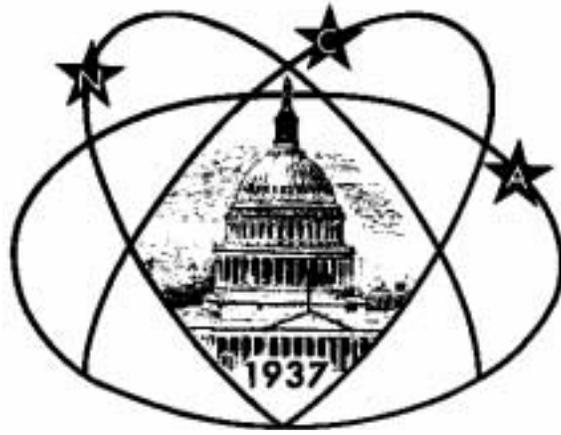


Star



Dust

National Capital Astronomers, Inc.

<http://capitalastronomers.org>

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On February 10

National Capital Astronomers

Presents a Lecture

Etienne Leopold Trouvelot (1827-1895), the Artist and Astronomer

Ms. Brenda Corbin, U. S. Naval Observatory, Retired

Abstract

The French born artist Etienne Trouvelot arrived in the United States in 1855. His interest in astronomy began with his observations and sketches of spectacular auroras in the 1870s. This work drew the interest of the Harvard College Observatory, and he was invited to join the staff. Using Harvard's 15-inch refractor and other telescopes, Trouvelot made many drawings of celestial objects. He was invited to Washington in 1875 to use the Naval Observatory's 26-inch Equatorial, at that time the world's largest refractor. In 1881 Charles Scribner's & Sons agreed to publish a portfolio with fifteen of his best drawings as chromolithographs. He subsequently returned to France in 1882 to work with Jules Janssen at the Meudon Observatory. Unfortunately, in the United States, Trouvelot will always be remembered not for his astronomical art, but as the person who introduced the gypsy moth into this country.

Biography

Brenda Groves Corbin held the position of head librarian at the U. S. Naval Observatory for 33 years, retiring in October 2005. The Naval Observatory Library is the largest astronomical library in the United States, with its oldest book dating from 1482. She was actively involved with astronomy librarians world wide and in 1988 founded the conference series, Library and Information Services in Astronomy, which is still being held. She has a keen interest in the history of astronomy and has served as an officer in the Historical Astronomy Division of the American Astronomical Society. She is also a member of the International Astronomical Union and recently served as Chair of the Working Group on Archives.

Date, Time, and Location

February 10, 2007, 7:30 P.M., at the University of Maryland Observatory, in College Park. The Observatory is reached by a driveway on Metzert 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 Metzertott. The relatively hidden entry point lies directly opposite the UM System Administration building. The Observatory is nested 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, February 9, 16, and 23, 6:30 to 9:30 P.M. 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 gbrandenburg@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 February 10, Ms. Brenda Corbin, U.S. Naval Observatory, Retired, "Etienne Leopold Trouvelot (1827-1895), the Artist and

Astronomer"

March 10, Ben Sugarman, Space Science Technology Institute will speak about "Massive-Star Supernovae as Major Dust Factories."

April 14, Frank Summers, Space Telescope Science Institute, will speak about "Astronomical Visualizations." He directed the IMAX short feature "Hubble: Galaxies Across Space and Time."

May 12, Mercedes Lopez-Morales, Department of Terrestrial Magnetism, Carnegie Institute of Washington, "Amateur Telescopes Can Do Real Science."

June 9, Dr. Nancy Grace Roman, NASA, retired, will speak about the Hertzsprung-Russell Diagram.

See Page 5 for other events this month.

Observing with the 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.

Dr. Theodore R. Gull: Eta Carinae: A Massive Star System in Transition

Reviewed by Ms. Marjorie Weissberg

This is a review of the talk given at the December 9 meeting of the National Capital Astronomers by Dr. Theodore R. Gull, NASA Goddard Space Flight Center: "Eta Carinae: A Massive Star System in Transition."

"The more we know about Eta Carinae, the more questions we have." Dr. Theodore R. Gull amply demonstrated this at his fascinating presentation of the enigmatic properties of the famous blue variable.

Eta Carinae is understood to be a to be a binary system whose Keplerian orbit is highly eccentric and is given to outbursts at perihelion. It is surrounded by shells of gas and dust shaped like an hourglass. Historically this structure has been called a homunculus because it was considered to be shaped like a dwarf. The homunculus is comprised of two main bipolar shells. In the center, with ionized hydrogen, is another, smaller, homunculus. The outer, neutral region contains ionized metals.

Nitrogen and helium are over-abundant and carbon and oxygen are under-abundant. Although we have not been able to determine the mass accurately, it is at

least 120 solar masses. The star system is currently being studied with the Hubble, the Space Telescope Imaging Spectrograph (STIS), the Very Large Telescope Array (VLT) in Chile, and the UV Spectrograph. It is expected that much more data will be produced during the 2009 spectroscopic minimum of ejecta, hence a minimum of obscuration. Every available instrument will be trained on Eta Car at that time. The four objectives for future research are to determine the mass of the binary system, the mass of the ejecta, and the abundances of metals, and to add to our understanding of massive star evolution.

Observations of stars such as Eta Carinae present a problem: Massive O-type stars do not lose, through their relatively steady winds, enough mass during their lifetime to account for the total mass loss before they become supernovae. This apparent discrepancy can be explained by significant mass loss occurring in abrupt stages. Such mass loss may effect the enrichment of gas and the initial composition of dust grains in star formation regions in today's epoch and early in the universe, when enrichment comes from massive stars.

Eta Carinae has shown remarkable variability. The homunculus is thought to be the ejecta from the 1840s, comprising 12 to 36 solar masses. In the 1840s, it was almost as bright as Sirius. It then faded and got bright again in the 1890s, when a smaller bipolar structure of ½ solar mass was formed. Currently, it is a system of 5 million solar luminosities. The observed periodicity is 5½ years, during which the wind velocity varies between 500 km/s and 1200 km/s. STIS has been invaluable for spectrographic analysis of the star system; you can't separate nebulosity from the star with ground-based observations. The shell ejecta absorption lines show that every 5½ years since the 1840s, there has been another mass ejection, some of which is moving at 3,000 miles per second. During the maximum, a lot of UV and X-radiation are hitting the ejecta. For several months after, something blocks the radiation, relaxes, and then blocks the radiation again.

Close in, 250 to 600 astronomical units away from the central source, are found the Weigelt blobs, a thousand times

(Continued on page 3)

Marjorie Weissberg: Eta Carina, cont.

(Continued from page 2)

brighter than the Orion Nebula. Spectra from Hubble have shown that they are very intense emission nebulosities, heavily photo-ionized and lasing. We don't know why they are clustered in one area, rather than appearing all around the star.

The outer shell is a region of partially ionized emission made up of gas that is being excited by ultraviolet radiation whose photon energies are less than 8.5 volts. There must be a lot of iron II sitting between the star and the nebulosity that blocks all of the hard ultraviolet. Dr. Gull calls this the "iron curtain."

Absorption lines have shown an abundance of heavy metals in the Eta Carinae system. Spectrographic filaments show the pres-

ence of strontium, which has never been seen in emission nebulosity before. This is also the first time that vanadium II has been detected. One of the mysteries of Eta Carinae is that this abundance of heavy metals in the system has not been found in interstellar space. This may be explained by the abundance of neutral gas that exists in the outer parts of the system. The lack of ultraviolet radiation prevents the formation of oxides.

We have not seen the secondary star in the system directly. Spectrographic analysis shows asymmetrical blue shifting of ultraviolet radiation in the core of the system. Since it is not symmetrical, as a stellar wind would be, it is something that is shifting from one side to the other. Dr. Gull

maintains that this is the companion star. It appears to be a hot massive star hidden by the wind of the primary star during periastron passage. Although still unable to determine the mass ratio of the binary system, Dr. Gull thinks that the secondary star is about 1/2 the mass of the primary star. His working hypothesis is that the secondary star exploded and lost material.

Dr. Gull concluded by cautioning us not to hold our breath waiting for a supernova. Eta Carinae is a system that has just gone from hydrogen to helium burning. From what we know about the sequence of massive stars, Eta Carina must go through a helium burning stage before it can become a supernova.

An Impact Crater in Our Own Backyard

by Nancy Byrd

On Saturday, January 13, 2007, Dr. Jeffrey Plescia of the Johns Hopkins University Applied Physics Lab, spoke to National Capital Astronomers about a truly remarkable impact structure. This structure was formed a mere 35.5 million years ago, a time well into the Cenozoic Era, the "Age of Mammals," which continues today.

This structure, known as the Chesapeake Bay Impact Structure, is a well preserved circular crater underlying the Delmarva Peninsula, the Chesapeake Bay and nearby mainland Virginia. It is centered at Cape Charles, Virginia and is about 85 kilometers in diameter.

Dr. Plescia began his talk with a discussion of terrestrial impact craters. By looking at craters elsewhere in the solar system, one would expect 10,000 to 20,000 craters; however, only 150 to 200 impact craters are known to exist on Earth. Of these, only a few have been discovered underwater. There are several reasons for this paucity of craters, explains Dr. Plescia. The oceans, which cover 71% of the globe, are geologically young features. They are less than ~200 million years old (Ma) and have an average age of ~55 Ma. Because of plate tectonics, the higher density ocean crust is subducted below the lighter, older continents, which average 2300 Ma. Earth processes, the continual interaction between mountain building and erosion by wind and rain, rearrange its surface. Thus,

after a million years, even one kilometer craters disappear.

Dr. Plescia said that material is falling to Earth continually. By looking throughout the Solar System, we can see that there is an inverse relationship between the size of in-falling objects and their frequency.

About several hundred thousand kilograms of cosmic dust fall to Earth every year. About 25 one-meter objects fall to Earth every year, but most burn up in the atmosphere. These enter the atmosphere with kiloton ranges of energy. Craters such as the Henbury complex of Australia (7 to 180 meters in diameter and ~4000 years old) can be expected to be created once in 500 years. One the size of Meteor Crater (also known as Barringer Meteor Crater) in Arizona, which is 1 km in diameter, can be expected to be created once in 20,000 years. Meteor Crater is about 50,000 years old. Some big objects never make it to the Earth's surface. For instance, in 1908, the Tunguska meteor in Siberia blew up in the atmosphere, yet caused significant destruction over thousands of square kilometers.

Most meteors are sand size grains, usually of cometary origin, and burn up in the atmosphere. Of the meteors that make it to earth, some land without making a hole. To make a hole, an iron and nickel meteorite must have a diameter of at least a few meters; a stony meteorite must be even larger. Dr. Plescia explained that infalling objects

lose mass in proportion to the atmosphere through which they travel. Other factors controlling impact effect are the mass and velocity on entry. Impact craters are generally round (unless the impact was at a very low angle) and come in three flavors: simple, complex, and basins (including multi-ring basins).

Simple craters are bowl shaped and steep sided, ranging in size up to 1200m in diameter and up to 180m deep (rule of thumb: depth = 1/10 diameter). They contain a rim of overturned material uplifted to about 30 to 60m and contain a breccia lens of the local rocks and sediments filling the floor of the bowl. Breccias are sedimentary rocks composed of pieces of angular pieces of rock from a previous rock structure, cemented together. Examples of simple craters are Meteor Crater, Wolfe Creek Crater and the Henbury complex of craters in Australia.

Meteor Crater is the best preserved crater and is very well studied. It is a one-kilometer crater with a depth of 174m and a 46m rim of overturned sediments. The overturned flap of sediments includes the Moenkopi, the Kaibab, the Toroweap, and the Coconino formations. The underlying Supai formation is undisturbed. Dr. Plescia noted that such a structure distinguishes an impact crater from a volcanic crater or a

(Continued on page 4)

Mid-Atlantic Occultations and Expeditions

by Dr. David Dunham

David Dunham was unable to provide the asteroidal, lunar grazing, and lunar total occultation predictions for the February *Star Dust*, but by the time you receive this, you will be able to find this information on

his Web site at <http://iota.jhuapl.edu/exped.htm>. Of special note will be the occultation of 5.0-mag 59 Leonis by the totally eclipsed Moon early Saturday evening, March 3; David is planning an expedition

to the vicinity of Wallops Island on the Delmarva Peninsula for the southern-limit graze of the star that will occur there.

Nancy Byrd: An Impact Crater in Our Own Backyard, cont.

(Continued from page 3)

salt dome. Deformation from the latter would not be shallow. Daniel Barringer (father of longtime NCA member Philip Barringer) bought the mineral rights to the area, hoping for a large ore body. But he abandoned the search for the meteorite when it became apparent that because of very high impact velocity, the meteorite was probably much smaller than expected. Although not economically profitable, Barringer's studies contributed to the understanding of such structures.

Complex craters have a central uplift and are characterized by fault blocks near the rim. On Earth, the transition from simple to complex craters takes place for craters greater than 2 kilometers in sedimentary rock and 4 kilometers in crystalline rock. The central uplift is caused by rebound of the crust in the central part of the crater. These craters are larger but proportionately shallower than simple craters. At still larger scales, multi-ringed basins form. Orientale on the Moon is a good example of a multi-ringed basin.

Vaporization and melting occur close in to the impact point. It is from this zone at shallow depths that material can get blasted out at huge velocities, sometimes with enough velocity to escape to space. This is followed by a zone of shock meta-

morphism, a very high temperature - high pressure metamorphism that does not occur from terrestrial processes. This is followed farther out by a fracture zone where the rock stays in place, but is broken up.

The Chesapeake Bay structure is a complex crater, buried by 100 meters of post-impact sediment. Because the sea level was high 35.5 million years ago, the meteor impacted in 400 to 1000 meters of water overlying unconsolidated to poorly consolidated sediments and finally crystalline rock (basement). The impactor was a 4-km asteroid with energy estimated to be 200 – 300 gigatons TNT equivalent. There is no evidence of global effects such as extinctions, although its effects on eastern North America must have been extensive.

The structure of the Chesapeake Bay Structure was determined by seismic exploration and drilling. The seismic data clearly show the fault blocks at the outer part of the structure and a 20-kilometer wide annular trough. There is a 35 to 45 km diameter ring consisting of raised crystalline basement, 3 to 6 km wide, and an inner basin 10 km wide. In the center is the central uplift.

The area has been drilled over the years, mostly for water. Two deep cores have been drilled into the Delmarva Peninsula. The Eyreville Core was drilled as a scien-

tific project last year. This core showed the post-impact sediments overlying the Exmore Breccia (the name of the breccia unit) which overlies thick granite mega blocks. These overlie various breccia, which overlie metamorphic rock. They had to stop drilling here because the project ran out of money.

Dr. Plescia showed us a gravity analysis that he performed with more than 1000 data points from many sources, including his own measurements, which gives a wonderful picture of the crater. He then showed us a video demonstrating the formation of the crater. The video showed that the impact made a huge hole in the water. Then, because the water ran back into the crater from all directions, scouring sediment and rock as it did, it formed the Exmore Breccia lens, an unconsolidated mish-mash of rock and sediment. Because the impact occurred in water, the crater was larger than it would have been if it had occurred on land. In that case, it would have been only 45 km in diameter.

He finished by showing the structure of the Silver Pit impact crater of the North Sea which has concentric fault blocks, similar to those of the Chesapeake Bay Structure.

Thank you, Dr. Plescia, for a delightful and informative lecture.

In the News - I

Reported by Dr. Nancy Grace Roman

CASSINI REVEALS TITAN'S XANADU REGION TO BE AN EARTH-LIKE LAND

[based on NASA News]

New radar images from NASA's Cassini spacecraft revealed geological features similar to Earth, on Xanadu, an Australia-sized, bright region on Saturn's moon Titan. These radar images show Xanadu is surrounded by darker terrain, reminiscent of a free-standing landmass. At the region's

western edge, dark sand dunes give way to land cut by river networks, hills and valleys. These narrow river networks flow onto darker areas, which may be lakes. A crater formed by the impact of an asteroid or by water volcanism is also visible. More channels snake through the eastern part of Xanadu, ending on a dark plain where dunes, abundant elsewhere, seem absent. Appalachian-sized mountains crisscross the region.

The deadline for the March Star Dust is February 21. 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

NOVAC

Upcoming Meetings

February 11, 2007 - 7:00 p.m.
Greg Redfern, "Meteorites."
Mr. Redfern is a JPL Planetary Ambassador and meteorite collector. He'll discuss what meteorites are, where they come from, and how we find them. His sample collection (including meteorites from the Moon and from Mars) is not to be missed!

Great Meadow Observing Schedule

NOVAC has finalized an observing schedule with Great Meadow.

NOVAC Garage Sale!

Meade 10" SCT and other astro gear for sale!

Looking for Tax Deductions!

Remember that donations of astro gear may be tax deductible.

Congratulations to Esther Li for winning 2nd place in the 2006 Jack Horkheimer Service Award.

Check out the new loaner scope reservation page!

The 2006 Star Party Calendar is updated!

The NOVAC Store is open for business! Get your NOVAC t-Shirts, hats, mugs and other official NOVAC gear and support the club at the same time. Many thanks to Kim Bieler for her new designs.

General Membership Meetings

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. If you come earlier, you can do a little socializing. 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 mem-

bers, but sometimes by "outside experts." We've had presenters from all aspects of Astronomy.

There's a good deal of socializing before and after meetings, allowing members to put faces with the voices they've heard in the dark.

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!

Annual Public Board Meeting

Our annual public board meeting will be held on Tuesday, February 6 at 7:30 p.m. at the Arlington Planetarium. All are welcome to attend.

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

In the News - II

Reported by Dr. Nancy Grace Roman

HUBBLE SEES FAINTEST STARS IN A GLOBULAR CLUSTER

[from NASA News]

NASA's Hubble Space Telescope has uncovered what astronomers are reporting as the dimmest stars ever seen in any globular star cluster. Globular clusters are spherical concentrations of hundreds of thousands of stars. These clusters formed early in the 13.7-billion-year-old universe. The cluster NGC 6397, which is 8,500 light-years away, is one of the closest globular star clusters to Earth. Seeing the whole range of stars in this area will yield insights into the age, origin and evolution of the cluster. A team led by Harvey Richer of the University

of British Columbia, Vancouver, is reporting that they have at last unequivocally reached the faintest stars. "We have run out of hydrogen-burning stars in this cluster. Any less massive ones faded early in the cluster's history and by now are too faint to be observed," Richer said. The light from these faint stars is as dim as would be, the light produced by a birthday candle on the Moon seen from Earth. Analyzing white dwarfs, the burned-out remnants of stars that died long ago, Hubble showed the dimmest white dwarfs have such low temperatures that they are undergoing a chemical change in their atmospheres which makes them appear bluer rather than redder as they cool. This phenomenon had

been predicted, but never observed. These white dwarfs are the relics of stars up to eight times as massive as the sun, which have exhausted the fuel capable of supporting nuclear reactions in their cores. Astronomers have used white dwarfs in globular clusters as a measure of the universe's age. The universe must be at least as old as the oldest stars. White dwarfs cool down at a predictable rate. The older the dwarf, the cooler it is, making it a perfect "clock" that has been ticking for almost as long as the universe has existed. Richer and his team are using the same age-dating technique to calculate the cluster's age. NGC 6397 is estimated to be nearly 12 billion years old.

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

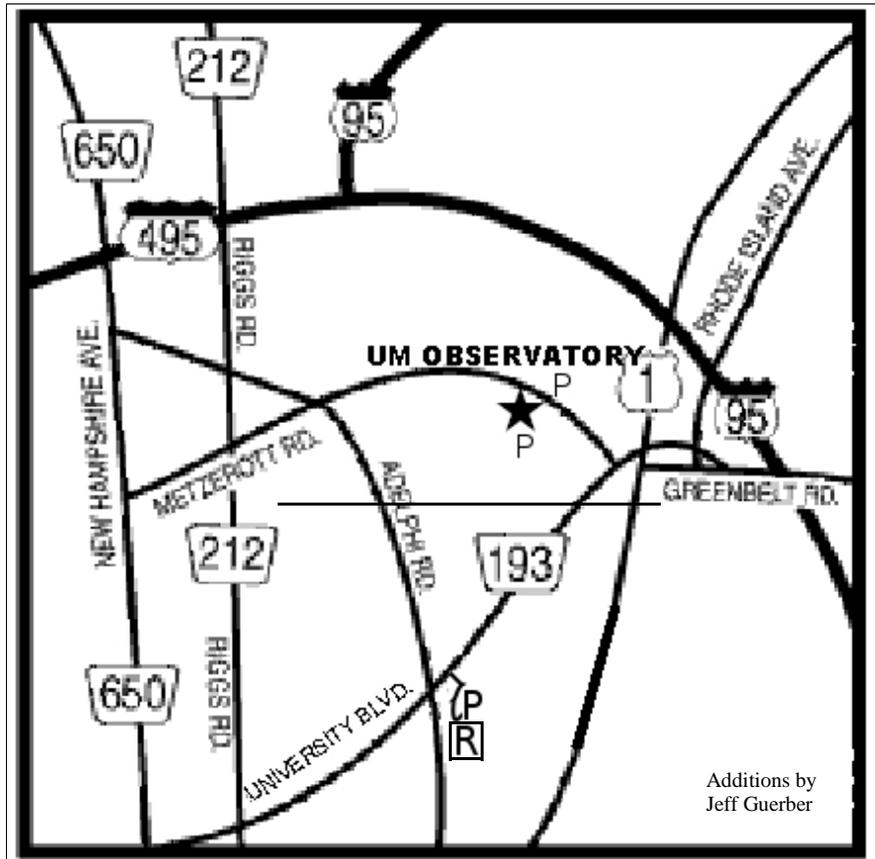
Jeff Guerber

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).



Getting to the NCA Meeting
Star=Observatory R=Restaurant P=Parking

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 e-mail at rigell@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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<http://capitalastronomers.org>

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Jeffrey B. Norman, Assistant Treasurer.

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, elliot.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
February 10!***

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