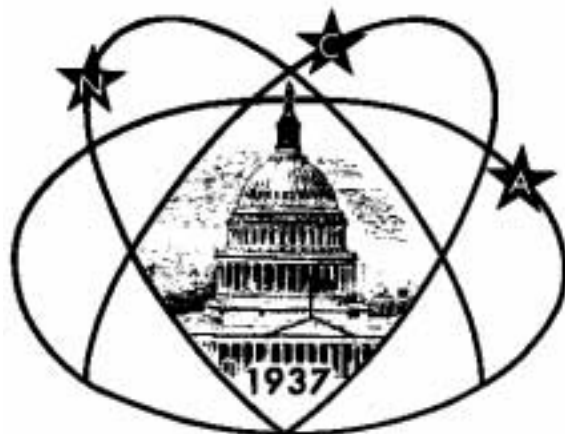


Star



Dust

National Capital Astronomers, Inc.

<http://capitalastronomers.org>

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The National Capital Astronomers

Present a Lecture

Terrestrial Impact Craters and the Chesapeake Bay Impact Structure

**Dr. Jeffrey B. Plescia,
the Johns Hopkins Univ. Applied Physics Lab**

Abstract

Impact craters are widespread in the solar system, including countless craters on other planets, from microscopic zap pits to basins hundreds of km across. Earth has been bombarded for billions of years by the same population of asteroids and comets, but her plate tectonics and active erosion have erased most of the scars. There are ~ 200 recognized impact structures on Earth, ranging from small (the Henbury Craters in Australia) to ~300 km (Vredefort in South Africa). These date from recent (1947, Sikhote Alin in Russia) to the Proterozoic (~2 billion years, Vredefort in South Africa and Sudbury in Canada). One of the Earth's best preserved is the Chesapeake Bay structure centered at Cape Charles VA, ~85 km in diameter and ~35.5 million years old. A central uplift, surrounded by an inner-basin with a raised basement rim, is in turn surrounded by an annular zone of slump blocks and filled with breccia. The entire structure is buried by young sediments of the Atlantic Coastal Plain.

Biography

At the Johns Hopkins Univ. APL since 2004, Jeffrey Plescia has studied terrestrial impact craters, hyperthermophile organisms in Yellowstone National Park, and geologic processes on Mars. He serves on committees of the American Geophysical Union, the Mars Expeditions Strategy Group, the Mars Surveyor Definition Team, etc. For the prior 6 years he was a geologist for the USGS in Flagstaff, AZ. In 11 years at JPL, he worked on planetary missions including Mars 2001, ACME, Lunar Rover, and Lunar Scout. He served two stints at NASA HQ, managing the Planetary Geology and Geophysics Program, and as Program Scientist for Mars missions.

Date, Time, and Location

January 13, 2007, 7:30 PM, at the Univ. of MD Observatory, in College Park. The Observatory is reached by a driveway on Metzger Rd., halfway between Adelphi Rd. and University Blvd. The buildings are not visible from the road; your clue is a modest sign on the southerly side of Metzger Rd. The relatively hidden entry point lies directly opposite the UM System Administration building. The Observatory is nestled among trees, at the north end of the University golf course. [This location alleviates the local portion of scattered light from the city. Red night-lighting along the edge of the driveway also helps. We ask that those who leave while others are observing douse their cars' lights, while on the driveway]

NCA Events This Month

The Public is Welcome!

NCA Home Page: <http://capitlastronomers.org>

NCA Mirror- and Telescope-making Classes: Fridays, January 5, 12, 19, 26, and xx, 6:30 to 9:30 P.M. at the Chevy Chase Community Center, at the north-east 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.

Open house talks and observing at the University of Maryland Observatory in College Park on the 5th and 20th of every

month at 9 P.M. The talks are non-technical. There is telescope viewing afterward if the sky is clear.

Upcoming NCA Meetings—Saturdays
January 13, Dr. Jeffrey B. Plescia, Johns Hopkins Univ. Applied Physics Lab, "Terrestrial Impact Craters and the Chesapeake Bay Impact Structure"

February 10,: TBA.

See Page 5 for other events this month.

Observing with NCA C-14 Mike McNeal

Schedule is open, generally, Saturdays at 7:30 P.M. Call to set up a time.

In Mike McNeal's backyard, 5410 Grove St, Chevy Chase, MD, (Friendship Heights Metro).

Please make reservations by 10 p.m. the Friday before. Call Mike at 301-526-2648 or email him at mcnealmi@verizon.net.

We need a new volunteer to house NCA's C-14, make it available for weekly viewing, and transport it to other sites, e.g., Exploring the Sky and star parties.

In the News Reported by Dr. Nancy Grace Roman

GRAVITY PROBE B TRACKING HELPS FARMERS

[based on Gravity Probe B Update by Bob Kahn]

Early in the design of GP-B, an experiment designed to test subtle predictions of Einstein's theory of gravitation, a doctoral student, Clark Cohen, turned his attention to solving the elusive problem of using GPS technology to precisely control the attitude of the GP-B spacecraft. This required GPS to be 100 times more accurate than then possible..

Cohen realized that controlling the attitude of a spacecraft was essentially no different from controlling the attitude of an airplane. Furthermore, not only could he more readily test this precision technology on airplanes, but also if this technology proved successful, the airlines and the FAA were a ready commercial market.

Cohen determined that he could address cycle ambiguities and achieve extremely precise positioning from GPS signals by placing a pair of fixed transmitters, called "integrity beacons," on the runway. His fellow graduate student, Stu Cobb, developed these GPS beacons. Another student, Dave Lawrence, developed the mathematical techniques to solve the cycle ambiguity problem. After receiving his doctorate in 1992, Cohen remained at Stanford for two more years developing a GPS system that could precisely and automatically land commercial airplanes

in any kind of weather.

In a dramatic tour-de-force technology demonstration, Cohen led a group of graduate students in automatically landing a commercial Boeing 737 airplane over 100 times. Buoyed by this success, Parkinson, a Stanford professor, was already thinking about another, more down-to-earth application of GPS precision vehicle control technology--farming and construction equipment.

Farmers have known for decades that some farm practices produce better results than others, but many of these advanced practices require very accurate placement of seed, fertilizers and irrigation lines. For example, seeding in the exact center of a cultivated row and spraying in a focused band can dramatically increase crop yields, reduce chemical usage and control costs. Farmers operate in difficult conditions such as rain, fog, dust and darkness. With traditional human-steered tractors, it is nearly impossible for even an experienced driver to reliably repeat straight crop rows. Normally, a tractor will wobble from 10 to 30 cm as it encounters small obstacles or experiences operator error.

While Cohen was busy landing airplanes, graduate student Mike O'Connor used a GPS receiver and a yacht steering mechanism to drive an electric golf cart in a straight line without anyone aboard. With support from the John Deere tractor company, Parkinson, O'Connor, and others

adapted GPS position control technology for agricultural use. Their solution was a variation of the GPS airplane landing system. Antennas placed on top of the tractor cab received GPS signals from a reference station, located in the field. The GPS signals provided centimeter-level accuracy on the tractor's exact position and attitude, and this information, along with sensor information from the tractors front wheel angle, was fed into a computer in the tractor's cab. The computer, which had been loaded with a driving map of the field, controlled the tractor's steering, while a human driver still controlled the throttle and brakes.

NASA FINDS SATURN'S MOONS MAY BE CREATING NEW RINGS

[based on NASA News]

During an unprecedented opportunity, with the sun poised behind Saturn, Cassini scientists discovered two new rings and confirmed the presence of two others. The new rings are associated with one or more small moons and share their orbits with the moons, while scientists suspect a moon is lurking near a third ring.

Under the cover of Saturn's shadow in mid-September, the entire ring system became visible, and never-before-seen microscopic particles began to appear. A single, faint new ring at the orbits of two moonlets, Janus and Epimetheus, was discovered. A second ring was found a

(Continued on page 5)

Mid-Atlantic Occultations and Expeditions

by Dr. David Dunham

Asteroidal Occultations

Date	Day	EST	Star	Mag	Asteroid	dmag	s	dur. Ap.	in.	Location
Jan 11	Thu	18:17	SAO 57786	9.1	1993 F01	6.7	2	2	2	VA, seMD, DE, NJ
Jan 17	Wed	23:40	TYC13311227	10.0	Arenda	5.0	3	4	4	DE, DC, MD, nVA
Jan 26	Fri	4:44	32 Lyncis	6.3	Palma	4.2	14	2	2	DC?, sMD, VA, WV
Jan 27	Sat	23:12	TYC01560156	11.0	Lampetia	3.0	7	6	6	nNJ, nPA, sNY
Feb 1	Thu	23:28	SAO 114705	9.3	Mabella	5.3	5	2	2	MD, DC, nVA, WV
Feb 3	Sat	19:30	TYC05930038	10.8	Hel	5.5	2	6	6	OH, sPA, nMD, NJ
Feb 4	Sun	18:10	SAO 56467	8.9	Masuisakura	6.9	2	3	3	ePA, seNY, CT
Feb 4	Sun	22:48	2UC33038166	10.9	Seraphina	3.7	4	6	6	NJ, sPA, nOH
Feb 6	Tue	19:46	2UC39132235	10.9	Hekate	2.3	8	6	6	VA, sKY, nTN
Feb 9	Fri	21:32	xi1 Ceti	4.4	2000 JJ57	13.6	0.4	0	0	AR, TN, sVA

Grazing Occultations

DATE	Day	EST	Star	Mag	% alt	CA	Location
Jan 10	Wed	1:00	SAO 138724	7.2	62-	18 11S	Pittsb.&LeaderHgtsPA;ElktonMD
Jan 20	Sat	18:36	delta Cap	2.9	4+	4 18S	Richmond, VA; Ocean City, MD
Jan 21	Sun	17:52	64 Aquarii	6.9	9+	25 17S	Pea Is., NC; Sun alt. -7deg.
Jan 28	Sun	1:52	B0 Tauri	7.8	74+	17 5N	Richmd, OH; Wstmstr&WhitMrshMD
Feb 19	Mon	18:22	ZC 3	8.2	7+	23 8S	Vienna, VA; Greenbelt, MD; Sun-7

Total Lunar Occultations

DATE	Day	EST	Ph Star	Mag	% alt	CA	Sp.	Notes
Jan 10	Wed	3:46	R ZC 1779	6.5	61-	42 66S	K0	graze in S.Car.
Jan 11	Thu	5:22	R 49 Vir	5.2	51-	40 80N	K2	ZC 1884
Jan 14	Sun	4:47	R SAO 183513	7.8	23-	12 82S	K0	Az 135; WA 260
Jan 15	Mon	5:01	R ZC 2354	7.5	15-	5 41N	A0	Az 131; WA 314
Jan 20	Sat	18:25	D delta Cap	2.9	4+	6 40S	A5	Az 243; graze seMD
Jan 20	Sat	18:46	R = ZC 3190	2.9	4+	3 -4S	A5	Azimuth 247 deg.
Jan 21	Sun	17:31	D 64 Aquarii	6.9	10+	27 55S	G0	ZC 3324; Sun alt. -4
Jan 21	Sun	18:36	D ZC 3325	6.9	10+	18 28N	G0	spectroscopic binary
Jan 24	Wed	22:00	D ZC 196	7.0	40+	21 65S	F0	mg2 8.5 sep 0.5", PA 109
Jan 25	Thu	19:23	D ZC 317	6.4	50+	61 24N	F5	
Jan 27	Sat	21:19	D SAO 76472	7.2	73+	67 78S	G8	spectroscopic binary
Jan 28	Sun	0:35	D SAO 76514	7.2	74+	31 53N	G5	
Jan 28	Sun	18:20	D ZC 756	6.6	81+	59 85S	F0	Sun alt. -11 deg.
Jan 28	Sun	21:23	D ZC 771	6.1	82+	76 69N	A5	mag.2 9.1, sep. 0.2"
Jan 29	Mon	3:00	D ZC 797	6.4	83+	16 52N	B9	1-line spec. binary
Jan 30	Tue	21:25	D 47 Gem	5.8	95+	70 71N	A4	ZC 1088
Feb 5	Mon	22:08	R ZC 1735	6.3	86-	11 88N	G8	Azimuth 101 deg.
Feb 7	Wed	7:22	R psi Vir	4.8	76-	21 86N	M3	ZC 1853; Sun alt. +2
Feb 8	Thu	1:20	R ZC 1940	6.9	69-	22 63N	F0	
Feb 9	Fri	0:44	R ZC 2039	5.5	60-	6 69N	A0	Azimuth 133 deg.
Feb 9	Fri	1:58	R ZC 2045	6.4	60-	17 87S	K0	mg2 10.3 sep ".7, PA 99
Feb 9	Fri	2:58	R CS Vir	5.9	60-	25 67N	A*	ZC 2051; var. dmag. 0.1
Feb 11	Sun	2:51	R pi Scorpii	2.9	40-	6 46N	B1	ZC 2287; Az. 130 deg.

David Dunham, e-mail dunham@starpower.net, more info. <http://iota.jhuapl.edu>
 Phone home 301-474-4722; office 240-228-5609; cell 301-526-5590

Help Find the Northern Edge of (372) Palma on Friday Morning, January 26

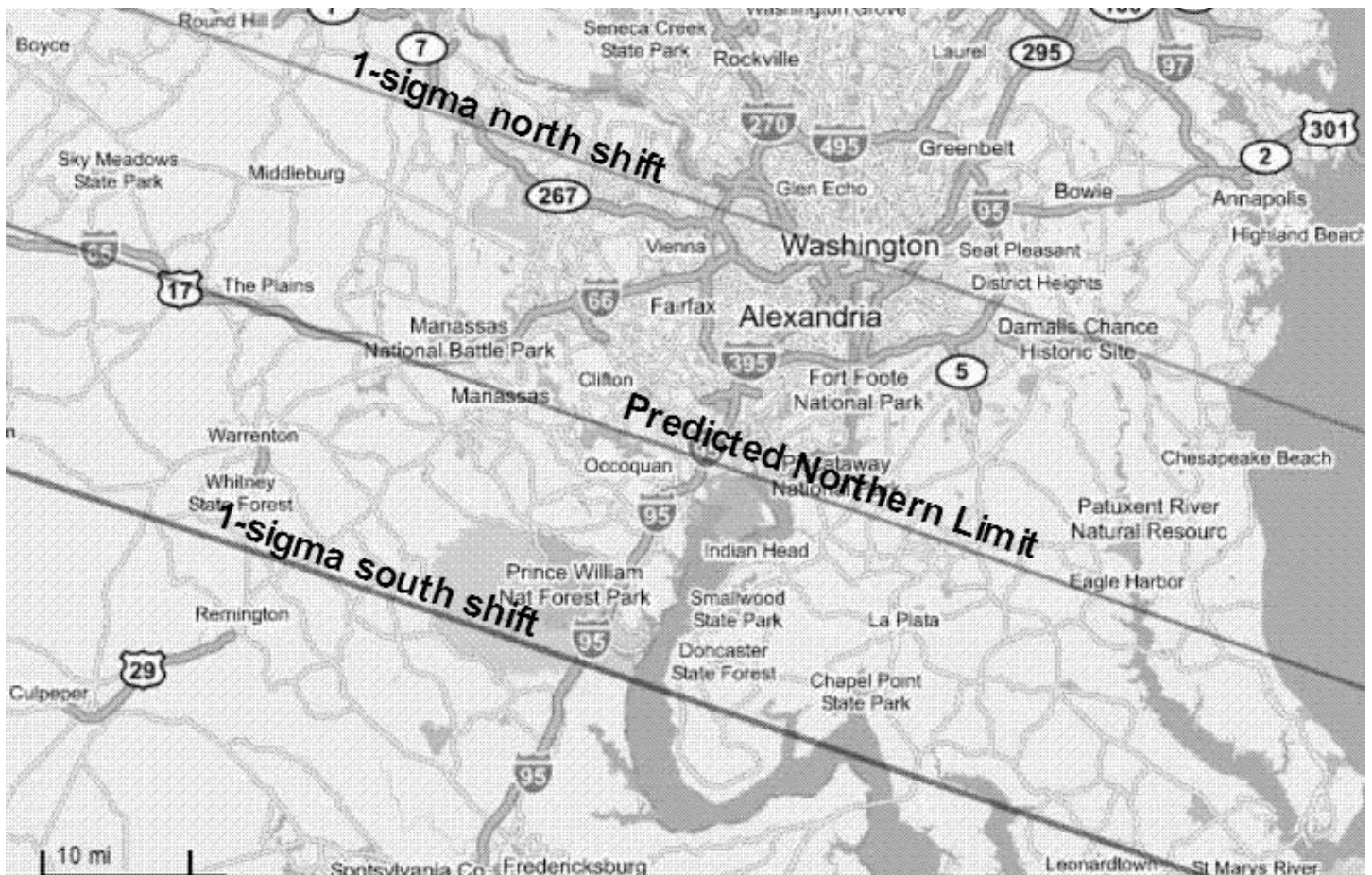
by Dr. David Dunham

If you have a pair of binoculars or telescope, and live in the area shown on the map, you can help us map the northern part of the large asteroid (372) Palma by watching 6.3-mag. 32 Lyncis between 4:43 and 4:45 am EST Friday morning, January 26th. All you need to do is tell us whether the star blinked out or not at your location, and report where you observed. Estimating how long the star was occulted, either with the stopwatch feature on your digital watch, or just by counting, is more useful. And better, if you have a tape recorder (or camcorder that can record sound), call “off” when the star disappears and “on” when it reappears, and record that along with WTOP at 103.5 FM, which we will be recording at one location with WWV time signals. A “graze” by Palma is possible, with the star possibly occulted twice by high mountains on Palma’s northern edge.

More about timing occultations is at <http://iota.jhuapl.edu/timng920.htm>. This is the best asteroidal occultation ever predicted to be visible from the Washington, DC region; please help us with this rare opportunity. The detail that we can resolve on the asteroid is proportional to the number of observers at separate locations. You need to be able to locate 32 Lyncis, which will be 39° above the west-northwestern horizon at J2000 RA 8h 33m 22s, Dec +36° 26.2′, about 0.1° west of the brighter star 33 Lyncis, about 7° north of 3rd-mag. i Cancr, and about 16° due north of the Beehive Cluster. Finder charts are in the Feb. issue of Sky and Telescope, and at <http://iota.jhuapl.edu/mp372.htm> which has more information about this event.

The map shows 3 lines, the center one being the predicted northern limit. But its location is uncertain; there is a 16% chance

that it could be as far north as the northern line through downtown Washington (the “1-sigma north shift” line) and an equal chance that it could be as far south as the southern line (84% chance for an occultation). There are smaller chances that the shift could be even larger. Traveling south increases your chances for seeing the occultation; the predicted central line is over Doswell and the southern limit over Stony Creek, VA. A central occultation should last 14s, but it will be less in the DC region. During the event, Palma will be visible at 10th mag. We want to coordinate observations of this event so that mobile observers don’t duplicate your timings, so if possible, inform me of your plans to observe this event.



In the News, continued

(Continued from page 2)

week later. It is narrow and overlies the orbit of the tiny moon Pallene, which Cassini discovered back in 2004. A third and fourth ring are visible in the Cassini Division, the big gap in Saturn's main ring system. Curiously, these rings were not seen in images from NASA's Voyager spacecraft.

Saturn's smallest moons have weak gravity and cannot retain any loose material on their surfaces. When these moons are struck by rapidly moving interplanetary meteoroids, this loose material is blasted off their surfaces and into Saturn orbit, creating diffuse rings along the moons' orbital paths. Collisions among several moonlets, or clumps of boulder-sized rubble, might also lead to debris trails. For instance, Saturn's G ring seems not to have any single moon large enough to see; it might have formed from a recent breakup of a moon.

Data from Cassini's visual and infrared mapping spectrometer also show distinct color differences in Saturn's rings, indicating variations in composition and in microscopic particles. Color variation in the rings might imply particles are being sorted by size. "The new rings appear very different, with none of their usual calling card of water-ice features. There are hints that other material besides ice might finally be detected within the rings" said Phil Nicholson, of Cornell, Cassini visual and infrared spectrometer team member.

NASA SEES INTO THE EYE OF A MONSTER STORM ON SATURN [based on NASA News]

NASA's Cassini spacecraft has seen something never before seen on another planet -- a hurricane-like storm at Saturn's South Pole with a well-developed eye, ringed by towering clouds. The "hurricane" spans a dark area inside a thick, brighter ring of clouds. It is approximately 5,000 miles across, or two thirds the diameter of Earth.

"It looks like a hurricane, but it doesn't behave like a hurricane," said Andrew Ingersoll, a member of Cassini's imaging team at the California Institute of Technology, Pasadena. This giant Saturnian storm is apparently different than hurricanes on Earth because it is locked to the

pole and does not drift around like terrestrial hurricanes. Also, since Saturn is a gaseous planet, the storm forms without an ocean at its base.

A movie taken by Cassini's camera over a three-hour period reveals winds around Saturn's South Pole blowing clockwise at 350 miles per hour. The camera also saw the shadow cast by a ring of towering clouds surrounding the pole, and two spiral arms of clouds extending from the central ring. These ring clouds, 20 to 45 miles above those in the center of the storm, are two to five times taller than the clouds of thunderstorms and hurricanes on Earth.

Though it is uncertain whether such moist convection is driving Saturn's storm, the dark "eye" at the pole, the eye-wall clouds and the spiral arms together indicate a hurricane-like system. Distinctive eye-wall clouds have not been seen on any planet other than Earth. Even Jupiter's Great Red Spot, much larger than Saturn's polar storm, has no eye or eye-wall, and is relatively calm at the center.

In the Cassini imagery, the eye looks dark at light wavelengths where methane gas absorbs the light and only the highest clouds are visible. "The clear skies over the eye appear to extend down to a level about twice as deep as the usual cloud level observed on Saturn," said Kevin H. Baines, of Cassini's visual and infrared mapping spectrometer team at NASA's Jet Propulsion Laboratory, Pasadena, California.

The deadline for the January Star Dust is January 24. Please send your material to Elliott Fein by that date to ensure inclusion. Send submissions to Elliott Fein at elliott.fein@verizon.net.

Articles submitted may be edited to fit the space available.

Other National Capital Area Meetings

Northern Virginia Astronomy Club Information about the January speaker and topic were unavailable as we went to press.

General membership meetings are open to the public, and are held at Enterprise Hall, Room 80, on the campus of George Mason University in Fairfax, Virginia. The meeting hall is in the basement floor of the building. It is best to park in Parking Lot B and walk up the hill to the rear of Enterprise Hall.

Meetings start at 7:00 P.M., on the second Sunday of every month. The first part of the meeting is club business, during which the officers make reports about their activities and areas of responsibility. The next part of the meeting usually includes:

- Show and Tell, where members share gadgets, books, techniques, etc.
- The Observing Report, describing the astronomical events for the next month.
- Q&A, where beginning astronomers are encouraged to ask questions to be answered by more experienced members.

- The Sky Tour, describing what's where in the sky for the next month.

The final part of the meeting is a program, usually by one of the members, but sometimes by "outside experts." We've had presenters from all aspects of Astronomy.

Please Join Us for Dinner!

Since February 1995, a number of NOVAC members have been congregating on the night of our regular meetings for dinner. Hopefully this assists in getting to know one another, at a more relaxed location than at the meeting itself. It's also nice to see who it is you're talking to for a change and be able to connect faces with names - unlike the usual observing situation. All are welcome to attend, whether NOVAC members or prospective members, guests or whoever — just be prepared to discuss a little astronomy or any other topic that pops up!

If you'd like to join us, stop by the Red, Hot and Blue restaurant at 5:30 P.M. See you there!

Source: <http://novac.com/>

Getting to the NCA Monthly Meeting and the Dinner Before the Meeting

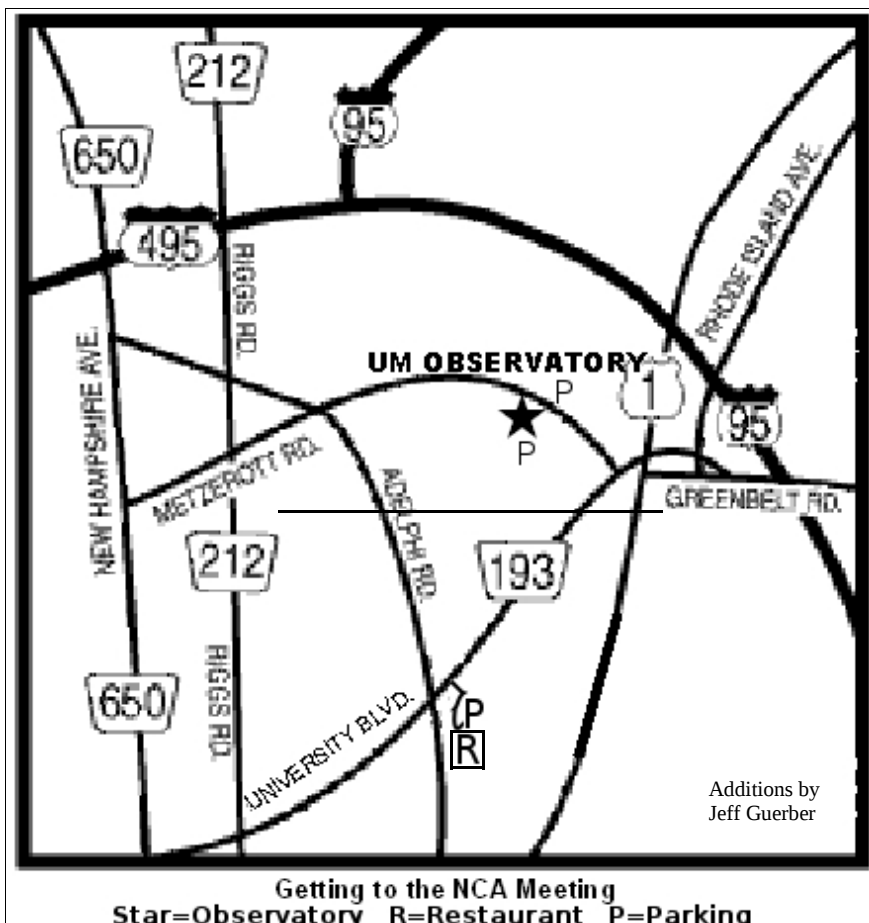
Jeff Guerber

NCA meetings are now held at 7:30 p.m. at the University of Maryland Observatory, in College Park on Metzerott Rd. between University Blvd. (MD-193) and Adelphi Rd. To get there from the Capital Beltway (I-495), either take US Rt. 1 south about a mile, turning right onto MD-193 West, then at the first light turn right onto Metzerott; or, take New Hampshire Ave. (MD-650) south, turn left at the second light onto Adelphi Rd., two more lights, turn left onto Metzerott, and proceed about a mile to the observatory. The observatory is on the south side of Metzerott Rd., directly opposite the UM System Administration building; you can park there if the observatory lot is full, but be careful crossing Metzerott Rd.

At 5:30 p.m., before the meeting, please join us for dinner at the Garden Restaurant in the UMD University College Inn and Conference Center, 3501 University Blvd. East at Adelphi Rd. From the Beltway, either take New Hampshire Ave. south, turn left onto Adelphi, and at the third light (passing Metzerott) turn left onto University then immediately right into the garage; or, take US-1 south, turn right onto University Blvd. west, and take it to the intersection with Adelphi Rd. Park either in the garage (costs), or in Lot 1 nearby (free). To get to the Observatory, exit to the right onto University Blvd. (MD-193) east, and at the second light turn left onto Metzerott Rd.

Do You Want to Get *Star Dust* Electronically?

Any member wishing to receive *Star Dust*, the newsletter of the National Capital Astronomers, via e-mail as a PDF file attachment, instead of hardcopy via U.S. Mail, should contact Nancy Grace Roman, the NCA Secretary, at nancy.roman6@verizon.net or 301-656-6092 (home).



Observing after the Meeting

Elizabeth Warner

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.

Are You Coming to Dinner?

If you are planning to come to the dinner before the meeting, please tell Benson J. Simon, telephone: 301-776-6721, e-mail bjs32@cornell.edu so that we can make reservations for the right number of people.

Do You 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 email at rigel1@starpower.net.)

Support the IDA

Join the International Dark-Sky Association
3225 N. First Avenue Tucson, AZ
85719-2103
www.darksky.org

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Trustees: Guy Brandenburg, Gary Joaquin, Jeffrey Norman, Benson Simon.

NCA Webmaster, Dr. Harold Williams, see info in top line above.

Elliott Fein, NCA *Star Dust* Editor, elliott.fein@verizon.net, 301-762-6261 (home), 5 Carter Ct., Rockville, MD 20852-1005.

Appointed Officers and Committee Heads: Exploring the Sky - Joseph C. Morris; Meeting Facilities - Jay H. Miller;

Observing - Michael McNeal, mcnealmi@verizon.net; Telescope Making - Guy Brandenburg; *Star Dust* Editor - Elliott Fein

SERVING SCIENCE & SOCIETY SINCE 1937

NCA is a nonprofit, membership-supported, volunteer-run, public-service corporation dedicated to advancing astronomy, space technology, and related sciences through information, participation, and inspiration, via research, lectures, presentations, publications, expeditions, tours, public interpretation, and education. NCA is the astronomy affiliate of the Washington Academy of Sciences. NCA is an IRS Section 501(c)(3) tax-deductible organization. All are welcome to join NCA.

SERVICES & ACTIVITIES:

Monthly Meetings feature presentations of current work by researchers at the horizons of their fields. All are welcome; there is no charge. See monthly *Star Dust* for time and location.

NCA Volunteers serve in a number of capacities. Many members serve as teachers, clinicians, and science fair judges. Some members observe total or graze occultations of stars occulted by the Moon or asteroids.

Publications received by members include the

monthly newsletter of NCA, *Star Dust*, and an optional discount subscription to *Sky & Telescope* magazine.

Consumer Clinics: Some members serve as clinicians and provide advice for the selection, use, and care of binoculars and telescopes and their accessories. One such clinic is the semi-annual event held at the Smithsonian Institution National Air and Space Museum.

Fighting Light Pollution: NCA is concerned about light pollution and is interested in the technology for reducing or eliminating it. To that purpose, NCA is an Organization Member of the International Dark Sky Association (IDA).

Classes: Some NCA members are available for educational programs for schools and other organizations. The instruction settings include star parties, classroom instruction, and school-teacher training programs that provide techniques for teaching astronomy. NCA sponsors a telescope-making class, which is described in the *Star Dust* "Calendar of Monthly

Events."

Tours: On several occasions, NCA has sponsored tours of astronomical interest, mainly to observatories (such as the National Radio Astronomy Observatory) and to the solar eclipses of 1998 and 1999.

Discounts are available to members on many publications, products, and services, including *Sky & Telescope* magazine.

Public Sky Viewing Programs are offered jointly with the National Park Service, and others. Contact: Joe Morris, joemorris@erols.com or (703) 620-0996.

Members-Only Viewing Programs periodically, at a dark-sky site.

NCA Juniors Program fosters children's and young adults' interest in astronomy, space technology, and related sciences through discounted memberships, mentoring from dedicated members, and NCA's annual Science Fair Awards.

Fine Quality Telescope, 14-inch aperture, see "Calendar of Monthly Events."

Yes, I'd like to join NATIONAL CAPITAL ASTRONOMERS!

Name: _____ Date: ____/____/____

Street address: _____

City/State/ZIP: _____

Telephone: ____-____-____ E-mail: _____

Other family members who should receive a membership card: _____

Would you prefer to get *Star Dust* by e-mail? _____

MEMBERSHIP CATEGORIES AND ANNUAL DUES RATES

All members receive Star Dust, the monthly newsletter announcing NCA activities. As an added optional benefit to extend your knowledge of astronomy you may also choose Sky and Telescope magazine at the discounted rate of \$33.

Student Membership: \$5with *Sky and Telescope*....\$38

Standard Individual or Family Membership: \$10with *Sky and Telescope*....\$43

You are welcome to make contributions in any amount in addition to the dues shown above.

Contribution amount: _____

Please mail this form with your check payable to National Capital Astronomers, to:

Mr. Michael L. Brabanski, NCA Treasurer; 10610 Bucknell Drive, Silver Spring, MD 20902-4254



National Capital Astronomers, Inc.

If undeliverable, return to
NCA c/o Nancy Roman
4620 N. Park Ave., #306W
Chevy Chase, MD 20815-4551

**FIRST CLASS
DATED MATERIAL**

***NCA Will
Meet on
January 13!***

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