Star Dust

National Capital Astronomers, Inc. http://capitalastronomers.org

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October Speaker: Dr. David DeVorkin- "How Astronomers Reacted to Sputnik."

Dr. David DeVorkin, Senior Curator, Astronomy and the Space Sciences, Division of Space History, National Air and Space Museum will present the talk "How Astronomers Reacted to Sputnik" at the October 13 meeting of the National Capital Astronomers, 7:30 P.M., at the University of Maryland Observatory in College Park.

Abstract
Prior to the launch of Sputnik, very few astronomers expressed any serious interest in sending instruments aboard rockets or satellites to observe celestial objects. A few speculated on what might be done, but only one or two actually discussed any substantive ideas. In the wake of Sputnik, all that changed. In this talk I will describe how astronomers reacted to Sputnik and how they responded to appeals from the military and the National Academy of Sciences to organize for space research. In particular, I will focus on Fred Whipple, who was an exception and indeed had very spe-

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May 2007 Talk by Dr. Mercedes López-Morales: "Small Telescopes Can Do Real Science?"

reviewed by Guy Brandenburg

At the May 2007 NCA meeting at the University of Maryland Observatory in College Park, Dr. Mercedes López-Morales showed us that small telescopes, even ones put together by amateurs, can make real scientific observations.

Three Examples
She gave three examples – the first discovery of a transiting extra-solar planet; the first observation of a gamma-ray burst in visible light; and the first observation of a nearby supernova in nearly 400 years. However, she modestly omitted discussing most of her own work in the body of her talk, much of which has involved precise scientific measurements of masses and sizes of M-class dwarf stars using relatively small telescopes.

Dr. López-Morales told us that she is aware that the public believes that to do real science, you need a very large, professional telescope, like the Keck, Subaru, or Magellan telescopes, with diameters of 393 inches (10 m), 323 inches (8.2 m) and 330 inches (8.4 m), respectively, or with the Hubble or Chandra orbiting space telescopes. Further, most of the public thinks that with relatively small backyard telescopes or home observatories, like many members of the audience have, all you can do is observe galaxies, clusters, and plan-

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September 2007 Talk by Dr. Douglas P. Hamilton: "Tilting the Planets"

reviewed by Victor J. Slabinski

Dr. Douglas P. Hamilton, University of Maryland, College Park, presented a very interesting lecture at the September 2007 NCA meeting at the University of Maryland Observatory in College Park. There were very frequent (polite) interruptions by questions from the audience for two reasons: a) We have all played with rotating objects (tops, Frisbees, thrown footballs) so we all have experiential knowledge of rotation, and b) the speaker gave a very clear lecture, so people felt they should be able to understand every single detail, since they could easily picture the dynamics.

Saturn
Dr. Hamilton started with some Saturn photographs from Earth showing that its ring system (and hence its equatorial plane) is sometimes edge-on to Earth and other times open at a large angle to our viewing direction. This varying aspect has a 15-year period to go from edge-on, to full on, back to edge-on; the period is half Saturn's orbit period around the Sun. Saturn's orbit is close to the ecliptic (the plane of Earth's solar orbit) and measurements show that Saturn's spin axis is tilted 27 degrees to its orbit.

Spin-Axis Tilts
The speaker then reviewed the spin-axis

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Calendar of Events

The Public is Welcome!

NCA Home Page: http://capitalastronomers.org

NCA Mirror- and Telescope-making Classes: Fridays, October 5, 12, 19, and 26, 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 gfbrandenburg @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 8 P.M. (Nov.-Apr.) or 9 P.M. (May-Oct.). The talks are non-technical. There is telescope viewing afterward if the sky is clear.

Dinner with NCA members and speaker: Saturday, October 13 at 5:30 P.M., preceding the meeting, at the Garden Restaurant in the University of Maryland University College Inn and Conference Center. See map and directions on Page 8.

Upcoming NCA Meetings—Saturdays

October 13, Dr. David DeVorkin, Senior Curator, Astronomy and the Space Sciences, Division of Space History, National Air and Space Museum will present the talk "How Astronomers Reacted to Sputnik"

November 10, Dr. Joan Centrella, Chief, Gravitational Astrophysics Laboratory, NASA/ Goddard Goddard Space Flight Center. Tentative title of talk is "Binary Black Holes and Gravitational Waves

December 8, tbd

January 12, 2008, speaker is James Zimbleman, from the National Air and Space Museum, who will speak about "Mars' Geology"

February 9, 2008, tbd

March 8, 2008, tbd

April 12, 2008, tbd

May 10, 2008, tbd

June 14, 2008, speaker is Dr. Harold Williams from Montgomery College

***The deadline for the November Star Dust** is October 24. Please send your material to Elliott Fein **by that date** to ensure inclusion.*

Send submissions to
Elliott Fein at
elliott.fein @verizon.net.

Articles submitted may be edited to fit the space available.
If a reviewer wants to have the speaker review the review then any corrections therefrom must be completed when the review is sent to me by the deadline. I need to have a final version by the stated deadline. Also, if a reviewer sends me a review before the deadline (which is great!) and says that it "final" then I will not accept changes to it after I receive it.

Come See the Stars!

Exploring the Sky

by Joe Morris

2007 Schedule

Date	Time	Things of interest
10/20	7:30 P.M.	Orionid meteors; Moon past first quarter
11/3	7:00 P.M.	Pleiades; Andromeda near zenith

Exploring the Sky is an informal program that for over fifty years has offered monthly opportunities for anyone in the Washington area to see the stars and planets through telescopes from a location within the District of Columbia.

Sessions are held in Rock Creek Park once each month on a Saturday night from April through November, starting shortly after sunset. We meet in the field just south of the intersection of Military and Glover Roads NW, near the Nature Center. A parking lot is located next to the field.

Beginners (including children) and experienced stargazers are all welcome — and it's free!

Questions? Call the Nature Center at (202) 895-6070 or check the Internet sites:

www.nps.gov/rocr/planyourvisit/expsky.htm or
www.capitalastronomers.org

A presentation of the National Park Service and National Capital Astronomers.

NCA History Wanted

I am a recent NCA member who is interested in conducting interviews to gather information for brief essays on our history. If you would like to participate in an oral interview, please contact Michael Chesnes at m.chesnes@verizon.net or (301) 317-0937.

Please Get *Star Dust* Only Electronically

National Capital Astronomer members able to receive *Star Dust,* the newsletter of the NCA via e-mail as a PDF file attachment, instead of hardcopy via U.S. Mail, can save NCA a considerable amount of money on the printing and postage in the production of Star Dust (the NCA's single largest expense) and also save some trees. If you can switch from paper to PDF please contact Michael L. Brabanski, the NCA Secretary-Treasurer, at mlbrabanski@verizon.net or 301-649-4328 (home). Thank you.

Dr. DeVorkin - "How Astronomers Reacted to Sputnik"

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cific ideas about how the nation should build a space program, a vision distinct from what finally emerged in the creation of NASA.

Biography

David Hyam DeVorkin has been Curator, History of Astronomy and the Space Sciences at the National Air and Space Museum, Smithsonian Institution since January 1981. From 1987 through 1991 he held the concurrent position of chair of the Advisory Committee to the Smithsonian Videohistory Program, and spent the summer and fall of 1991 as a visiting member at the Institute for Advanced Study in Princeton.

We Should Get *Star Dust* Electronically

Jeffrey Norman

For the last few years, we have had both paper and electronic versions of *Star Dust*. About three-quarters of our members get the electronic version, but many in that group also get the paper version. In order to get the electronic version, you need Adobe Acrobat Reader software, which is absolutely FREE. Only a very small number of our members do not have e-mail and depend on getting the paper copies. I think that most members read the paper copy once and then throw it away, and that is wasteful.

I propose that all NCA members who have e-mail agree to get *Star Dust* electronically only (no paper copy).

According to our Fiscal 2008 Budget, 56% of our expenses will be for the postage and printing of the paper copies of *Star Dust*. If we could eliminate the postage and printing costs of paper copies for all those members who can get the electronic copy, we could save about $2000 a year. We would still need to print a few copies for those members who don't have e-mail plus a few complimentary copies to give out at meetings and to send to a few institutions like the U.S. Naval Observatory.

The current $10 dues for regular (non-student) members do not pay for all of our expenses, but fortunately, we had a surplus of about $12,000 accumulated over many years. We are now running a deficit and, if nothing changes, we will have to raise the dues again in a few years after our surplus is gone. The Board of Directors lowered the dues from $27 to $10 about a year ago because we felt that we had too much money in our bank account, and this was one way of returning some of it to our members.

I think that we should keep our dues at $10 for the indefinite future and not run our surplus down to zero. We can do that if all the members who can, would agree to accept the electronic copy only. I am already a subscriber to four electronic newsletters, and all of them are absolutely free because there are no printing or postage costs. But if I need a paper copy of all or part of one of those newsletters, I can always print it on my own printer. You and I can do the same thing with respect to an electronic *Star Dust*. Please let me and the other officers know if you have any objections to my proposal.

Jeff Norman, Assistant Treasurer and Trustee of NCA

Review of Talk by Dr. Douglas P. Hamilton

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tilts to their orbit plane for the nine Solar System planets for the purpose of discovering what the present tilts can tell us about planetary formation. There is a great range of tilt: six are less than 90 degrees; three are greater than 90 degrees (retrograde rotation). The tilts do not seem to be random; four lie between 20 and 36 degrees. If planets formed by condensation from the primordial Solar System nebula, we would expect spin-axis tilts near zero (spin axes perpendicular to orbits). What caused them to be different? Our speaker offered the following explanations:

Mercury and Venus

Mercury and Venus experience large Solar tidal torques because these two planets are so close to the Sun. The resulting spin-down to their present very long spin periods (measured in months) indicates that their spin orientation also is non-primordial, i.e., has changed greatly since the Solar System's formation. (\Our speaker noted that conditions on Venus are such that its cloudy atmosphere rotates relative to the Sun with a 4-day period, much faster than rotation of the solid planet.

Pluto and Earth

The large spin-axis tilt**s** for Pluto and Earth are believed to result from moon-forming impacts of sizeable bodies on these two planets.

Mars

Celestial mechanics calculations for Mars show that Solar tidal torque, coupled with perturbations to its orbit plane, cause Mars' spin-axis tilt to oscillate between 0 and 60 degrees over geological time. By contrast, tidal torques cause Earth's spin axis to trace out a large precession cone in inertial space with a 26,000 year period, so that different stars acted as "North Star" in different historical eras. But because of the large mass of the Moon relative to Earth, and because the Moon orbits close to Earth's orbit plane, Earth's spin-axis tilt angle stays nearly constant.

Uranus and Neptune

Uranus and Neptune are "ice giants," i.e., have large solid cores. Their large spin-axis tilts are believed to result from giant impacts of the several smaller bodies that collided to form these two planets.

Jupiter and Saturn

That leaves Jupiter and Saturn, two planets that are "gas giants"; 90 to 95 percent of their mass accreted as gas from the Solar Nebula. This leads to the expectation that their spin axes should be perpendicular to their orbit planes. Indeed, Jupiter has a spin-axis tilt of only 3 degrees. But Saturn has a spin-axis tilt of 26.7 degrees**!** Why is this? Are our ideas about gas accretion for Saturn's formation wrong, or did something happen to Saturn?

Saturn Is Special

To answer this question, the speaker reviewed the sources of gravitational tidal torque on Saturn which might change its tilt. The gravitational torque from the Sun might not appear important because of the Sun's great distance, but that overlooks the role of Saturn's larger inner satellites. The solar tidal force perturbs the satellite orbits out of Saturn's equatorial plane, and the satellites then supply an important tidal torque on Saturn. For this reason the inner satellites can be considered as part of Saturn's equatorial bulge, in that they magnify the effect of the solar tidal torque.

However, the tidal torque on Saturn's rings is not important for changing Saturn's tilt because the total mass of particles in the rings is relatively small. If a giant snow blower were used to gather the ring particles into a snow ball, the snow ball's radius would be only 200 kilometers. (Applying the snow blower to Jupiter's rings would give a dust ball only 50 meters in radius!)

"Which planet (other than Earth) has the most accurately known precession rate?", asked the speaker. The answer is Saturn: its spin-axis precession rate has been measured to an accuracy of 20 percent. This was determined by timing the moment when the rings are exactly edge-on to Earth, an observation that has an accuracy of 15

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How Should We Celebrate NCA's 70th Anniversary?

From: Jack Gaffey

It has been suggested that NCA have a party, perhaps at the December meeting, to celebrate the 70th anniversary of its founding.

I wanted to get information about how NCA celebrated its 50th anniversary. I knew that the USNO has bound copies of *Star Dust* back to 1943, so I asked Victor Slabinski who works at USNO to look for it in the 1987 issues of *Star Dust*. I wasn't sure of the month. Victor struck gold. He found information about NCA's first 50 years, but nothing about a celebration. See reprint on right.

Does anyone remember how the 60th, 50th, and 40th anniversaries were celebrated? What kind of party would the NCA members like to have? Let's discuss this briefly at the next meeting.

Page 2 of the November 1987 *Star Dust*

NATIONAL CAPITAL ASTRONOMERS BEGINS SECOND HALF CENTURY

Fifty years ago, on Friday, August 27, 1937, Mr. U. Sherman Lyons, an astronomer at the United States Naval Observatory and presently at 93 a life member of NCA, gathered a group at the Observatory to establish the organization that later evolved into National Capital Astronomers, Incorporated. At the seond organizational meeting, on September 3, 1937, the group met at the National Museum of National History to elect its first president. Stephen Nagy

The same year, 50 years ago, Grote Reber, widely hailed as the "Grandfather of Radio Astronomy," built his steerable 31-foot dish, the first radiotelescope, in Wheaton, Illinois, to study the cosmic radio noise discovered by Karl Jansky. For the succeeding decade, Reber, alone in the field, plotted the radio sky at dekameter wavelengths, and proved that the emissions were non-thermal.

Reber and his dish were later moved to Washington where he joined the staff of the National Bureau of Standards to study solar radio noise, and, on January 3, 1948, became a member of National Capital Astronomers. On May 1 the same year, Reber was elected Vice President of NCA; Bob Wright was elected President at the same time.

Early activities of the new organization included monthly talks, visits to observatories and other institutions, and a telescope-making class, still active under the dedicated instructor, Jerry Schnull. Previous instructors were Stephen Nagy, Robert McClellan, Irene Warthen, and Hoy Walls.

On August 15, 1938, the group purchased the Alvan Clark 5-inch refracting telescope for $225.00, which is still housed at the U.S. Naval Observatory. During the World War II years, when admission to the Observatory was closed, the telescope was stored in the basement of the Washington Cathedral. Following the war, the telescope was reinstalled in building 25 at the Observatory, where it remains available for members' use.

The organization became a charter affiliate of the Astronomical League upon the League's founding on August 19-20, 1939.

Mabel Sterns, a charter member, and now a life member, originated *Star Dust* in 1943, and served as its editor for many subsequent years.

In those times, when night still came to Washington, Member David Rotbart, in June, 1946, using binoculars, discovered a comet from atop his house on River Road in the District of Columbia! Independently discovered by a European observer, it was named Comet Pajdunakov-Rotbart.

The Junior Division was formed in 1946 and populated by a bright and enthusiastic group of youngsters. Some won the Science Talent Search.

On September 7, 1946, the meetings were moved to the U.S. Department of Commerce Auditorium, where the monthly lectures were held through June 1987. They were then returned to the Smithsonian, this time to the Einstein Planetarium of the National Air and Space Museum - the most popular museum in the world.

In 1948 NCA member Charles Little was discovering daytime meteor showers with the meteor radar he built, until, alas, the broadband radio interference his pioneering work caused prompted the Federal Communications Commission to terminate his activities.

In preparation for the planned International Geophysical Year (IGY), NCA organized a number of programs. Bob Wright was appointed chairman of a committee to develop a visual satellite-tracking system, dubbed "Operation Moonwatch," for the Vanguard satellite, to be launched in 1957 as a part of the United States' participation in the 40-nation effort. Unfortunately, the first Vanguard failed; the Soviets launched the first artificial satellite on October 4, 1957, before the next United States Satellite was ready.

NCA member Dr. Armand Spitz, the planetarium developer and manufacturer, was the advisor to the Smithsonian Astrophysical Observatory on visual satellite tracking. The committee developed the "optical fence" system which was used in hundreds of stations worldwide during the IGY. Bob Wright maintained the developmental station north of Silver Spring, Maryland, and Bob Dellar maintained a station south of Springfield, Virginia. The NCA teams used both extensively during the 1957 to 1959 IGY.

Other very productive NCA-IGY programs included Meteor observation under Dr. Peter Milman, National Research Council of Canada; Aurora monitoring under Dr. C.W. Gartlein, Cornell, and solar activity monitoring with the AAVSO.

In January 1958 Bob McCracken, then president, changed the format and method of production of *Star Dust* to to make possible the use of photographs.

In the spring of the same year, McCracken established the annual NCA High-School Science Fair Awards for the District of Columbia and the contiguous counties.

The Washington Academy of Sciences accepted NCA as an affiliate in 1969.

The 1980 Nobel Prize in Chemistry was awarded to former NCA Junior member Dr. Walter Gilbert, Harvard, for his sequencing the DNA molecule. When an NCA Junior, he won the 1949 Science Talent search for his "One-step Separation of Zirconium and Hafnium."

Today's NCA serves the science, the public, and the individual in many ways. The monthly lectures are generally given by workers who are defining the horizons in their fields, and are scheduled month-by-month in order to be of timely usefulness to the peers of the speakers, as well as to others. Expeditions are led by Dr. David Dunham, frequently to all parts of the world, to gather observational data for several purposes. Ongoing programs include solar radius tracking, searches for asteroidal satellites, and the grazing lunar occultation program. The latter, through David Dunham's dedicated efforts, yields dynamical data which have been used in preparation of navigation tables, corrections to the celestial coordinate system, discovery of close, spectroscopic multiple stars, and even to revise the figure for the mass of the galaxy!

NCA occasionally cosponsors Washington Academy of Sciences programs, Naval Observatory functions, and Smithsonian affairs at the National Air and Space Museum, offers a telephone information service, operates a computer bulletin board, (Temporarily suspended for alterations), and is continually increasing its services to science.

With more dedicated people to enjoy the gratification derived from service, NCA will have a great future!

We thank Mabel Sterns for her memories in our efforts to compile these few highlights of NCA's first half century.

Review of Talk by Dr. Mercedes López-Morales

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ets, and take nice photographs. She graphically showed the difference between the sizes of all of these telescopes, making the point that a large amateur telescope of 16-inch diameter is totally dwarfed by those large professional scopes, and that the human eye, with a maximum opening of 0.3 inches, is invisible. Thus, most people think you won't get enough light with an amateur telescope, but they are mistaken.

First Example: Transiting Extra-Solar Planet

Dr. López-Morales said that the idea of extra-solar planets has been around for several hundred years. The first one was discovered orbiting 51 Pegasi, in 1995, by two European astronomers Michel Mayor and Didier Queloz. They used the spectroscopic radial velocity method at the 1.93-m telescope at Haute Provence Observatory in France. Earlier, a number of previous claims by others turned out to be false. Only six days later, Geoff Marcy and Paul Butler confirmed the existence of the same extra-solar planet by using data they had been gathering for years at the 3-meter Lick telescope in California, which she said was a bit sad for them. Of course, those are not exactly small telescopes. The two teams found that the period of the planet was 4.23 days, which put it amazingly close to the star. The problem was that the mass of the planet was only known to be 0.45 times mass of Jupiter, all divided by the sine of the angle of inclination of the orbit to our line of view. Unfortunately this angle was totally unknown. The size of the planet was also unknown, and could only be measured if the planet is transiting the star, and there only can be a transit if the angle of inclination of the planet and the star is just right in regards to the Earth. When a planet transits a star, there is a small partial eclipse, which will block some of the light of the star. By measuring how much light is blocked, one can tell a lot about the radius of the planet – in fact, it's the only way to get the exact size and radius of a planet. And, once it has been caught transiting the star, we have a good idea of the angle of inclination of the planet's orbit.

Dr. López-Morales said that out that after 1995, astronomers began finding lots of extrasolar planets using the wobble, or spectroscopic radial velocity, method; but for five years there were no observations of transits. The discovery of the first transiting extra-solar planet came out in 2000, when David Charbonneau, Tim Brown and others, using an extremely modest telescope, detected two transit events around the star known as HD209458. The apparatus they used had a primary mirror of only 3.9 inches in a Schmidt camera, and virtually all of it used commercial, off-the-shelf parts, such as a Meade LX200 fork mount, a finder scope, a small guide scope with a CCD camera in it, and a 44megapixel commercial CCD for the main detector. They had to make some parts to get the apparatus to fit into the Meade mount, which eventually broke down and was discarded. The telescope was designed to take a photograph of the field of interest, which was 2.5 degrees by 2.5 degrees and contained 24,000 stars, every 2 minutes. [To see an annotated image of the telescope, you can go to www.hao.ucar.edu/public/research/stare/scope_schmidt.html.]

Second Example: Visible Gamma-Ray Burst

The second example that our speaker gave was the very first observation of a mysterious gamma-ray burst in visible light.

Gamma-ray bursts, or GRBs, come from all parts of the sky, on the average about once per day, in many wavelengths, and were first discovered by accident after the United States sent up Vela satellites to try to verify compliance with the 1963 nuclear test ban treaty (which banned the US and the USSR from conducting tests in atmosphere, underwater, or outer space). During the period 1963 to 1969, the Vela satellites orbited the earth with X-ray, gamma-ray, and neutron detectors, because those were the characteristic types of radiation they expected to see if there were any nuclear blasts in space.

But soon after the satellites were launched, they found that the gamma ray detector was getting triggered every day, while the other detectors weren't. They had no idea what this radiation was from; they did know it wasn't from a nuclear explosion. It took about nine years for three astronomers at Los Alamos National Labs to analyze the data and conclude that the bursts did not originate on Earth or the Sun but were coming from all over. They still had absolutely no idea what they were or what their source was.

Since you can't focus gamma rays with a lens or mirror, astronomers started using more modern satellites like BEPPOSAX, which was able to narrow down the location to a region on the order of 6 arc minutes by 6 arc minutes. But in such a field there are a lot of stars, and astronomers still couldn't tell whether the GRB was coming from a star in that field or from a blank space between the stars, especially after the GRB faded, in a few seconds or a few minutes. It was necessary to observe the field at optical wavelengths, and to do it immediately after a GRB was detected. Astronomers worked on this for years.

Finally in January 1999, visible light from a gamma ray burst was discovered for the first time. Most people would assume this must have been by one of the most expensive telescope ever built. But no, it was just a bundle of Canon telephoto lenses in a box or enclosure in New Mexico, called ROTSE or Robotic Optical Transient Search Experiment, a collaboration between the University of Michigan and the Los Alamos National Laboratories. Each of the telephoto lenses had a diameter of 4.4 inches; the mount, by Epoch Instruments, allowed for rapid slewing, and the detectors were Apogree Instruments AP10 CCDs that are 2k by 2k in size. It was controlled by a network of five personal computers, one of which is in constant communication with the satellite, so that if there is news of a GRB, it can immediately slew to the region. (For more details, you can look at www.rotse.net.)

Third Example: Sn1987a

Dr. López-Morales told us about the discovery of Supernova 1987a, by the simplest telescope you can think of, the human eye.

There is a history of naked-eye observations of supernovas over the past 2000 years. In 185 AD, Chinese astronomers recorded one, but they didn't give very much information other than stating that it could be seen for eight months in the night sky. The second one, called SN1054, was recorded by Chinese and Arab astronomers. It is now known as the Crab Nebula. Apparently SN1054 could be seen for 23 days during the daytime,

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Review of Talk by Dr. Mercedes López-Morales

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and for 368 days during the night. SN1572, the third one, was discovered by Tycho Brahe; it was brighter than Venus. Thirty-two years later (in 1604), Kepler discovered the last superbright nearby supernova, just before the invention of the telescope. Remnants of most of these supernovas have been photographed.

Dr. López-Morales said that astronomers would very much like to observe a supernova that was relatively close, but not too close, because it would be so dangerous to life on Earth. The ideal distance would be about 100 to 200 light-years away. Quite a few have been found in far-away galaxies.

Oscar Duhalde, who was then a telescope night assistant at Las Campanas Observatory in Chile, discovered SN1987a in the Large Magellanic Cloud on February 23, 1987, just over 20 years ago. He has since been promoted to equipment specialist, but is by no means a wealthy or famous man. Duhalde had been working with astronomer Ian Shelton all night on the 100-inch telescope, and was walking back to his room at 5 a.m. He looked up and saw a really bright object in the sky in a location where he knew there was normally nothing. He went back to the observatory to tell his astronomer what he had seen. Neither of them knew how to report the discovery, so they frantically searched back issues of *Sky and Telescope* magazine for instructions on how to send a telegram to Brian Marsden at IAU. Naturally, the professional astronomer got all of the credit. Several other people in other Southern Hemisphere countries also noticed the event, but Duhalde and Shelton were the first to report it. All of the observatories in the Southern Hemisphere immediately aimed at it, and have been doing so for 20 years.

To sum up, Dr. López-Morales emphasized that important discoveries in astronomy can be made with very small telescopes made out of commercial parts – and even by eye. Of course, professional astronomers will probably come right along afterwards and interpret what you found. Amateur astronomy is a very important part of the understanding the universe puzzle and should be widely promoted. When she talks to young folks, she finds that they assume that you have to have enormous scopes, and she tries to show them that it's not necessary.

During the question-and-answer session, our speaker told us that she herself has built two network telescopes of modest aperture, similar to the projects she described in her talk. One was for her doctoral thesis and involved the study of M-class dwarfs like Gliese 581, with a mass of one half of our Sun or less. She said that about 70% of stars of the galaxy are in this category. She discovered that the size of these stars is about 20% larger than most astronomers would predict. She built the telescope to be fully robotic, which meant that she had to drive the 225 miles from Chapel Hill, NC to near Asheville, NC, and back, to fix it, about twice a week. (This got quite a few chuckles from the audience.) The project involved an 8-inch Meade SCT running under Windows 98 and a small observatory.

One of the telescopes in her new network will be on a site in Nevada, and two of them will be at Las Campanas in Chile. They involve relatively small telescopes with photomultiplier tubes, not CCD cameras, to do high precision photometry, over a period of years, of all the stars that have planets. She thinks that there are some stars that might appear to have planets from the radial velocity method, but if you do the high precision photometry, you might find that the star's luminosity varies along with the radial velocity in the same period and this might show there is no planet, but rather that the star itself is pulsating or has spots.

One problem with small telescopes is scintillation. One of her papers describes how to beat down scintillation with longer exposures and by defocusing and using a neutral density filter, enabling one to measure star brightness down to 3 millimagnitudes. Another recommendation was to put the star of interest on the very exact same pixel on the CCD every time you make a measurement. If its location drifts over the CCD chip from one night to another or during the night, you will lose a lot of sensitivity in your measurements.

The NCA thanks Dr. López-Morales for an entertaining and edifying evening, one that might inspire amateur astronomers to do real science.

Talk by Dr. Douglas P. Hamilton

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minutes. These events occur every 15 years and tell us where Saturn's equatorial plane and spin axis lie in inertial space at the time. These observations provide a useful check on the tidal torque calculations.

Saturn and Neptune

The calculations show that Saturn's spin-axis precession period is 1.83 million years, which is very close to Neptune's orbit precession period of 1.87 million years. Is the near equality of these two periods a coincidence, or is Saturn trapped in a "spin-orbit resonance"? In such a resonance, Neptune's weak tidal torque on Saturn, as modulated by the eccentricity of Neptune's orbit, stays in phase with the Saturn spin-axis motion, that is, it does not average to zero. The torque may be weak, but because of the constant phase, its effect adds up over geological time.

To test this possibility, Dr. Hamilton investigated how Saturn's spin-axis precession period increased with time since the formation of the Solar System, based on assumptions about planetary physical evolution, such as the way Saturn contracted as it cooled and how the gas disk around Saturn formed satellites. These processes caused the two precession periods to eventually become equal and initiate a resonance.

Dr. Hamilton explained that it is "great to be a theorist" in doing these calculations, because he gets to mathematically vary the orbits through geological time and see how that might change the spin-axis motion. Using a computer, he integrated the changing torque effects over the lifetime of the Solar System He found that Saturn's (assumed) initial tilt of zero grew to 13 degrees, only half of the observed 27-degree tilt.

But then he took into account the thinning of the Kuiper Belt caused by collisions of bodies there resulting in some bodies being expelled from the Solar System. This thinning caused Neptune's orbit precession period to decrease with time in such a way that the calculation showed Saturn's tilt growing to the observed 27 degrees.

His calculations thus show that Saturn's large spin-axis tilt is consistent with the nebular theory of Solar System formation.

We thank Dr. Hamilton for a most enjoyable and informative talk.

Mid-Atlantic Occultations and Expeditions to Early November

by Dr. David Dunham

Asteroidal Occultations

2007 Date	Day	EDT	Star	Mag	Asteroid	dmag	dur. s	Ap. in.	Location
Oct 21	Sun	2:51	BD +18 2307	9.6	Cora	5.8	1	5	VA,seMD-low
Oct 30	Tue	0:06	TYC63691129	11.8	Arago	3.4	5	8	SC,NC,seVA-low
Nov 5	Mon	2:02	PPM 146007	9.6	Tutenchamun	5.9	1	4	sVA,nNC,TN

Lunar Grazing Occultations

DATE	Day	EDT	Star	Mag	% alt	CA	Location
Oct 17	Wed	19:58	ZC 2702	6.8	36+	17 14S	Bethesda and e.Columbia, MD
Nov 3	Sat	7:58	Regulus	1.4	34-	68-19N	s.Savannah & Atlanta, GA

Oct. 17 is the only graze in our area, but it's a good one. The path also passes over Elk Run, s.e. Manassas, Fairfax, and McLean in VA, and over Chevy Chase, n. Silver Spring, Burtonsville, APL, Catonsville, n. Baltimore, and Bel Air in MD.

Total Lunar Occultations

DATE	Day	EDT	Ph	Star	Mag	%	alt	CA	Sp.	Notes
Oct 16	Tue	18:49	D	ZC 2540	7.2	27+	18	68N	B3	Sun alt. -5 deg.
Oct 17	Wed	20:49	D	SAO 187089	7.9	36+	13	87S	B9	Azimuth 217 deg.
Oct 18	Thu	19:56	D	SAO 188263	7.7	46+	23	53N	F0	
Oct 18	Thu	21:46	D	ZC 2862	8.0	47+	14	86S	F3	Azimuth 219 deg.
Oct 19	Fri	21:22	D	ZC 2991	6.1	57+	25	71N	K5	
Oct 19	Fri	21:40	D	SAO 189360	8.5	57+	23	68S	K0	
Oct 19	Fri	22:59	D	SAO 189403	7.7	57+	14	82S	F0	mg2 8.0,39",PA129;Az225
Oct 21	Sun	21:14	D	SAO 164945	8.1	77+	39	57S	G8	
Oct 21	Sun	21:15	D	40 Aquarii	6.9	77+	39	21N	G5	ZC3262; close dbl.?
Oct 21	Sun	22:56	D	ZC 3267	7.3	78+	35	90N	G8	close double?
Oct 24	Wed	0:24	D	ZC 1	7.2	94+	49	65S	G0	mg2 9.4 sep2",PA 164dg
Oct 24	Wed	19:11	D	delta Psc	4.4	98+	22	71S	K5	ZC 105
Oct 26	Fri	19:11	R	mu Arietis	5.7	99-	9	35N	A0	ZC399;dbl;az71;term.7"
Oct 27	Sat	3:10	R	ZC 438	6.8	98-	65	65S	A3	close double; WA 228
Oct 27	Sat	19:16	R	Maia	3.9	95-	2	42N	B8	ZC541;WA310;dbl?;Az.60
Oct 27	Sat	19:41	R	Alcyone	2.9	95-	6	55S	B7	ZC552;WA226;dbl?;Az.64
Oct 27	Sat	20:02	R	Pleione	5.1	95-	9	19S	B7	ZC561;WA230;dbl;term.13"
Oct 27	Sat	20:13	R	ZC 557	7.0	95-	11	88S	A1	Az 68; WA 26; double?
Oct 27	Sat	20:30	R	ZC 562	6.6	95-	14	81S	B9	Az 70; WA 294; double
Oct 27	Sat	20:56	R	SAO 76259	7.4	94-	19	85S	A2	WA 257; close double
Oct 28	Sun	5:48	R	SAO 76472	7.2	93-	51	90N	G8	WA 262; close double
Oct 30	Tue	23:55	R	ZC 1094	7.1	68-	18	78S	A0	
Oct 31	Wed	2:23	R	SAO 79277	8.1	67-	45	35N	F0	mg2 10.4 sep .4",PA229
Oct 31	Wed	3:51	R	SAO 79319	7.9	66-	61	33N	K2	
Nov 1	Thu	5:20	R	ZC 1253	7.3	55-	65	61S	K0	close double?
Nov 2	Fri	3:07	R	80 Cancri	6.9	45-	42	42S	A0	ZC 1370
Nov 3	Sat	4:26	R	SAO 98906	7.8	35-	32	35S	K0	Graze, s. Virginia
Nov 3	Sat	5:51	R	EP Leonis	7.9	34-	47	71S	K5	SAO 98928,mag rng 0.1

Events after October 28 can be found on my Web site below.

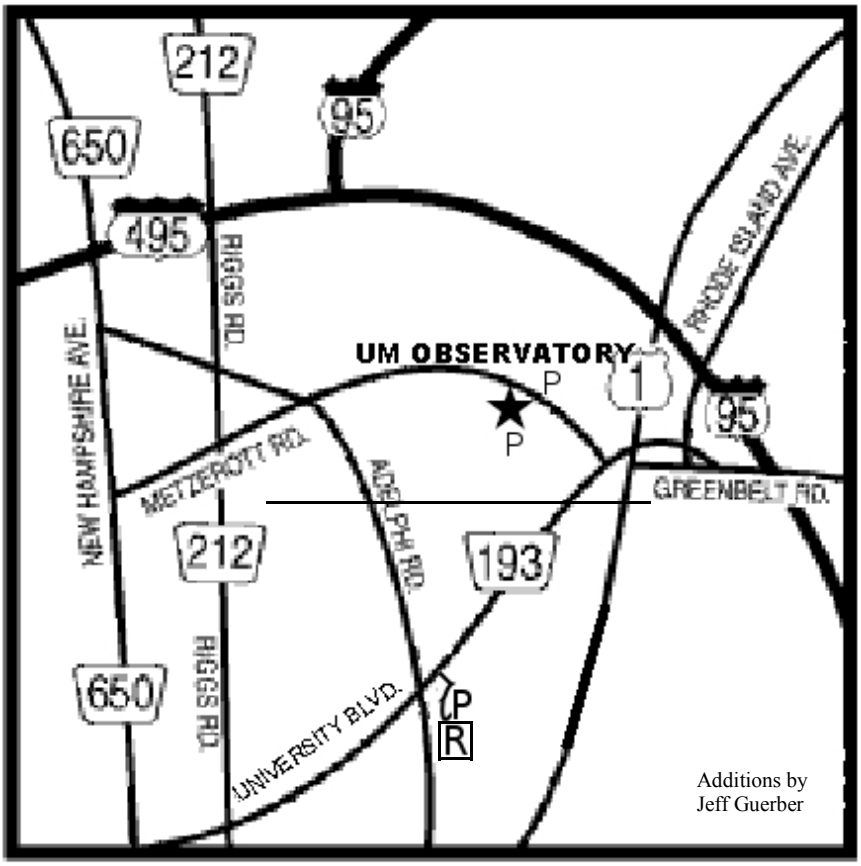
More information is at http://iota.jhuapl.edu/exped.htm .
David Dunham, dunham@starpower.net, phone 301-474-4722

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

The NCA Meeting
NCA meetings are now held at 7:30 p.m. at the University of Maryland Observatory, in College Park. The observatory is located on Metzerott Road between Adelphi Road and University Blvd. in College Park. From the beltway (I-495):

• if on the Inner Loop, take Exit 28B toward Takoma Park, which puts you on New Hampshire Ave. (MD-650) south, turn left at the second light onto Adelphi Road, two more lights, turn left onto Metzerott Road, and proceed 0.6 miles to the observatory entrance (on your right);

• if on the Outer Loop, take the College Park/Route 1 exit. Head south on Route 1 for about a mile until you see a sign for 193 West. Get on 193 West. The first traffic light is at Metzerott Road. Take a right onto Metzerott Road. Once on Metzerott Rd., continue past a traffic light at St. Andrews Place. The observatory entrance is about a quarter of a mile on the left side of the road after that. The observatory entrance is slightly hidden, so slow down to turn left as soon as you pass a large "System Administration" sign. The observatory entrance is almost directly across the street from the UM System Administration sign (3300 Metzerott Rd.).



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

The Dinner before the Meeting
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 at the second traffic light onto Adelphi Rd., 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 Road. 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 Road. Once on Metzerott Rd., continue past a traffic light at St. Andrews Place. The observatory entrance is about a quarter of a mile on the left side of the road after that. The observatory entrance is slightly hidden, so slow down to turn left as soon as you pass a large "System Administration" sign. The observatory entrance is almost directly across the street from the UM System Administration Sign (3300 Metzerott Rd.).

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 rigel1@starpower.net.)

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.

Support the IDA

Join the International Dark-Sky Association

3225 N. First Avenue Tucson, AZ 85719-2103

www.darksky.org

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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.

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.

✂

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FIRST CLASS
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NCA Will Meet on October 13!

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