed	0.5	1.5 8		NJ,eNY;DE,seMD?
Jun 3	Fri	4:25	PPM 719647	10.5	Sakuntala	2.6	4 6		NJ,DE,eMD,seVA
Jun 10	Fri	4:28	2UC21644474	13.3	Jenny	1.2	7 10		NJ,MD,DC;VA,PA?

Lunar Grazing Occultations (*, Dunham plans no expedition)

Date	Day	EDT	Star	Mag.	% alt	CA	Location
Jun 3	Fri	21:20	SAO 78529	8.0	5+ 8	8N	*Jacksonville, NC Sun alt -11
Jun 9	Thu	0:00	SAO 138004	7.5	51+ 12	3N	*Lewsbq&Bethlhem,PA;Edison,NJ

Total Lunar Occultations

DATE	Day	EDT	Ph	Star	Mag.	% alt	CA	Sp.	Notes
May 16	Mon	0:56	D	ZC 2039	5.5	98+ 31	40N	A0	Term. dist. 19";CTgraze
May 16	Mon	1:44	D	ZC 2045	6.4	98+ 27	79S	K0	
May 16	Mon	2:36	D	CS Vir	5.9	98+ 21	75S	Ap	ZC 2051
May 18	Wed	23:14	R	39 Oph	5.2	96- 11	47S	K	Az134,AA228,ZC2490,dbl
May 18	Wed	23:15	R	SAO 185237	6.7	96- 11	48S	G8	39OphCompanion,sep. 10"
May 18	Wed	23:24	R	ZC 2491	6.6	96- 12	83N	G3	Azimuth 135, AA 278
May 19	Thu	3:18	R	ZC 2510	6.2	95- 27	71S	K0	AA 251
May 19	Thu	4:03	R	44 Oph	4.2	95- 25	79S	A3	AA260, ZC2513; double?
May 20	Fri	1:01	R	ZC 2661	7.3	90- 18	47N	B8	
May 20	Fri	4:46	R	ZC 2675	7.0	89- 27	63S	G8	Sun-11, close double?
May 21	Sat	3:13	R	ZC 2829	6.7	82- 27	80S	K2	
May 23	Mon	5:07	R	ZC 3088	8.0	64- 36	90N	K1	Sun Alt. -8 deg.
May 24	Tue	1:54	R	ZC 3199	6.5	55- 6	79S	K0	Azimuth 107 deg.
May 25	Wed	2:59	R	Situla	5.0	45- 13	40S	K2	Az107,ZC3320,dbl?,kpAqr
May 25	Wed	4:24	R	SAO 146222	8.0	44- 29	40N	K0	
May 25	Wed	5:41	R	ZC 3326	6.4	44- 40	85N	F6	Sun-2,mg2 7.8,.1",PA122
May 26	Thu	6:47	R	kappa Psc	5.0	34- 47	33S	A0	Sun+10,ZC3453,closeDbl?
May 29	Sun	4:34	R	SAO 92548	8.1	11- 11	50S	A3	Azimuth 81 deg.
May 29	Sun	5:15	R	104 Psc	6.7	11- 19	71N	K0	Sun -6, ZC 244
Jun 3	Fri	21:17	D	ZC 1010	7.9	5+ 9	27S	F2	Sun -9, Azimuth 290 deg
Jun 4	Sat	21:35	D	ZC 1142	8.0	11+ 14	73S	F5	Sun-11,Az283,mg2 12 4"
Jun 7	Tue	20:37	D	SAO 118150	7.3	38+ 43	79N	K0	Sun -2, close double?
Jun 7	Tue	22:23	D	19 Sex	5.8	38+ 25	15S	K0	ZC1495
Jun 8	Wed	23:53	D	SAO 138004	7.5	50+ 14	22N	M	Az. 257, close double?
Jun 9	Thu	0:20	D	66 Leonis	6.8	51+ 8	65S	A2	Az. 261, ZC1620
Jun 9	Thu	22:51	D	ZC 1729	8.1	62+ 29	55S	F2	
Jun 11	Sat	0:51	D	SAO 157613	7.4	73+ 14	11N	K5	Az. 242,mg2 9,sep 0.1"
Jun 11	Sat	0:53	D	ZC 1858	6.3	73+ 14	45N	K5	Azimuth 242 deg.
Jun 12	Sun	1:21	D	ZC 1993	6.6	83+ 14	57S	K3	Az. 234, close double?

Explanations & more information are at <http://iota.jhuapl.edu/exped.htm>.

David Dunham, dunham@starpower.net

Phones: home 301-220-0415; cell 301-526-5590

Timing equipment and even telescopes can be loaned for most expeditions that we actually undertake; we are always shortest of observers who can fit these events into their schedules, so we hope that you might be able to.

Information on timing occultations is at: <http://iota.jhuapl.edu/timng920.htm>.

Good luck with your observations.

Science News

Thank you Nancy Grace Roman for finding this article.

Flash: Herschel Measures Dark Matter Required for Star-Forming Galaxies

From NASA News, Feb. 16, 2011

WASHINGTON -- The Herschel Space Observatory has revealed how much dark matter it takes to form a new galaxy bursting with stars.

Herschel is a European Space Agency cornerstone mission supported with important NASA contributions.

The findings are a key step in understanding how dark matter, an invisible substance permeating our Universe, contributed to the birth of massive galaxies in the early Universe.

"If you start with too little dark matter, then a developing galaxy would peter out," said astronomer Asantha Cooray, the principal investigator of new research appearing in the Feb. 24, 2011 issue of *Nature*.

"If you have too much, then gas doesn't cool efficiently to form one large galaxy, and you end up with lots of smaller galaxies. But if you have the just the right amount of dark matter, then a galaxy bursting with stars will pop out."

This right of amount of dark matter turns out to be a mass equivalent to 300 billion of our Sun.

APS Mid-Atlantic Senior Physicists Group

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

May 2011 Event

Date: Wednesday—May 11, 2011 (NOTE: DAY AND DATE)

Speaker: Professor Robert Park, Physics Department, University of Maryland

Topic: The Last Endangered Species

Time and Location: Talk starts at 1:00 pm with Q&A to follow. It will be held in one of the first floor conference rooms at the American Center for Physics (<http://www.acp.org>), One Physics Ellipse, College Park, MD. This is located off River Road, between Kenilworth Ave. and Paint Branch Parkway.

Abstract: Of the 5,487 known species of mammals, 1,410 are listed as "threatened with extinction." There have been five mass extinctions in the past 540 million years during which at least three fourths of all species have become extinct in geologically brief periods of time. Paleobiologists say Earth has now entered Mass Extinction Six. The cause is not asteroid impact but man himself. Wild species are being crowded out of their natural habitats by a single invasive species: *Homo sapiens*. Now numbering almost seven billion, science has given *Homo sapiens* control of the planet, but few people are scientists. The greatest threat to *Homo sapiens* and to the planet is ignorance. More than 90% of the population professes a belief in superstition. Science, with its insistence on openness and physical evidence, has a responsibility to inform the world of what has been learned even when people would prefer not to hear. I will illustrate popular beliefs with examples ranging from power lines and cancer to homeopathy & acupuncture.

Biography: Robert L. (Bob) Park is research professor and former chair of Physics of the University of Maryland. An Air Force Officer during the Korean War, his study of physics began after the war at the University of Texas, where he graduated Phi Beta Kappa with High Honors in 1958. He was named the Marston Fellow at Brown University and awarded a PhD in Physics in 1964. He was Director of the Surface Physics Division at Sandia National Laboratory until 1972, when he accepted an appointment as Professor of Physics and Director of the Center of Materials Research at the University of Maryland. Five years later he was named Chair of the Department of Physics and Astronomy. For twenty years, research into the properties of crystal surfaces had occupied most of his waking hours, but in 1983 he was recruited by American Physical Society President Willie Fowler to open a Washington Office. Bob initiated a weekly report that evolved into the news/editorial column *What's New*. For the next twenty years he divided his time between the University and the Washington Office, often testifying before Congress, appearing on television and radio news programs, and writing op-eds for major newspapers. In 2003 he returned to the University full time, but with the support of the University he continues to write the occasionally controversial *What's New*, which has a following that extends far outside physics. He is the author of *Voodoo Science: the Road from Foolishness to Fraud* (Oxford, 2000), and *Superstition: Belief in the Age of Science* (Princeton, 2008).

Nominating Committee Report

By Jeff Norman, Chair

This is a reminder to all NCA members that we will elect officers for next year (July 2011 to June 2012) at NCA's June 11, 2011 meeting. The Nominating Committee (Jay Miller, Harold Williams and Jeff Norman) is recommending the following slate of officers; but any member may make additional nominations from the floor.

President	- Joseph Morris
Vice-President	- John Hornstein
Secretary	- Gary Dehne
Treasurer	- Michael Brabanski
Asst/Sec/Treas	- Jeff Norman
Trustee	- Wayne Warren

Arlington Planetarium Upcoming Events

Reserve your seats for events at the planetarium by emailing us at contact@saveplanetarium.org up to 24 hours before the event. Walk-ins are accommodated on a first-come-first-served basis.

May 9 (Monday) – Demonstrations of the Konica-Minolta full-dome digital projector. 4:30 and 7pm

May 14 (Saturday) – Wine-tasting benefit at **Marvelous Market** (888 N. Quincy St., Arlington). 4-7pm.

May 17 (Tuesday) – "Grass Roots Historic Preservation and the Rescue of the Arlington Planetarium," Guests should reserve seats by emailing us. **Event schedule:** Welcome and refreshments (7 pm), brief business meeting (7:30pm), guest speakers and open forum (7:45pm).

May 21 (Saturday) – Night at the Planetarium 5, multiple shows starting at 4:00 pm.

June 5 (Sunday) – Sunday Science Lecture. Dr. Roopesh Ojha of the NASA Goddard Space Flight Center will discuss astronomy in Antarctica. 4:30pm, at the Planetarium. Ages 9 and up. Contribution \$10 per seat.

June 10 (Friday) – Observing at Kenmore Middle School 6 – 9 p.m. Volunteers needed.

Calendar of Events

• **NCA Mirror- and Telescope-making Classes:** Tuesdays May 3, 10, 17, 24 and Fridays, May 6, 13, 20, 27, 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.

• **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). There is telescope viewing afterward if the sky is clear.

• **Dinner:** Saturday, May 14 at 5:30 pm, preceding the meeting, at the [Garden Restaurant](#) in the University of Maryland University College Inn and Conference Center.

• **Owens Science Center:** Saturday, May 7 3:00 pm. Speaker: Dan Hooper. *Dark Cosmos: In Search of Our Universe's Missing Matter and Energy*

• **APS Mid-Atlantic Senior Physicists Group:** Wednesday, May 11 1:00 pm. Speaker: Robert Park. *The Last Endangered Species*

• **Upcoming NCA Meetings** at the University of Maryland Observatory

• May 14, 2011 **Tracy Clarke (NRL) - Bubble, Bubble, Turbulence and Trouble: Gastrophysics and Cosmology with Clusters of Galaxies**

• June 11, 2011 **Science Fair Winners**

National Capital Astronomers Membership Form

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

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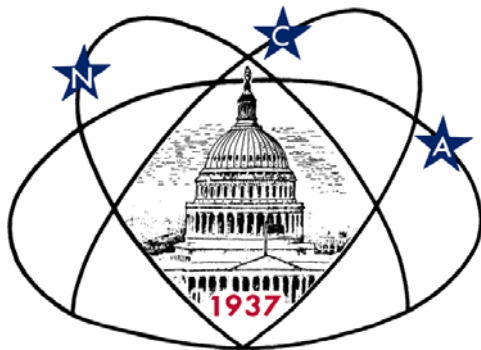
Members receive Stardust, the monthly newsletter announcing NCA activities, by e-mail. If you would like to receive a paper copy of Stardust via regular mail, please check here: _____

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Next NCA Mtg:
May 14
7:30 pm
@ UM Obs
Dr. Tracy Clarke

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