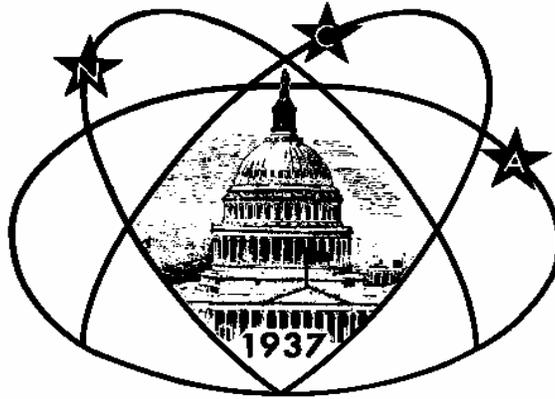


# Star



# Dust

National Capital Astronomers, Inc.

<http://capitalastronomers.org>

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## January Talk: Dr. Nancy Grace Roman, "The Untranquil Universe" *Submitted by Gary Joaquin*

Dr. Nancy Grace Roman will present the featured talk for the January 4 meeting of the National Capital Astronomers: "The Untranquil Universe". The meeting will be held at 3:00 P.M. in the Bethesda-Chevy Chase Regional Services Center of Montgomery County, 4805 Edgemoor Lane (Second Floor), Bethesda, MD.

### Synopsis

The view of a dark starry sky gives a feeling of tranquility. Because stars and galaxies are so distant, they appear changeless. Our extension of observations to a broad range of wavelengths as well as more detailed study in the optical, has demonstrated how wrong this impression is. Baby

stars are rambunctious. Our sedate middle-age sun spews plasma clouds that disrupt terrestrial power systems. Bloated old stars expel rings of gas. Former stars devour their companions and die in explosions that leave remnants far denser than we can obtain in our laboratories. Galaxies collide

*(Continued on page 5)*

## "Understanding the Different Kinds of Comet Impact Hazards" A Talk by Dr. Carey M. Lisse *Reviewed by Dr. Nancy Grace Roman*

Dr. Carey M. Lisse was the featured speaker at the December meeting of NCA. While waiting for a projector to arrive, Dr. Lisse talked about life as an astronomer. Hours are long; pay is good but not great; he has an asteroid named for him; he gets to do research, which is fun, in return for teaching or working on a project; and gets to travel to telescopes for his research.

### Origin of the Solar System

The solar system originated in the collapse of a giant molecular cloud weighing a few solar masses. As it collapsed, it condensed and warmed up until the central portion became a star. It was surrounded by a disk of very fine dust, much like that in cigarette smoke. Asteroids and comets were formed in this disk. Most of the condensa-

tions that could form asteroids and comets combined to form planets.

### Comets

Comets are dirty snowballs about the size of an Appalachian mountain (about 1 km in diameter). Deep Impact is a mission to aid our understanding of comets. It will

*(Continued on page 2)*

## "Dim Stars and Bright Skies" A Talk by Dr. Philip Ianna *Reviewed by Jay H. Miller*

Dr. Philip Ianna, Professor Emeritus in the Department of Astronomy at the University of Virginia, gave the featured talk at the NCA meeting on November 2: "Dim Stars and Bright Skies". He talked about three distinct subjects: astrometry, nearby stars, and control of light pollution

### Early Beginnings

Dr. Ianna grew up in Philadelphia. At the age of about 12 or 13 he took a trip outside of the city and saw the Milky Way for the first time. It "blew him away" and kindled

his interest in astronomy. He soon made his own 8" mirror. He attended Swarthmore because there, undergraduates could get involved in astronomy. The area of astronomy that has interested him most is astrometry, the study of positions, distances, parallax, etc. This is where it's at. (This was the first astronomy. historically speaking.)

### The Beginning of Astrometry

The study of parallax goes back to Aristotle, when people thought that since they

could observe no parallax, the Earth must be stationary. To study parallax, one needs a long focal length telescope. Although Bessel gets credit for finding the first parallax, it was actually Thomas Henderson who measured the first parallax, that of alpha Centauri, in 1832. Unfortunately, he did not publish his work. F. G. W. Struve ascertained the parallax of Vega around 1840.

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## Dr. Lisse's Talk

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send a probe into Comet Tempel 1 in an effort to determine its composition and structure. The probe is unlikely to affect the comet greatly; the effect will be comparable to driving a car into a mountain. There are about 200 short period (SP) comets (periods of 5-6 years). Their orbits have been strongly influenced by Jupiter. Each lasts only about 100,000 years as the Sun continuously evaporates the surface.

### Sources of Comets

Comets in the Oort cloud were formed near Jupiter and ejected to greater distance from the Sun by planetary perturbations; comets in the Kuiper belt were formed in that region. Oort cloud comets are probably not affected by passing stars or interstellar clouds but are perturbed by planets. Most have perihelia near about 3 AU. Short period comets are from the Oort cloud; long period comets are from the Kuiper belt. We may even see comets from the  $\alpha$  Centauri system someday, in the same way that many Oort cloud comets are thrown out of our solar system when they come by the Sun. Comets from the Oort cloud have random inclinations as a result of scattering. There may be an inner and an outer Oort cloud with the former more concentrated to the ecliptic. There appear to be no Kuiper belt comets beyond about 55 AU from the Sun. The most numerous family of comets is the SOHO family, which contains about 500 members. These are very small, (about 1 to 100 m in diameter) and may have formed from a break-up of a larger comet.

### Composition of Asteroids and Comets

Asteroids are much more processed than comets. Most probably melted and resolidified. A comet is any interplanetary body that is out-gassing as surfaces newly exposed to the Sun boil off. They are probably fractured ice or compact snow.

### Comets Vary

All large comets have very hot dust. The Sun and cosmic rays create a thin mantle (~ few mm thick on the Oort cloud comets, cm to m thick on the SP comets, depending on their age) These mantles are burned up when the comets approach the Sun. Many new comets are very bright at about 5 AU from the Sun. The Sun then boils off their volatiles so they are not as bright when near the Earth. About 1 m is burned off from a 1 km comet on each passage by the Sun. Short period comets evaporate more slowly until they stop out-gassing. Encke will turn off in about 100 –

## NCA Events This Month

### The Public is Welcome!

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

**Fridays, January 3, 10, 17, 24, and 31, 6:30 to 9:30 P.M.**, NCA Telescope-making Classes at the Chevy Chase Community Center, at the northeast corner of the intersection of McKinley Street and Connecticut Avenue, N.W. For more information, see Page 5. Contact instructor Guy Brandenburg at [gfbranden@earthlink.net](mailto:gfbranden@earthlink.net) or 202-262-4274.

**Saturday, January 4 and Fridays, January 10, 24, & 31d, 8:30 P.M.** Open nights with NCA's 14-inch telescope at Ridgeview Observatory near Alexandria, Virginia. For more information, see Page 3.

**Saturday, January 4, 3:00 P.M.** NCA meeting in the Bethesda-Chevy Chase Regional Services Center of Montgomery County, 4805 Edgemoor Lane, (Second Floor), Bethesda, MD. See map and directions on Page 8.

Dr. Nancy Grace Roman will give the featured talk, "The Untranquil Universe"

**Saturday, January 4, following the meeting**, dinner with the speaker and NCA members at the Bangkok Garden Restaurant 4906 St. Elmo Ave, Bethesda, MD 20814 (301) 951-0670

See Other National Capital Area Meetings, Page 6.

200 years. There must be many dead comets. On a dead comet you can punch a hole and probably produce a jet, if you penetrate deep enough to get through the devolatilized mantle. To get to an SP comet, the required  $\Delta v$  is small and there is good lead-time.

Comets have the composition of interstellar clouds except that they have less H and possibly less He, N, and Ar. Under the surface, a comet is quite cold (~30-40K). The impact of the Deep Impact probe, at 370 kg total mass and 10.2 km/sec relative velocity, is expected to make a hole about the size of a football field about 20 m deep. This has never been done before. If the comet is extremely porous, the probe could go right through it!

Halley is darker than asphalt. Its is 0.1-1 gm/cm<sup>3</sup>; it is 10<sup>14</sup> – 10<sup>15</sup> km in diameter. Chiron has a circular orbit beyond Saturn. It will eventually turn into a comet and evolve like the other short period comets; it may very well fragment before doing this. Eros has a density of about 3 g/cm<sup>3</sup>. Mathilde appears to be a rubble pile. The only comets for which we have close-up views are Halley and Borrelly.

C-class and D-class asteroids may be old comets. C-class asteroids have nearly flat spectra; this is consistent with their being very dark. D-class asteroids have more slanted spectra. Short period comets are

very dark because material has been burned off. We do not know the masses of comets because they are too light to perturb other bodies measurably. On a comet, if you jump, you leave on an escape trajectory.

We think that there are comets in other systems. They are probably responsible for the dust in relatively old systems such as  $\beta$  Pic. The chronology of star formation is: 10<sup>4</sup> years, condensation stage; 10<sup>5</sup> years, dust and flare jets; 10<sup>7</sup> years, cylindrical system – planetesimal formation begins; 10<sup>8</sup> years, terrestrial and giant planets – still some dust.

Many people work on asteroids; few on comets. There are many comets that can cause a problem on Earth.

### Frequency of impacts

Frequency of comet impacts:

- Micro dust: about 100 tons per day
- Asteroidal and comet bodies:
- ~30 basketball-size per year.
- ~1 5-10m (10 tons TNT equivalent) per year
- 1 Leonid shower every 33 years
- 1 Tunguska (100m asteroid; 10Mton) every 200-10,000 years
- 1 dinosaur killer > 1 km every 10-100Myr
- 1500 Near Earth Asteroids have

(Continued on page 3)

## Dr. Lisse's Talk

(Continued from page 2)

been detected (about 50% of expected number); 600 are > 1 km. Of the estimated 100-200 Near Earth Comets fewer than 20 have been studied.

Congress has mandated that all Near Earth Objects > 1 km are to be detected by 2008. SIRTf will be able to observe objects down to 10 km in the K-band. The Air Force is exchanging information on meteor impacts with some other countries to avoid having them mistaken for bombs.

### How to Prevent Impacts

Mitigation techniques:

- **Avoidance:** With a year's notice, we could use  $\mu\text{N} - \text{mN}$  force to change velocity by a few m/sec. We could use a laser, solar heating by changing the surface reflectivity, or solar electric propulsion, etc
- **Destruction:** On short notice (< 1yr) we could change the velocity by 10 m/sec using a nuclear subsurface blast, nuclear stand-off blast, or impact.

Which technique is used depends on the composition of the object. A rubble pile is difficult to destroy. Therefore, you need to know the mass, shape, rotation rate, and map of optimal sites. Knowledge of surface characteristics is also required. You cannot attach something to a very dusty surface. Comets can be studied from the ground with images in various pass bands. The emission from sunlight and temperature lead to an estimate of the object's nature. With good enough data, we can determine the size of the nucleus. Comets are smaller than Near Earth Asteroids and most are slow. There are no fast rotators among comets.

### Visits to Comets and Asteroids

Stardust will image P/Wild2, and obtain and return a sample of material below the surface. Rosetta, to be launched in January 2004, will study both the surface and the interior of a comet. Deep Impact has two pieces: a fly-by bus and an impactor. The latter will carry a camera. The ejection of the impactor can be controlled to land it in a bright area visible to both the fly-by and the Earth. It will plow into the comet's surface using an impact load 2/3 of which is made up of 6 slices of copper formed into the shape of a paraboloid. The copper will impact first, and be immediately evaporated and ejected. Copper is used to avoid

## Observing with the NCA C-14 by Bob Bolster

### Date, Time: All 8:30 p.m.

Saturday, January 4  
Friday, January 10  
Friday, January 24, 31

### Prime Objects

Saturn, M31, M42, Double Cluster  
Saturn, 1st Quarter Moon  
Saturn, M31, M42, Double Cluster

At Ridgeview Observatory in Bob Bolster's backyard, 6007 Ridge View Drive, Franconia, Virginia (off Franconia Rd. between Telegraph Rd. and Rose Hill Dr.). Call Bob at 703-960-9126 before 6:00 p.m., to let him know you are coming.

confusing the elemental analysis as little copper is expected in a comet. The mission is working very hard to put redundancy into the system. About 10 days before the rendezvous, Deep Impact will begin getting detailed photometry of the nucleus. The first highly resolved images will be obtained about 2 hours before impact. The speed of approach will be 10 km/s relative to the comet. The size of the crater and the ejecta curtain caused by the impact will tell us about the materials in the comet nucleus.

The time scale during which the ejecta curtain is formed is between a few hundred and 1000 seconds because the comet's gravity is so weak. It is possible that the impactor will miss the comet, or the comet may be a ball of fluff allowing the impactor to pass through it without making a crater. The comet flyby and impact will occur on July 4 2005. The impact will appear as bright as 5<sup>th</sup> magnitude in the southwestern sky. At that time, the comet will be .9 AU from Earth and 1.5 AU from the Sun.

**For up-to-date information** about the event, contact Elizabeth Warner at the University of Maryland ([warnerem@astro.umd.edu](mailto:warnerem@astro.umd.edu)) or Dr. Lisse ([lisse@astro.umd.edu](mailto:lisse@astro.umd.edu)).

**Question period:** If the impactor passes through the comet, it will go into an orbit around the Sun. They hope that the main part of the spacecraft will be sent to another comet after the flyby, but no definite target has been selected. Three correction maneuvers for the spacecraft trajectory are currently planned. The impactor will be ejected 24 hours before point of closest approach (PCA) and be guided by an on-board intelligent guidance system called "Autonav". Just before PCA, the spacecraft will be rotated so that its shield is pointed toward the comet. Just after PCA, the spacecraft will be rotated again so that the impact ejecta curtain can be observed. The impactor is shaped like a bullet.

The author thanks Dr. Andrew Seacord who provided notes on the end of the lecture and the question period.

She particularly thanks Dr. Lisse for his careful reading, and substantial editing of this review.

# Support the IDA

Join the International  
Dark-Sky Association  
3225 N. First Avenue  
Tucson, AZ 85719-2103  
[www.darksky.org](http://www.darksky.org)

# Review of Dr. Philip Ianna's Talk, continued

(Continued from page 1)

## The Rise and Fall of Photographic Astrometry

By the start of the 20th century, photographic astronomy came into its own. Early work was done at McCormick Observatory at the University of Virginia. The first plates were blue sensitive and very slow - it took 30 minutes to capture an image of an 11th magnitude star. Most of the work was done at four observatories, McCormick, Allegheny, and in the southern hemisphere, the Royal Astronomical Observatory at Capetown and the Yale refractor at Mt. Stromlo Observatory in Australia.

By the mid 1990's, photographic work was dying out. Even with about 100 years of work, only about 11,000 parallaxes had been obtained for about 6,000 objects, by about two dozen observatories. The errors were about 0.01 arcsec, which is not good.

Nowadays, very little photographic work is done. One of the reasons is because Kodak stopped making the large plates about 6-7 years ago. Not only did they not make any money on the plates, but there were problems making the emulsion. The gelatin for the emulsion came from water buffalo and yak hides which they could no longer obtain. Pure gelatin did not work and it was not economically feasible to do the research for other sources. Because of this, researchers are turning to CCDs.

One of the first observatories to do CCD astrometry was the USNO in the late 1980's. CCD chips have an advantage over the large-scale photographic plates. With their small chip size and narrow field of view the field is uniform and there is no coma. However, this small field means that there are few reference stars. A field of at least 5 arc-minutes is preferable. Also, bright stars are difficult to measure because they can saturate the pixels. However, they can do fainter stars than Hipparcos. The chips can be more stable than gelatin emulsions which can shrink, etc. Using several images and mathematical techniques, measurements as precise as 1/50 pixel can be made. The USNO has gone to 1/2 milli-arc-second (mas).

## Use of Satellites

The 11,000 parallaxes mentioned above pale compared to the 118,000 the Hipparcos satellite measured to a 9.5 magnitude to about .001 arc-seconds (1-2 mas) in

three years. Satellite measurements have advantages over ground-based observations. Seeing, the atmosphere, stellar spectra differences, and refraction are major obstacles circumvented by observing in space. Other astrometric satellites planned include FAME from the USNO. This was cancelled because of cost overruns, but may be restarted. The Europeans have GAIA, which is to measure a billion stars to 1  $\mu$ s accuracy and NASA has a Space Interferometry mission planned for 2007-2009 that will also look for extra-solar planets.

## Nearby Stars

Astrometric techniques form an important part of the search and identification of nearby stars and extra-solar planets. Dr. Ianna has been involved with several Southern Hemisphere nearby-star search programs: one at Mt. Stromlo and Siding Springs in Australia, now ended, and another one at Cerro Tello (CTIO) in Chile, which has better seeing and is continuing. So far, they have found about 70-80 new stars nearer than 20 pc at Siding Springs and CTIO. They have also found new binaries nearby.

NASA and the National Academy of Sciences have realized that there is a lot we don't know or haven't collected together on the nearby stars. They are, therefore, working on a database to bring together the known data. Getting the astrometric information is involved. There are many factors such as proper motions of the stars themselves and for binary systems the length of time to ascertain the orbits which can take centuries or greater.

## A Puzzle

One of the puzzles of astrometry is that measuring the number of stars at increasing distances shows that the number doesn't increase, but rather, there is a leveling off. Assuming that we know all of the stars to 5 parsecs, we're off by about 130 stellar systems by 10 parsecs. Some of the missing mass can be in brown dwarfs, methane dwarfs, etc., but we're unsure where the missing stars are.

One of the early stars which has been studied in the search for extra-solar planets is Barnard's star, the star with the greatest proper motion. Perturbations in its motion indicated a planet-sized mass. Peter Van de Camp at Sproul Observatory studied this and thought that it might have Jupiter- and

Saturn-size masses orbiting it. Others have studied this and have been unable to corroborate it. Marcy and Butler, the astronomers who have found many of the extra-solar planets, also have kept Barnard's star in their search program.

## Light Pollution

The last topic Dr. Ianna covered was IDA, the International Dark Sky Association. He is active in the Virginia division. Mary Margaret Whipple, a local state senator, introduced Senate Bill 379 this year. It required the Department of General Services to buy full cut-off fixtures for all public institutions except for athletics, and similar programs. Unfortunately, a waiver was inserted at the last minute that effectively negated much of this.

The amount of light hitting the ground should also be limited, because it can be reflected into the sky. One to two foot-candles should be adequate, rather than the 10 foot-candles commonly found. (There was some concern about VDOT's commitment. However, VDOT has signed on to minimize glare, sky glow and light trespass as long as it is cost effective. VDOT has an advisory committee, on which Dr. Ianna serves, which can be effective.

Jeff Norman brought up D.C.'s acorn lights. Dr. Ianna showed that these are available as full cut-off fixtures, although a little light leak is present to define the curlicue at the top.

The reviewer wants to express his appreciation to Nancy Byrd for her critical reading and precise editing of this article.

**The deadline for the February *Star Dust* is January 15. (Please have your material Elliott Fein by January 15 to ensure inclusion in the January *Star Dust*.)**

Please send submissions to Elliott Fein at [elliott.fein@erols.com](mailto:elliott.fein@erols.com). Text must be in ASCII, MS Word, or WordPerfect.

**All articles submitted may be edited to fit the space available.**

Thank you.

## Dr. Roman's January Talk

(Continued from page 1)

with spectacular results. Gamma ray bursts shine briefly from the farthest reaches of our instruments. A magnetostar at 20,000 light years affects our communications.

### Biography

Dr. Nancy Grace Roman is an astronomer with a long and distinguished career. She earned her Ph.D. in Astronomy from the University of Chicago in 1949. Soon thereafter she engaged in radio astronomy research at the U.S. Naval Research Laboratory. From 1959 to 1979 she was employed at NASA where she developed programs and organized their scientific participation to ensure scientific integrity and to maximize scientific return. The programs for which she was responsible included the Orbiting Solar Observatories, Geodetic satellites, Small Astronomical Satellites, International Ultraviolet Explorer, Orbiting Astronomical Observatories, the Hubble Space Telescope, UK 5, Infrared Sky Survey (IRAS), Cosmic Background Explorer and High Energy Observatories. She has served on several key committees includ-

ing chairing the Astronomy Working Group and Management Operations Working Group for Shuttle Astronomy from 1965-1979 and serving as the Deputy Chair of the science portion of the Outlook for Space Committee that was tasked to plan programs for NASA for the period 1980-2000. Since leaving NASA Dr. Roman has served in a variety of scientific and consulting roles.

Dr. Roman has received numerous honors throughout her career including the NASA Exceptional Scientific Achievement Award (1969), the NASA Outstanding Scientific Leadership Award (1978) and the William Randolph Lovelace II Award from the American Astronomical Society (1980). Dr. Roman is currently a fellow in the American Astronomical Society (1978) and the American Association for the Advancement of Science (1989). In 1987 the asteroid "Roman" was named after her. She is currently an adjunct professor at Montgomery College and the Secretary of the NCA Board of Directors.

## NCA Telescope/ Mirror-Making Workshop Guy Brandenburg

The NCA mirror- and telescope- making workshop continues to function every Friday evening from 6:30 to 9:30 PM at the Chevy Chase Community Center at McKinley Street and Connecticut Avenue, NW in Washington, DC. This month, it will be January 3, 10, 17, 24, and 31.

We have glass (Pyrex and other), grits and other abrasives, pitch for making pitch laps for polishing, measuring devices for testing nearly-finished mirrors, and even a lathe and an aluminizer. But more important, we have a good deal of experience, which means we can help you in rough grinding, fine grinding, polishing, and doing the final figuring for a very high-quality Newtonian reflector with an aperture from 4.25 inches to over 12 inches.

Our prices are just for the supplies, and are less than you pay for a comparable kit from any vendor. For example: \$70.00 for a 6-inch mirror, all costs included except for aluminization, which is about \$15 extra. We can also assist you in the design and construction of the telescope itself.

You can start or finish a mirror at any time. What's more, if you have a mirror that you would like to have tested, we can do that, also. If you are just curious, feel free to stop by. (There is free parking in the CCCC parking lot, which opens onto McKinley St.)

For more information, look at any book on telescope making, and then e-mail Guy Brandenburg at [gbranden@earthlink.net](mailto:gbranden@earthlink.net) or call him at 202-262-4274.

## Meteor Showers

### January Radiants

Full Moon: January 18

### Major Activity

Radiant	Duration	Maximum
Quadrantids (QUA)	December 28-January 7	Jan. 3 (?)

### Minor Activity

Radiant	Duration	Maximum
Zeta Aurigids	December 11-January 21	December 31/January 1
January Bootids	January 9-18	January 16-18
Delta Cancrids (DCA)	December 14-February 14	January 17
Canes Venaticids	January 13-30	January 24/25
Eta Carinids	January 14-27	January 21/22
Eta Craterids	January 11-22	January 16/17
January Draconids	January 10-24	January 13-16
Rho Geminids	December 28-January 28	January 8/9
Alpha Hydrids	January 15-30	January 20/21
Alpha Leonids	January 13-February 13	January 24-31
Gamma Velids	January 1-17	January 5-8

### Daylight Activity

None

Source: <http://comets.amsmeteors.org/meteors>

## Star Dust is Now Available 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](mailto:nancy.roman6@verizon.net) or 301-656-6092 (home).

## Other National Capital Area Meetings

**Attention: Access to Goddard Space Flight Center is limited to those holding Goddard badges or official visitors. You can become an official visitor by finding a badged Goddard employee to escort you.**

**University of Maryland Observatory** on Metzerott Road. The Department of Astronomy College Park Campus Observatory. The Observatory is open to the public on the 5th and 20th of each month. The program starts at 8 p.m. with a presentation. The talk is followed by observing if weather permits.

January 5 Dr. Andrew Harris on, "Infrared astronomy and the SOFIA airborne observatory"  
Info: (301) 405-6355. Source: [www.astro.umd.edu/openhouse/](http://www.astro.umd.edu/openhouse/)

### **Goddard Scientific Colloquia**

All colloquia will be held in the Bldg. 3 auditorium. Coffee and tea will be served at 3:00 p.m., courtesy of GEWA. If you plan to attend and do not have a NASA badge, please contact Carol Krueger, at (301) 286-6878, at least 24 hours beforehand. Access to Goddard Space Flight Center is limited to those holding Goddard badges or official visitors. You can become an official visitor by finding a badged Goddard employee to escort you. The Scientific Colloquium Committee cannot promise to provide escorts. We regret the inconvenience to our regular guests.

January 10 Neil Ashby, University of Colorado, "Large and Small Relativistic Effects in the Global Positioning System"

January 17 Judith Lean, Naval Research Laboratory, "Solar Forcing of Climate - the Previous Millennium, the Coming Millennium"

January 24 Vera Rubin, Carnegie Institution of Washington, "A Brief History of Dark Matter"

January 31 Harry McSween, Jr., University of Tennessee, "The Rocks of Mars, from Far and Near"  
Source: [heawww.gsfc.nasa.gov/users/djt/colloq/](http://heawww.gsfc.nasa.gov/users/djt/colloq/)

### **Stellar & Extragalactic Astronomy**

**Lunch** Talks are Wednesdays at Noon in Room 242 of Bldg. 21. BWSS talks are in the Aerospace Building (see below).

January 15 Ken Sembach, STScI, "Highly-Ionized High-Velocity Gas in the Vicinity of the Milky Way" (BWSS)

Talks labeled BWSS are part of the Baltimore-Washington Starburst Seminar Series. These talks are in the Aerospace building at 10210 Greenbelt Road, Room 408 on the 4th floor; a free pizza lunch will be provided. To get to the Aerospace building, go out the main gate of GSFC, turn left and go about 3/4 mile. The Aerospace building will be on your left, just after a Lutheran church. Source: <http://hires.gsfc.nasa.gov/~gardner/seal>

### **Solar Physics Talk Calendar**

Talks at 3:30 in Bldg. 26, Rm. G10 of Goddard Space Flight Center.

January 22 Enrico Landi, Artep, Inc. at NRL, "Flare Diagnostics with SUMER"  
January 29 C. Z. "Frank" Cheng, Princeton Plasma Physics Laboratory, "Magnetic Reconnection and Merging - Mechanism of Solar Flares"  
Source: [http://orpheus.nascom.nasa.gov/~kucera/solar\\_talks/](http://orpheus.nascom.nasa.gov/~kucera/solar_talks/)

### **Department of Terrestrial Magnetism**

Carnegie Institution of Washington  
5241 Broad Branch Road, N.W., Washington, D.C. 20015. (202) 478-8820  
Seminars are held on Wednesdays at 11:00 a.m. in the Seminar Room of the Main (old) Building. Coffee and tea will be served at 10:45 a.m. Please call or email Brooke Hunter to confirm that there have been no cancellations.

January 8 Richard W. Carlson, DTM, "Early Solar System Chronology"

January 15 Eugenio Rivera, DTM

January 22 Mark D. Behn, DTM

January 29 Marc J. Kuchner, Harvard-Smithsonian Center for Astrophysics  
Source: <http://www.ciw.edu/DTM-seminars.html>

### **Northern Virginia Astronomy Club**

January 12 Pete Johnson, "Preparing for an Observing Session"

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. 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 PM, on the second Sunday of every month. Source: <http://novac.com>

### **Space Telescope Science Institute**

**(STScI)** Come to the free public lectures at the Space Telescope Science Institute (STScI). Each month a noted scientist discusses a different cosmic topic. Lectures are at 8 p.m. the first Tuesday of every month in the STScI auditorium, on the campus of Johns Hopkins University. Free parking is available. For directions, call 410-338-4700.

January 7 Dr. Neill Reid, STScI, "Brown Dwarfs: Not the Missing Mass"

February 4 Dr. Bill Blair, JHU, "The FUSE Satellite: A New Tool for Exploring the Ultraviolet Universe"

Want to see some of the wonders of our universe? Come peer into the heavens with the Johns Hopkins University's Bloomberg telescope. The telescope is open to the public every Friday evening, weather permitting. For more information, contact the observatory at (410)-516-6275 or [altan@pha.jhu.edu](mailto:altan@pha.jhu.edu).

### **Montgomery College's Planetarium**

Exciting public planetarium programs are offered at Montgomery College at Takoma Park. Astronomy is one of the few sciences accessible to any inquiring mind. Astronomy is the oldest science and one of the few sciences that welcomes amateurs. Please come to a public planetarium program and explore the universe with us. Everyone who looks up at the stars with wonder is an astronomer.

January 25 at 7:00 P.M. "How are Stars Born?"

The planetarium shows 1,834 naked-eye stars, the Milky Way, and the five naked eye planets under a twenty-four-foot dome with forty-two comfortable chairs. The planetarium is located on Fenton Street on the Takoma Park campus of Montgomery College. It is attached to the Science South building on the ground level and has a conspicuous silver colored domed roof. The stars are the province of all of mankind. An astrophysicist will answer questions about the universe. There is no admission charge for these public planetarium programs. Contact Dr. Harold Williams, [hwilliam@mc.cc.md.us](mailto:hwilliam@mc.cc.md.us) or 301-650-1463. Source: <http://www.mc.cc.md.us/Departments/planet/>

# Mid-Atlantic Occultations and Expeditions

## by David Dunham

### Asteroidal Occultations

Date	Day	EST	Star	Mag	Asteroid	dmag	s	in.	Location
Jan 2	Thu	22:16	TYC48482317	10.9	Joella	4.1	4	7	s. e. N. Carolina
Jan 5	Sun	21:27	51 Aqr A	5.8	Fredegundis	0.8	1	2	near Mex. City
Jan 7	Tue	0:04	TYC01640975	11.1	Tyche	1.5	5	7	MA, central NY
Jan 10	Fri	22:52	SA0 117679	7.7	Bathilde	4.8	9	2	n. MD, n. DE, sePA
Jan 15	Wed	20:36	TYC12090124	10.5	Bohemia	3.6	4	6	New York, Mass.
Jan 21	Tue	6:05	SA0 160149	8.6	Venus	0.0	495	3	e. N. America
Jan 21	Tue	21:29	TYC01901917	11.6	Arethusa	1.0	12	8	MD, DC, n. VA
Jan 24	Fri	1:55	TYC01622751	11.3	Tyche	1.5	6	7	Maine
Feb 1	Sat	7:15	SA0 59230	6.7	Paracelsus	9.8	4	2	Ariz., Nev.

### Grazing Occultations

DATE	Day	EST	Star	Mag	% alt	CA	Location
Jan 9	Thu	17:45	X32727	10.3	44+	51 17S	Barnesville, Hyattstown, Mt. Airy & Winfield, MD
Jan 24	Fri	6:18	SA0 139340	8.4	61-	43 15S	Goddard O. R. F., Bowie, Walkervielle, Mt. Airy, & Ashton, MD
Jan 28	Tue	6:35	SA0 185120	8.3	18-	19 17S	Ashland & Hampton, VA; Sun-9

### Total Lunar Occultations

DATE	Day	EST	Ph Star	Mag	% alt	CA	Sp.	Notes
Jan 5	Sun	19:25	D ZC 3202	6.2	11+	5 63N	F0	Azimuth 241 deg.
Jan 6	Mon	18:20	D SA0 165221	7.8	18+	25 89N	G0	
Jan 6	Mon	18:36	D SA0 165227	8.1	18+	23 65S	K0	
Jan 7	Tue	20:04	D ZC 3458	6.2	26+	20 88S	K0	
Jan 8	Wed	20:39	D ZC 0025	7.4	36+	25 74N	G6	
Jan 11	Sat	19:10	D ZC 0350	7.6	63+	62 47S	G5	See graze list
Jan 11	Sat	20:32	D SA0 092929	7.9	64+	57 76N	K5	
Jan 12	Sun	21:50	D SA0 093331	7.5	73+	55 36N	K5	
Jan 15	Wed	21:05	D ZC 0880	6.8	94+	69 55S	K2	
Jan 16	Thu	23:18	D SA0 078778	6.8	98+	76 84S	K0	Close double
Jan 17	Fri	0:44	D ZC 1049	6.8	98+	67 47N	A2	terminator 18" away
Jan 17	Fri	2:34	D 37 Gem	5.7	98+	47 87N	G0	ZC 1055
Jan 21	Tue	4:04	R ZC 1569	6.9	89-	59 88N	A2	
Jan 22	Wed	23:56	R ZC 1783	7.3	73-	19 38N	A0	
Jan 24	Fri	6:18	G SA0 139340	8.4	61-	43 15S	K0	See graze list
Jan 25	Sat	6:06	R ZC 2052	7.8	49-	39 50S	K2	
Jan 26	Sun	2:10	R nu Librae	5.2	39-	4 88S	K5	ZC 2159; az. 284 deg.
Jan 26	Sun	2:10	R 22 Librae	6.4	39-	4 37S	A1	ZC 2160; nu Lib+5sec.
Jan 28	Tue	6:49	R SA0 185120	8.3	17-	20 36S	F3	Sun -6; see grazes

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. 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 <http://www.lunar-occultations.com/iota>. Sp. is spectral type-color, O, B, blue; A, F, white; G, yellow; K, orange; M, N, S, C red

Phone the IOTA occultation line, 301-474-4945, for updates (but there have been problems with it recently), or check the local IOTA Web site at <http://iota.jhuapl.edu>  
David Dunham, e-mail [dunham@erols.com](mailto:dunham@erols.com), phone 301-474-4722

# Getting to the NCA Monthly Meeting

## Saturday, January 4

**3:00 P.M. - NCA Meeting** in the Bethesda-Chevy Chase Regional Services Center of Montgomery County, 4805 Edgemoor Lane (2nd Floor), Bethesda, MD.

Dr. Nancy Grace Roman will give the featured talk, “The Untranquil Universe”

**Following the meeting, dinner** with the speaker and NCA members at the

Bangkok Garden Restaurant  
4906 Saint Elmo Ave,  
Bethesda, MD 20814  
(301) 951-0670

## Directions to the Meeting Place

**in the Bethesda-Chevy Chase Regional Services Center of Montgomery County, 4805 Edgemoor Lane, (Second Floor), Bethesda, MD.**

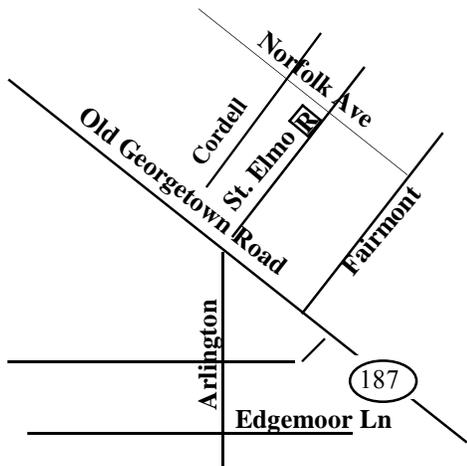
### From North of Bethesda

1. Take Rockville Pike/MD-355 South.
2. Rockville Pike/MD-355 S becomes MD-355/Wisconsin Ave.
3. Shortly after Cheltenham Dr. (and one block before reaching Rt. 410), turn right onto Commerce Lane.
4. Commerce Lane becomes Edgemoor Lane.
5. After crossing Old Georgetown Rd., 4805 is the second entrance on the right. (See **M** on map.)
6. To get to public parking, continue on Edgemoor Lane, which will make a sharp right turn. The parking garage is then on your right. See note below.

### From South of Bethesda

1. Take MD-355/Wisconsin Ave. North.
2. Turn slight left onto MD-187/Old Georgetown Rd.
3. Turn next left onto Edgemoor Ln. 4805 is the second entrance on the right. (See **M** on map.)
4. To get to public parking, continue on Edgemoor Lane, which will make a sharp right turn. The parking garage is then on your right.

Note: there are two parking lots. The one on Woodmont is for the apartments and may have a fee. The one on Edgemoor is marked “Public” and does not charge on weekends.



## Directions to the Restaurant

1. Following the meeting, turn right out of the parking garage.
2. Continue on Edgemoor Lane and cross Woodmont Ave.
3. Turn right onto Arlington Blvd.
4. Move into the right lane as you approach the traffic light at MD-187/Old Georgetown Rd.
5. At the green light, go straight and you will be on St. Elmo Ave.
6. The Bangkok Garden Restaurant (#4906) has a purple awning and will be on your right, just before the corner at Norfolk Ave. Have change available for meters (still in operation at that time) or use the public parking garage near the restaurant.

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Observing - Robert N. Bolster; Telescope Making - Guy Brandenburg; Travel Director - Sue Bassett; *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. 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. Most of these NCA members are also members of the International Occultation Timing Association (IOTA).

**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 semiannual 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). Some NCA members are also individual members of IDA.

**Classes:** Some NCA members are available for educational programs for schools and other organizations. The instruction settings include star parties, classroom instruction, and schoolteacher 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. Contact: Sue Bassett wb3enm@amsat.org

**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 the NATIONAL CAPITAL ASTRONOMERS**

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Name(s): \_\_\_\_\_

Address: \_\_\_\_\_

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\_\_\_ \$57 With *Star Dust* and a discount subscription to *Sky & Telescope*.

\_\_\_ \$27 With *Star Dust* ONLY.

\_\_\_ \$45 Junior membership with *Star Dust* and a discount subscription to *Sky & Telescope*.

\_\_\_ \$15 Junior membership with *Star Dust* ONLY.

\_\_\_ \$100 Contributing member (with *Sky & Telescope*) (\$43 tax-deductible).

\_\_\_ \$150 Sustaining member (with *Sky & Telescope*) (\$93 tax-deductible).

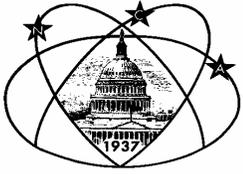
Junior members only: Date of Birth: \_\_\_\_\_ Only members under the age of 18 may join as juniors.

Tax deductible contribution: \_\_\_\_\_ Thank You.

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Please send this form, with your check payable to National Capital Astronomers, Inc., to:

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