Star Dust

National Capital Astronomers, Inc.

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Steve Robinson: Gamma Ray Bursts

submitted by Gary Joaquin

Steve Robinson has been an amateur astronomer for the past 12 years and is the proud owner of a variety of telescopes, the latest of which is his dream scope, a split ring equatorial 18-inch Newtonian, the NGT-18. He is a member of the local NOVAC, the Webb Society, and the American Association Variable Star Observers (AAVSO). It was the AAVSO that provided Steve with the opportunity to attend the High Energy Astrophysics Workshop in Huntsville, Alabama at Marshall Space Flight Center. It is as a direct result of his attendance at this workshop that brings him to NCA in September.

Steve will address NCA using materials provided by the scientists at Marshall for expressly this purpose. The topic of his presentation will be Gamma Ray Bursts, and what amateurs can do to support the search for transients.

In real life, Steve is a lecturer in the field of Object Oriented Software Requirements, Analysis, and Design. Steve travels extensively in this occupation.

To learn more about Mr. Robinson and his work see his web site at http://www.highenergyastro.homestead.com/ .

David Dunham on Space Rocks

by Elliott Fein

Dr. David Dunham presented the featured talk at the June 3, 2000 meeting of National Capital Astronomers. His talk was entitled "Space Rocks: Observed Hitting the Moon, Covering Stars, & by NEAR".

Dr. David Dunham received his Ph.D. in astronomy from Yale University. He is a long time president of IOTA (International Occultation Timing Association), a frequent contributor to Sky & Telescope, and a member of NCA. At his job at the Johns Hopkins University's Applied Physics Laboratory in Laurel, MD, Dr. Dunham calculates spacecraft orbits and maneuvers, primarily for the Near Earth Asteroid Rendezvous mission.

He covered three major topics: observation of Leonid meteor impacts on the Moon, Lunar Occultations, and the NASA NEAR (Near Earth Asteroid Rendezvous) Mission.

The Leonid Meteor Impacts on the Moon

An IOTA press release summarized nicely the information we received from David Dunham regarding the lunar impacts. Some of that information is:

North American astronomers recorded at least six Leonid meteors striking the Moon's surface late Wednesday night, November 17/18, 1999. It was part of a meteor storm that had swept over Europe, Africa, and the Middle East a few hours earlier. Each of these meteors produced a flash of light that was seen with a video camera or the eye by at least two independent observers, marking the first confirmed observations of lunar meteor impacts. The observations were orchestrated by Dr. David Dunham. When Dunham read a NASA Web site suggesting that meteors might be seen hitting the Moon during the Leonid meteor shower predicted to occur on November 17/18, he used the Internet to encourage IOTA observers to use their

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The President's Corner

Greetings fellow NCA members! We are poised for another year of exciting excursions into various parts of the astronomical universe. National Capital Astronomers has always provided a forum for excellent lectures from speakers at the forefront of their respective astronomical disciplines. Indeed, we have been most fortunate to be able to do so. It is because of our location, with NASA, the Smithsonian, Carnegie Institute of Washington, the Hubble Space Science Institute, major universities and others in our own backyard, that NCA has been able to offer these lectures, which have become the hallmark of NCA.

However, in recent years, there are members who remember fondly the other activities that NCA used to do and does no more. Among these was an active AAVSO program, many more NCA sponsored observing outings, and, from time to time, special event-oriented observing projects, such as the Mars Project, organized for the 1998 apparition of Mars and coordinated with ALPO.

Many have made suggestions as to additional NCA activities. I will be reporting on these in subsequent communications to you. I would like to add your ideas. What do you think NCA should be doing that it is not doing, or what efforts should be increased? Contact me or another officer and let us know.

Nancy Byrd

NCA Events This Month

The Public is Welcome!

NCA Home Page: http://capitalastronomers.org

Fridays, September 1, 8, 15, 22, and 29, from 7:00 - 10:00 P.M. Telescope-making and mirror-grinding classes at American University, McKinley Hall, Basement (room 9), Nebraska and Massachusetts Avenues, N.W. However, on September 1, 22, and 29, if the weather is clear, class may be canceled so that the instructor can go out star-gazing himself, instead, because the Moon will be near new or 3rd quarter. Call or email Guy Brandenburg to confirm: 202-635-1860 or gfbranden@earthlink.net.

Friday, September 8, 22, 29, 8:30 P.M. - Open nights with NCA's 14-inch telescope at Ridgeview Observatory near Alexandria, Virginia; 6007 Ridge View Drive (off Franconia Road between Telegraph Road and Rose Hill Drive). Call Bob Bolster, (703) 960-9126 before 6:00 p.m.

Saturdays, September 30 and October 21, beginning 6:00 P.M. - Open House at Hopewell Observatory. NCA members, families, and guests, only, are invited to enjoy the autumn sky at Hopewell Observatory. View the Milky Way and numerous deep-sky objects as well as the planets Uranus, Neptune, Saturn, and Jupiter (midnight in Sept., 10 p. m. in Oct.). On Sept. 30 sunset will be at 6:54 p.m., astronomical twilight ends at 8:23, and the Moon sets at 8:50. On Oct. 21, sunset is at 6:23, astronomical twilight ends at 7:52, and the Moon rises at 2:06 a.m.

See more information and directions on Page 5.

Saturday, September 9, 5:30 P.M. - Dinner with the speaker and NCA members at the North China Restaurant, 7814 Old Georgetown Road, Bethesda MD. See the map and directions on Page 8.

September 9, 7:30 P.M. - NCA meeting, at Lipsett Auditorium in Building 10 at NIH, will feature Steve Robinson speaking about Gamma Ray Bursts.

See Page 6 for more National Capital area astronomical doings. To join NCA, use the membership application on Page 9.

Meteor Showers

September Radiants

Full Moon: September 13

Major Activity – None

Minor Activity		
Radiant	**Duration**	**Maximum**
Gamma Aquarids	September 1-14	September 7/8
Alpha Triangulids	September 5?-15?	September 11/12
Alpha Aurigids (AUR)	August 25-September 6	September 1/2
Eta Draconids	August 28-September 23	September 12/13
Gamma Piscids	August 26-October 22	September 23/24
Southern Piscids (SPI)	August 12-October 7	September 11-20

Daylight Activity — None

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

David Dunham

(Continued from page 1)

equipment to monitor the dark side of the Moon that night.

Brian Cudnik, a research technician at Prairie View Agricultural and Mechanical University at Prairie View and at Rice University in Houston, Texas, watched visually with a 14-inch telescope. At about 22:46:20 CST, he saw a very brief orange flash near the center of the Moon's dark side and estimated that it was about 3rd magnitude. Cudnik sent a message to Dunham reporting the observation and asking for confirmation. Dunham then looked at his own video record obtained that night with a 5-inch telescope set up at fellow observer George Varros' home in dark rural country near Mount Airy, Maryland, about 40 miles northwest of Washington, D.C. He was amazed to see the flash, as Cudnik described it, in his black-and-white recording, and was able to refine the time to 4:46:15.2 GMT. When word of this confirmed sighting spread, Steven Hendrix reported that he also saw a flash on the dark side of the Moon at about that time using a 4-inch telescope at Cameron, Missouri, but he did not time it.

Then Pedro Valdes Sada, Universidad de Monterrey, Monterrey, Mexico, and David Palmer, Goddard Space Flight Center, Greenbelt, Maryland, examined their video tapes, made with black-and-white cameras attached to 8-inch and 5-inch telescopes, respectively. Neither was pointed at the right part of the Moon at 4:46:15.2 GMT to confirm Cudnik's flash, but each of them found two more flashes and reported their approximate times and descriptions to Dunham. Dunham found each of these four new flashes in his recording. Sada also found the brightest of Palmer's flashes on his videotape, as did Rick Frankenberger in San Antonio, Texas, providing a quadruple confirmation of that event. All of the impacts were just north of the lunar equator in the western part of Oceanus Procellarum or in highlands southwest of Oceanus Procellarum. Each of the impacts was bright on only one video image, and was seen at a considerably fainter level on the next image 1/60th second later.

The Leonids and other dense meteor streams are of interest to NASA and other space agencies since they pose some threat to space navigation. Dunham and other astronomers plan to examine their tapes, and those made by a few other observers,

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NCA Contributors

Nancy Grace Roman

NCA thanks those who have made financial contributions to NCA during the past year. The contributors were:

Contributions:
James K. Crowley
Nancy Byrd
Nancy Grace Roman
Andrew W. Seacord, II
Sam Somers
Chris Walker

Contributing members:
William P. and Roberta Pala
Irving Price
Howard Schwartz

Contributing member who added an additional contribution:
Robert N. Bolster

Sustaining members who added an additional contribution:
Bill Chandler and Holly Gwin

Attention All NCA Junior Members

Now that you are back at school, you may be starting to think about your Science Fair project for this year. If you are considering a project in astronomy or related sciences, you should know about NCA's mentor program for Juniors. Any NCA Junior member desiring help with an astronomy project may call me for referral to an NCA adult member who has expertise in the Junior's particular interests. If you call me (at 301-564-6061), I shall be happy to try to find a mentor whom you may contact when you need assistance. Don't be timid about calling. We are eager to help you. All Juniors, including youngsters in homes with NCA family memberships, qualify for this help. Please call me for more details.

Leith Holloway
Director of NCA Junior Division
Telephone: (301) 564-6061

Exploring the Sky

Exploring the Sky, a joint presentation of the National Park Service and the National Capital Astronomers, continues Rock Creek Park near the Nature Center, in the fields just south of the intersection of Military and Glover Roads N.W.

The remaining sessions for this year are
9/23 – 8:00 P.M.
10/28 – 7:30 P.M.
11/18 – 7:00 P.M.

Times are EDT except EST in November. NCA members are urged to bring their telescopes to these sessions. Members without telescopes are also needed to answer questions from the public.

For additional information, call the Rock Creek Nature Center at (202) 426-6829 or NCA's Joe Morris at joemorris@erols.com
You may also check the Internet sites:
http://www.nps.gov/rocr/planetarium
http://www.capitalastronomers.org

Observing Earth Satellites

Walter Nissen

I offer to help NCA members obtain information about and predictions for Earth satellites. In the past I have offered to run predictions for members at your request. Changing technology impels me to write this brief guide to how I can be helpful. Here are some resources now freely available to everyone.

Almost everything you want to know about observing Earth satellites can be found just below the Visual Satellite Observer's Home Page (VSOHP), http://www2.satellite.eu.org/sat/vsohp/satintro.html. There is a Frequently Asked Questions (FAQ) file.
The latest information and discussion about observing Earth satellites can be found on the SeeSat-L mailing list; see the VSOHP or send Subject: info to seesat-l-request@lists.satellite.eu.org.

General information about satellites can be found in the Satellite Situation Report at http://oig1.gsfc.nasa.gov/scripts/foxweb.exe/app01?. While upgrades are in progress there, try substituting "oig3" for "oig1" and/or "dll" for "exe". Log in there for full service. Also, Encyclopedia Astronautica at http://www.friends-partners.org/~mwade/spaceflt.htm.

Routine predictions of satellite overflights, including the spectacular Iridial glints, can be obtained from http://www.heavens-above.com/.

You can obtain accurate coordinates for most locations by using map clicking at http://www.mapsonus.com.

A convenient source for updated elsets is ftp://ftp.fc.net/pub/users/mikem/mccants.zip. In that file you will find much useful information. In that directory you will find top-quality data files and tracking programs, such as QuickSat and HighFly.

So, with all of that now available directly to everyone who can visit a neighborhood library or organizational help desk, how can I be helpful to our members?

If the above seems intimidating or inaccessible, I can answer newbie questions and help you start up. If you have used the routine facilities and still have questions, I can try to analyze the problems and suggest possible solutions or use special tools. I may know about or refer you to people with special expertise, including some other NCA members. When geometry and meteorology combine to produce Eye-Poppers (TM) over the National Capital area, I will continue to offer e-mail alerts to those requesting them from me at wnissen@tfn.net.

The Opposite
Turning around 180 degrees and looking down, you may find aerial photography of your neighborhood at http://terraserver.microsoft.com.

Student Science Fair Winner Honored

Seven of the eight winners in the NCA 2000 Science Fair Judging gave presentations at our May. The remaining winner, Adam Siegel, a student at Walt Whitman High School, who had entered his project at the 44th Annual Montgomery Area Science Fair, gave a brief presentation on his project, "*Mathematical Moon"*, at our meeting on June 3.
In his presentation, Adam reported that he had found an elliptical saw-tooth image of the Moon in images from the GEOS 8 satellite. NCA President Dr. Andrew W. Seacord presented Adam with a certificate recognizing his achievment. NCA also gave Adam one-year membership in our organization, which included a one-year subscription to *Sky and Telescope.*

Deadline for October *Star Dust*: September 15

♦

Please send submissions to Elliott Fein at elliott.fein@erols.com.

Text must be in ASCII, MSWord, or WordPerfect. Graphics in BMP is best. Thanks.

David Dunham, continued

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more thoroughly. Several more impacts, mostly fainter ones, will probably be confirmed.

Occultations

Nancy Byrd informed us that Dr. Dunham's talk was in response to her request that he share with us not only the where and when of occultations, but also his vision of why observing occultations is important and interesting. This is explained in the sections below on asteroid occultations and lunar occultations. Asteroid occultations occur when the Moon moves in between us and our view of an asteroid. Lunar occulations occur when the Moon moves in between us and our view of a star.

Asteroid Occultations

Dr. Dunham showed slides to illustrate that information obtained from an occultation (observers' latitude and longitude and time of disappearance and reappearance) is used to draw lines ("chords") on a chart to define the shape of the asteroid. Observers at specific locations and specific times not seeing any occultation during the expected time period also help by constraining the shape of the asteroid.

He presented several interesting examples of the value of occultation observations. One was with regard to Herculena. In this case, in addition to the principal occultation, a secondary occultation was observed visually and recorded. This revealed the presence of a satellite. This report was considered controversial until the later discovery and photograph of the satellite (Dactyl) of the asteroid Ida by the Galileo spacecraft

In 1991, occultation observations of Kleopatra showed that the object had a rather extreme shape, four times as long as it was wide. This was not entirely unexpected as the light curves (variations in the brightness) of Kleopatra had been observed and indicated that the shape of the asteroid was extreme.

The occultation information sparked interest to observe Kleopatra with the Arecibo antenna. This antenna, which uses radar, got 15-km. resolution on the asteroid, but 25% uncertainty in the scale so they used the occultation results to constrain the size of the asteroid. This was the first Main Belt asteroid object imaged by Arecibo.

Lunar Occultations

There are two types of lunar occultations, "grazing" and "total".

Grazing Lunar Occultations.

Grazing occultations of the Moon occur at the northern and southern limits of the Moon. The path of the star relative to the Moon's disk is a tangent line. The star will disappear and reappear among the mountains and craters along the edge of the Moon, possibly several times. The observer must record the time of the disappearance and then reappearance of the star. Looking for the reappearance seems to be the trickier part. If the reappearance is going to occur on the unlit side of the Moon, it is difficult to know exactly where to look for it. If the appearance is to occur on the lit side of the Moon, it may be difficult to see the reappearance in the glare of the light from the Moon. Dr. Dunham showed one example of a profile from a lunar graze in 1981. For the first time, a video recording was made of multiple events; the observer recorded 14 events!

Clementine had mapped the Moon, with an accuracy of around a kilometer or so. Now with the Hipparcus star positions, we can map the features to well under 100 meters relative to the Moon's center of mass, and individual features to 10 meters or so.

Total Lunar Occultations

Total occultations of the Moon are most useful in improving topography of the lower latitude parts of the Moon. Radar observation by Arecibo provides accuracy of only 50 meters vertically and 150 horizontally.

Knowledge of the Lunar profile is of great use in analyzing solar eclipse observations. There is analysis of the width of the eclipse path which translates into corrections to the Sun's diameter vs. the Moon. The Moon's diameter isn't changing, but there are small variations in the Solar diameter, in the order of 2 or 3 tenths of arc-seconds or a couple of hundredths of a percent change in the solar radius. These changes seem to be cyclic in nature, periodicity with the sun spot cycle and a longer period as well.

Video recording of occultations is being done more often now, because it has become quite simple and inexpensive. If you have a telescope and VCR, there is just the cost of adding a CCD camera.

Send Dr. Dunham your e-mail address if you are interested in participating in their expeditions. [His e-mail address is dunham@erols.com]

In answer to a question from the audience, he said that the main use of total occultations of the Moon was to satisfy the need to improve lunar profile information, the largest uncertainty in the analysis of solar eclipse observations. A lot more observations of solar eclipses are made near the center line where you have to know the low latitude features of the Moon, than are made at the limits. We are less interested in the north and south limits because in a solar eclipse, latitude libration is always the same, Bailey's Beads (mountains and valleys of the Moon) are the same but at the center line, longitude libration can be anything, so the Bailey's Beads are different for every eclipse. So we need better data points on the Moon to better define the solar diameter variations.

In summary, grazing occultations are used to refine the shape of the mountains and valleys of the Moon at the Northern and Southern limits, whereas total occultations refine the shape of the mountains and valleys of the Moon at middle latitudes, and that is of use in refining our information about the Solar diameter.

NEAR

In his talk on the NEAR mission, Dr. Dunham used images captured during the mission and diagrams showing the orbits.

We learned that NEAR was launched on Feb. 17, 1996 with an original rendezvous with Eros planned for January 10, 1999. The car-sized spacecraft was designed with four solar panels, which opened up into one fixed plane after the launch, a high gain antenna in the middle, low-gain antennas on the top and bottom, and a medium-gain antenna off to the side. A multi-spectral imager, an infrared spectrometer, and an x-ray/gamma ray spectrometer are located in the bottom of the satellite looking off to the side. There is also a laser altimeter. These instruments are designed to measure the spectral signatures and determine mineral and elemental composition of the asteroid.

NEAR's first fly-by was of the asteroid Mathilde, in June 1997, at a distance of 1200 km and a velocity of 10 km/sec, with no chance of orbiting. Pictures surprisingly showed very large craters, five with diameters equal to the radius of the asteroid, which is very unusual. This shows that Mathilde cannot be a monolithic rocky object – if it were hit with something that

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NCA TREASURER'S REPORT

Jeffrey Norman

July 1, 1999 to June 30, 2000

INCOME		
Dues	$	8217.50
Gifts		694.00
Interest		196.17
Telescope-making Classes		106.00
Total Income	$	9213.67
EXPENSES		
IDA Dues		$ 100.00
Miscellaneous		8.26
Secretary		345.70
Sky & Telescope Subscriptions		3854.70
Speakers' Dinners		766.93
Star Dust		4088.37
Total Expenses	$	9163.96
Balance - July 1, 1999	$	13091.90
Excess Income over Expenses		49.71
Balance - June 30, 2000	$	13141.61*
Total number of paying members joining or renewing from 7-1-98 to 6-30-99		173**
Total number of paying members joining or renewing from 7-1-99 to 6-30-00		174**
Increase in Membership (.6%)		1

MEMBERSHIP REVIEW

Total Paying Memberships as of 6-30 of Each Fiscal Year

1992 - 223
1993 - 184
1994 - 163
1995 - 201
1996 - 179
1997 - 194
1998 - 169
1999 - 173
2000 - 174

* The Balance includes $5388.06 from the NCA Travel account.

** This does not include life members or science fair winners because they receive free memberships.

NCA BUDGET - FISCAL 2001

Income	
Dues	8200
Gifts	700
Interest	200
Telescope-making Classes	100
Total Income	9200
Expenses	
Int. Dark-Sky Assn. Dues	100
Miscellaneous	50
Secretary	350
Sky & Telescope subscriptions	3900
Speakers Dinners	700
Star Dust	4100
Total Expenses	9200
Surplus	0

Open House at Hopewell

Saturday, September 30 and October 21, beginning 6:00 p.m. If you wish, come any time after 6:00 p.m. and bring your prepared picnic dinner. Coffee, tea, and cocoa will be provided by the Hopewell Corporation.

Directions: (1) From the Beltway (I-495) go west on I-66 25 miles to Exit 40 at Haymarket onto U.S. 15. (2) Turn left on U.S. 15 at the end of the exit ramp. (3) Go 0.3 mile to traffic light, turn right onto Va. 55. (4) Go 0.8 mile to Antioch Road (Rt. 681) and turn right. (5) Go 3.2 miles to the end of Antioch Rd. and turn left onto Waterfall Road (601). (6) Go one mile and bear right onto Bull Run Mountain Rd. (Rt. 629). (7) Go 0.9 mile on 629 to narrow paved road at right with an orange pipe gate (Directly across from an entrance gate with stone facing). (8) Turn right through pipe gates, go 0.3 mile to top of ridge, and around the concrete building and towers. (9) Continue on dirt road through the white gate and woods a few hundred feet to the observatory. Park along the road short of the buildings.

If it is raining or hopelessly cloudy the event will be canceled. For further information call (703) 960-9126. Observatory phone: (703) 754-2317.

David Dunham

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would cause a crater that big, the whole asteroid would have shattered.

After swinging by the Earth twice to boost NEAR into an orbit with EROS, there was a failed attempt on Dec. 20, 1998, "Black Sunday", to put the spacecraft into an orbit around EROS. A firing of the spacecraft's engine exceeded preset acceleration limits and caused the spacecraft to retreat into safe mode. But because of resilient mission design, with generous fuel margins and robust contingency plans, a second chance was provided on January 3, 1999 to put NEAR into its final orbit for rendezvous, by swinging by the Earth for third time.

On February 13, 2000, NEAR flew directly between the Sun and Eros. The near-infrared spectrometer, with its scan mirror, took critical observations of Eros' northern hemisphere under near-

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Other National Capital Area Meetings, etc.

U.S. Naval Observatory (USNO) Monday nights at 8:00 p.m., except on Federal holidays: USNO public nights in Northwest Washington, D.C. (off Massachusetts Avenue). Held regardless of cloud cover. Information: USNO Public Affairs Office, 202/762-1438.

Department of Terrestrial Magnetism (DTM) Carnegie Institute of Washington 5241 Broad Branch Road, N.W. Washington, D.C. Wednesdays at 11:00 a.m. in the Seminar Room of the Main Building. No information available at press time.
Call (202) 686 4370 to confirm.
Source: http://www.ciw.edu/DTM-seminars.html

Goddard Scientific Colloquium — Due to construction in the Building 3 auditorium, the colloquia will be held at 3:30 p.m. on Fridays in the Goddard Space Flight Center Building 8 auditorium. 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.
September 8, Bruce Margon, University of Washington, "The Universe in Ten Terabytes: Scientific Results from the Sloan Digital Sky Survey"
September 15, Steve Ostro, Jet Propulsion Laboratory, "Strange Worlds: Radar Encounters with Earth-Approaching Asteroids"
September 22, Dava Sobel, "Galileo's Daughter"
September 29, Nima Arkani-Hamed, Lawrence Berkeley Laboratory, "How to Make Gravity Join the Other Forces of Nature at a Reasonable Energy: Localizing Gravitons in an Extra Dimension"
Source: http://lheawww.gsfc.nasa.gov/users/djt/colloq/

Montgomery College's Planetarium Fenton St. in Takoma Park, MD.
September 23, at 7:00 P.M. "When the Sky Falls" Source: http://www.mc.cc.md.us/Departments/planet/

Northern Virginia Astronomy Club (NOVAC) meets at 6:00 p.m., the second Sunday of each month, at Lecture Hall 1 on the Fairfax campus of George Mason University. 703 803-3153.
September 10, The Next Generation Space Telescope -
Source: http://novac.com

University of Maryland Observatory on Metzerott Road. Open house on 5 and 20 of each month.
Each open house program consists of a 20 to 30 minute slide presentation in the lecture hall (which is now air conditioned!) followed by telescope viewing (weather permitting) of various astronomical objects.
September 5, 9:00 p.m., Dr. Lucy McFadden, "NEAR Shoemaker in orbit around Eros"
September 20, 9:00 p.m., Dr. Suchitra Balachandran, "Understanding the Chemical Composition of Stars"
Info: (301) 405-3001 Source: http://www.astro.umd.edu/openhouse/

Greenbelt Astronomy Club meets on the last Thursday of each month (except holidays) at 7:30 p.m. at the Howard B. Owens Science Center, 9601 Greenbelt Road, Lanham, MD 20706. (Call the Science Center at 301-918-8750 or (301) 441-4605 to confirm meeting dates). Club meetings are open to the general public.
Source: lheawww.gsfc.nasa.gov/docs/outreach/gac/GAC.html
September 2, Star party at Northway field. Starts at dusk. See Greenbelt Astronomy Club web page (see above) for a map.
September 22-24, Possible weekend trip to Rocky Gap State. Contact Bill Hale at wmchal1@umbs.edu for further information.
Source: Nancy Grace Roman

NASA/GSFC LEP Seminar Laboratory for Extraterrestrial Physics Brown Bag Seminar. The Laboratory for Extraterrestrial Physics (LEP) at NASA's Goddard Space Flight Center conducts weekly science seminars Fridays at noon in Room 8 in Building 2 at Goddard. Since the seminar is conducted during the lunch hour, the audience often brings their lunch.
No information available at press time.
Source: http://lepjas.gsfc.nasa.gov/~seminar/lep_seminar.html

MERAL Convention
September 22-24 , Mid-East Region of the Astronomical League (MERAL) Convention will be held in Charlottesville, VA. For information, see www.cvilleastro.org or
Ed Walendowski (804) 975-2888

David Dunham, continued

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perfect lighting conditions, allowing it to characterize the asteroid's mineral composition. On Feb. 14 it went into orbit around Eros. NEAR will orbit Eros for a year.

Insertion into orbit was at an altitude of 200 km. The orbit was reduced to 100 km and then to 50 km where it is now. It is in an almost polar orbit now, in Eros' sunplane, that is, perpendicular to the direction of the Sun.

(On March 14, 2000, NASA announced that the NEAR spacecraft was renamed "NEAR Shoemaker" in honor of Dr. Eugene Shoemaker.)

Some of the meteorites that we are studying in our laboratories today came from asteroids and some from comets. But we don't know for *sure* where any of them came from. So, one of the purposes of studying asteroids is to determine their mineralogy to tell which meteorites on earth came from which class of asteroids. If we could tell, then study of the meteorite would tell us more about the asteroids.

We have gotten a lot of information about Eros from solar flares, which cause elements on the asteroid to fluoresce in the x-ray spectrum. It's been determined that Eros is similar in composition to the components of the original solar system. It is a primitive body, probably a chip off a larger object. Pictures of the largest crater show
a big boulder in the bottom of the crater. It is possible that it may be a satellite of the asteroid which impacted and rolled down into the bottom of the crater. Eros has the same density as the crust of the Earth. It is not a rubble pile like Mathilde; it's monolithic.

In July, for nine days, NEAR will be in a 35- km. orbit to get better resolution. This is the lowest stable orbit. From August to November it will be in a 50-km. orbit over its southern hemisphere. In December, the orbit will be back to 35 km. in a retrograde orbit about the equator, the most stable orbit. In January, it will be put into a couple of low-altitude passes to hover at 2 to 5 km., and at the end of the mission, on February 14, 2001, it will get down to 100 meters of the surface, which is the focusing limit of the imager. One possibility is that the spacecraft will be bounced off the surface of Eros to better tell what the surface is like. (Accelerometers on board will help with this, as will observation of the footprint of the spacecraft.). Because velocities will be very low, it is expected that the craft won't crash, however it has not been designed to land (it doesn't have feet.)

Mid-Atlantic Occultations and Expeditions, September 2000

by David Dunham

Asteroidal Occultations

The next asteroidal occultation, of a 10.7-mag. star by Interamnia, will occur Monday evening, Oct. 9, and will be listed next month.

Lunar Grazing Occultations

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DATE   Day  EDT     Star    Mag  % alt  CA  Location
Sep 21 Thu  3:44 SAO 078074 7.4 47- 40 13N Cary, NC &
 Norfolk, VA
Sep 22 Fri  6:46 delta Gem  3.5 35- 60  3N n. of Tampa,
 FL; Sun -3 deg.
Sep 25 Mon  5:55 SAO 099052 8.2  8- 17 12N Ashland, VA
Sept. 21:  Probably only local efforts, no expedition
 from DC.
Sept. 22:  Wayne Warren will try this; for details,
 contact him at 301-474-0814 or by e-mail at
 Wayne_H_Warren@Compuserve.com
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Total Lunar Occultations

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DATE   Day  EDT     Star      Mag  %  alt  CA Notes
Sep  7 Thu 21:14 D SAO 187331 7.2 72+ 28  40S Spectral
 type (Sp.) G5
Sep  7 Thu 23:56 D nu1 Sgr    4.9 72+ 15  45S ZC 2747;
 Sp. K1
Sep  8 Fri  0:26 D nu2 Sgr    5.0 72+ 11  57S ZC 2749;
 K1; pos. close dbl.
Sep 19 Tue  3:02 R SAO 093805 7.0 69- 52  72S Sp. B8
Sep 21 Thu  2:01 R SAO 077983 7.1 47- 22  17S Sp. K2
Sep 21 Thu  2:36 R SAO 078006 7.3 47- 29  57N Sp. F0
Sep 22 Fri  2:54 R ZC 1086    6.4 35- 21  45S Sp. G9
Sep 22 Fri  4:07 R SAO 079174 7.3 35- 35  56S Sp. G5
Sep 23 Sat  3:44 R SAO 080019 7.8 24- 19  90S Sp. G5
Sep 23 Sat  4:37 R SAO 080046 8.0 24- 29  82S Sp. K2
Sep 24 Sun  5:50 R 83 Cancri  6.6 15- 30  55N Sp. F5;
 ZC 1383
Sep 25 Mon  5:46 R 37 Leonis  5.4  7- 16  75S Sp. M1;
 Az. 85 deg.; ZC 1504
Oct  2 Mon 20:01 D SAO 184634 7.7 27+ 18  71S Sp. G8
Oct  3 Tue 20:02 D ZC 2535    6.2 36+ 22  89N Sp. G6
Oct  5 Thu 22:25 D SAO 188112 6.8 56+ 17  65N Sp. K3
Oct  6 Fri 22:32 D X047994    7.0 65+ 22  80N
Oct  7 Sat 22:46 D ZC 3084    6.7 74+ 28  56N Sp. K1
```

D following the time denotes a disappearance, while **R** indicates that the event is a reappearance. If the cusp angle (**CA**) is less than 30 deg., the time could be 5 minutes or more different for other locations.

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. Cusp Angle is measured around the Moon's circumference from either the north (**N**) or south (**S**) cusp, or horn; all events are on the dark side. **Sp.** is spectral type, indicating the star's 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 or check IOTA's Web site at http://www.lunar-occultations.com/iota which has asteroidal occultation finder charts and updated path maps.

David Dunham, phone 301-474-4722, e-mail dunham@erols.com

Tours or Not

Sue Bassett

NCA will not be doing any group solar eclipse tours for the next several years. Therefore, we are considering other types of tours.

Some of the suggestions have been for trips within about a day's drive (Space Telescope Institute, Goddard, Green Bank) or longer trips combining dark sky viewing with tours of major observatories

(Arizona, Hawaii, Puerto Rico, Chile). If you are interested in any of these or have other suggestions, contact Sue Bassett either by e-mail (wb3enm@amsat.org) or in person at the meeting.

NAS Exhibition and Lectures

An exhibition, *Tools of Vision*, to open at the National Academy of Sciences on September 26, features large format color photographs of the tools used to see from the furthest reaches of the universe to the sub-atomic level. A preview of *Tools of Vision* can be found at www.deeppoolltov.html.

An opening reception will be held on September 26, at the National Academy of Sciences, from 5:30 to 7:00 p.m. Two lectures, intended for the general public, exploring how these facilities contribute to recent discoveries in science will be held in conjunction with the exhibition: September 26, at 7 p.m. (immediately following the opening reception): Dr. Andrea Ghez, Associate Professor of Physics and Astronomy, Institute of Geophysics and Planetary Physics at the University of California: *Discovering a Black Hole in the Middle of the Milky Way*, and November 7, at 7 p.m. (following a reception in the gallery at 6:00 p.m.): Dr. Leon M. Lederman, Nobel Laureate and Director Emeritus of the Fermi National Accelerator Laboratory, *As Simple As Possible: The Doing and Understanding of Physics.*

All events will be held at the National Academy of Sciences, entrance at 2100 C Street, and are open and free to the public. The exhibition will continue until January 1, 2001. Exhibition hours are Mondays - Fridays 9-5 p.m. For more information, photographs, slides, or digital files, please contact: Janis Tomlinson: 202-334-2439; or jtomlins@nas.edu.

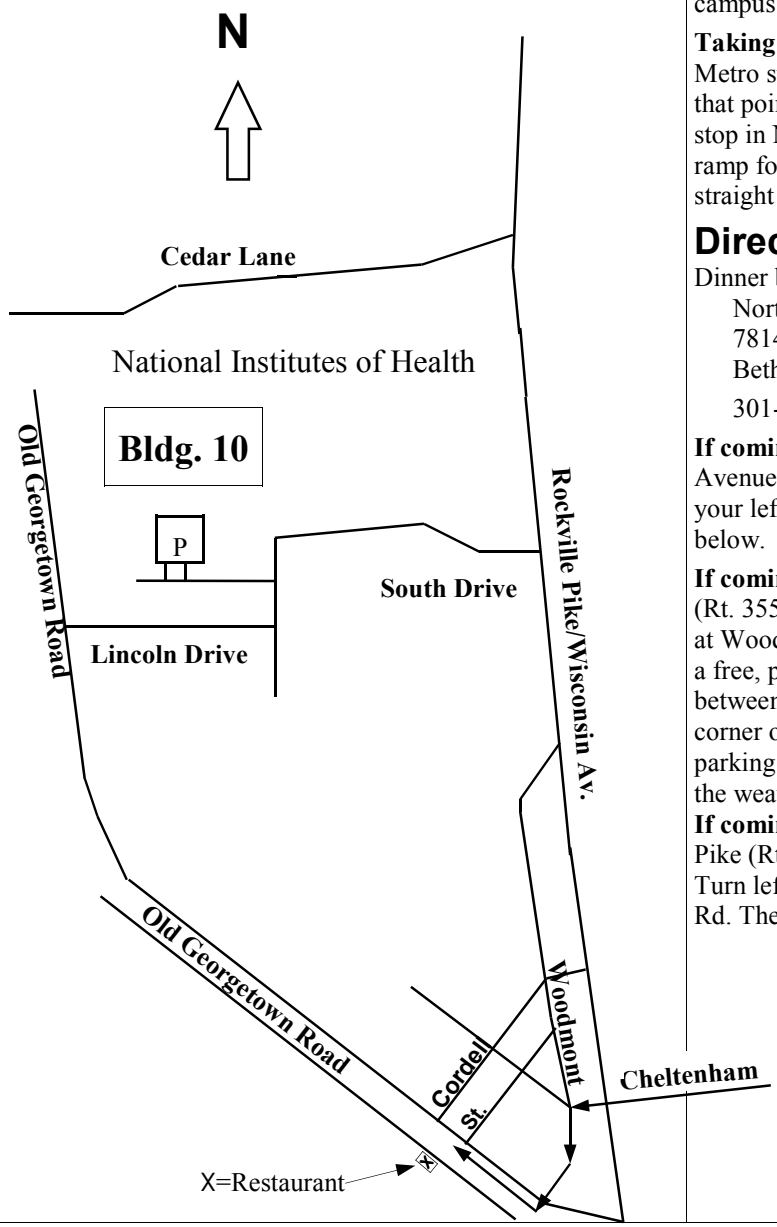
Getting to the NCA Monthly Meeting

Saturday, September 9

5:30 P.M. - Dinner with the speaker and NCA members at the

North China Restaurant
7814 Old Georgetown Road (near Cordell)
Bethesda MD
301-656-7922

7:30 P.M. - NCA Meeting at Lipsett Auditorium in Building 10 at NIH. Guest speaker: Steve Robinson, speaking about Gamma Ray Bursts.



Directions to the Meeting Place

From Rockville Pike (Wisconsin Ave., Rt. 355)
To get to the parking lot at the South entrance (this will be the entrance for the next three years or so until they finish the new wing) from Rockville Pike, enter NIH at the Metro Entrance: South Drive (traffic light). Go straight ahead. At the third stop sign you will be at the parking lot, but you will have to make a left turn then a right to get to the entrance to the lot. Make a right turn into the lot. Building 10 is just north of the parking lot. Enter the building and follow the signs to the Lipsett Auditorium.

From Old Georgetown Rd., enter at Lincoln Drive (traffic light nearest to Suburban Hospital). Go straight ahead. The second stop sign is at a T. Bear left and the lot will be on the right. Make a right turn into the lot.

Metrorail Riders - From Medical Center Metro Station: Walk down the hill, past the bus stops. Continue straight past the anchor. At the second stop sign after the anchor, bear right up the incline into the entrance of Building 10, the tallest building on campus (walking time less than 10 minutes).

Taking the J2 or J3 buses from Silver Spring, get off at the Metro stop and follow the directions given for motorists from that point. If coming from Montgomery Mall, get off at the first stop in NIH, before the Clinical Center. There are signs near the ramp for the garage directing you into the side entrance. Walk straight through the building to the Lipsett amphitheater.

Directions to the Restaurant

Dinner before the meeting will be at 5:30 P.M. at

North China Restaurant
7814 Old Georgetown Road (near Cordell)
Bethesda MD
301-656-7922

If coming from the District, when going north on Wisconsin Avenue, ignore all signs until you pass Old Georgetown Road on your left. Once past Old Georgetown Rd., follow the directions below.

If coming from south of Bethesda, go north on Wisconsin Ave. (Rt. 355), turn left onto Cheltenham Dr. (traffic light). Turn left at Woodmont Ave. Turn right onto Old Georgetown Rd. There is a free, public parking garage very close to Old Georgetown Road between Cordell and St. Elmo. The restaurant is almost on the corner of Cordell and Old Georgetown Road. Best to get to the parking garage by 5:30 because it becomes full soon thereafter if the weather is good.

If coming from north of Bethesda, go south on the Rockville Pike (Rt. 355). Turn right onto Cheltenham Dr. (traffic light). Turn left at Woodmont Ave. Turn right onto Old Georgetown Rd. The restaurant is a few doors from the corner of Cordell.

After dinner,
Go Northwest on Old Georgetown Rd.
Enter NIH at Lincoln Drive (traffic light nearest to Suburban Hospital). Go straight ahead.
The second stop sign is at a T.
Bear left and the lot will be on the right.
Make a right turn into the lot.

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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 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). 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

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___ $45 Junior membership with Star Dust and a discount subscription to Sky & Telescope.
___ $15 Junior membership with Star Dust ONLY
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FIRST CLASS
DATED MATERIAL

Inside this issue

- Steve Robinson to speak on Gamma Ray Bursts
- Review of David Dunham's talk "Space Rocks: Observed Hitting the Moon, Covering Stars, & by NEAR"
- NCA Treasurer's Report