Star Dust

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Dr. Alan Boss to Discuss the Origin of the Moon

National Capital Astronomers will meet Saturday November 2, 7:30 pm at the National Institutes of Health (the Bunim Room at the Clinical Center (Floor 9, Building 10)). At this meeting, we will be addressed by Dr. Alan Boss of the Carnegie Institution of Washington on the subject "The Origin of the Moon".

From the beginning of history, people have been fascinated by the moon and have wondered about its origin. Other planets have satellite systems but the earth-moon pair has very unusual features and is unlike any other. Recent studies suggest that our moon was probably formed during the early years of the solar system from the debris of a collision between a mars-sized body and the embryo earth. Dr. Boss will discuss the results of some of his own investigations into the subject.

Alan Boss comes originally from Ohio. He obtained his BS degree from the University of South Florida and his PhD from the University of California at Santa Barbara. He is presently a staff member at the Department of Terrestrial Magnetism of the Carnegie Institution of Washington. Scientists in this research organization based in NW Washington are concerned with fundamental investigations in astronomy, geochemistry and geophysics and have a common interdisciplinary interest in the origin and evolution of the sun and the solar system.

Astronomy and Personal Computers
By Joan Bixby Dunham

X-Rays of Computers and Software - During a recent trip to Europe, we found airport security personnel absolutely adamant on x-raying computers, computer software, and film. Their position was that we could have our things x-rayed and take them on the plane with us, or we could give them away. No amount of arguing or discussion would change that. The x-ray machines had stickers labeling them as "film safe" and "computer safe". Are they? Probably not. X-ray exposure is cumulative — a pass through an airport security machine is unlikely to be noticeable, except on very sensitive film of ASA 1200 or more. But multiple passes will be. An extended trip can often include numerous passages through airport security. A portable computer might be taken on many trips. If the computer display or software develops a problem, can we say if it was or was not caused by being x-rayed too many times?

Our computer and the software we have checked seem to be OK, or at least no worse than before the trip. We had 70 diskettes containing the Watts Charts of the Marginal Zone

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The Public is Welcome

Saturday, November 2, 7:30 pm - NCA Monthly Meeting will be held in the Bunim Room at the National Institutes of Health. Dinner with the speaker before the meeting at 5:30pm at Frascati's Restaurant in Bethesda. **For directions refer to map and description on inside back page.**

Tuesday, November 5, 12, 19, 26 7:30 pm - Telescope making classes at Chevy Chase Community Center, Connecticut Avenue and McKinley Street, NW. Information: Jerry Schnall, (202) 362-8872.

Friday, November 8, 15, 22 7:30 pm - Telescope making classes at American University, McKinley Hall Basement. Information: Jerry Schnall, (202) 362-8872.

Friday, November 8, 15, 22, 29 8:30 pm - NCA 14-inch telescope open nights with Bob Bolster, 6007 Ridgeview Drive, south of Alexandria off Franconia Road between Telegraph Road and Rose Hill Drive. Call Bob at (703) 960-9126. The Moon will be the featured object on the 15th.

1991-1992 Speaker Schedule: As part of its program for the coming year National Capital Astronomers has arranged talks covering a wide variety of astronomical subjects. Note the dates of the following events so that you can be sure of attending, and tell your friends.

November 2:	Alan Boss (Carnegie Institute of Washington) "The Origin of the Moon".
December 7:	Gregory Paul (Author) "Computers, Robotics, and Space Travel".
January 4:	Maurice Shapiro (NASA) "The Explosive Universe - as revealed by the new astronimies".
February 1:	James Zimbleman (National Air and Space Museum) "Geology of Mars".
March 7:	Harold Williams (Montgomery College) "The Formation of Stars".
June 6:	Presentation of High School Science Fair Awards (preceded by a Pizza Party).

October Colloquium

By Nancy Byrd

On October 5th, 1991 at the National Institutes of Health in Bethesda, Dr. Julie Lutz presented a talk to the National Capital Astronomers' monthly colloquium on the subject of planetary nebulae. Normally a professor of astronomy at Washington State University, Dr. Lutz is currently serving as Director of Astronomical Sciences at the National Science Foundation. She also is the current president of the Astronomical Society of the Pacific.

Dr. Lutz began her talk with a view and description of the archetypal planetary nebula, the Ring Nebula in the constellation, Lyra (M57). Planetary nebulae are associated with stars that are considerably farther along in their life cycles than is the sun. During the later "throes" of becoming a white dwarf, a star ejects its outer atmosphere in a gentle explosion. The material separates from the central star with a velocity of a few miles a second, and forms a spherical shell around the central star which is on the order of one tenth of a solar mass. The shell appears to be a ring because we observe more material at the edge of the sphere than in the center. Dr. Lutz pointed out that while some planetary nebulae are similar to the Ring Nebulae, the symmetry of the Ring Nebula is the exception rather than the rule. Planetary nebulae, she told us, got their name from their commonly greenish color due to a strong oxygen emission line in the spectra of the nebulae, but that they are not related to planets.

Dr. Lutz then gave us a quick tour of the Herzsprung-Russell diagram, which shows how various types of stars fall on a chart of temperature versus absolute brightness. Points representing most stars plot along a band known as the main sequence, extending toward the upper left of the diagram (increasing brightness and temperature). However, some much bigger objects show luminosities hundreds of times that of the sun (the supergiants). Others with a temperature higher than our sun and a significantly lower luminosity (the white dwarfs) consequently plot below and to the left of the main sequence. The puzzle for astronomers is to infer the evolution of stars from that "snapshot of time" which is our night sky.

A star like the sun will condense from an interstellar dust cloud, continued Dr. Lutz. When hot and dense enough for thermonuclear reactions converting hydrogen to helium to occur, it will come on to the main sequence. At this point, the outward pressure due to the thermonuclear reactions will counterbalance the gravity, halting the gravitational collapse. The star will then remain a stable, main sequence star until the thermonuclear reactions have exhausted the hydrogen in its core. All stars along the main sequence are converting hydrogen to helium. Those near the bottom of

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the diagram, she observes have only a fraction of a solar mass, whereas those near the top of the main sequence may have up to fifty times the mass of the sun.

Moreover, the mass of the star is proportional to the length of time it will spend on the main sequence. A star the mass of the sun has a main sequence lifetime of about ten to twelve billion years. A very massive star, however, may remain on the main sequence for only 50,000 years. The sun is about 5 billion years old and therefore has about 5 billion years to go before it has used up the hydrogen in its core.

Eventually, the sun will move off the main sequence and into the giant region of the Herzsprung-Russell diagram, then relatively rapidly will progress through the RR Lyrae (variable) region and then to the white dwarf stage. When the sun enters the giant stage, it will expand to many times its present radius. Mercury and Venus will be engulfed; the earth will become very hot and lose its atmosphere.

Planetary nebulae are associated with stars about the mass of the sun. We have observed that stars dribble off material continually, throughout their lifetimes, but when a star starts to pulsate significantly, expanding and contracting with resultant changes in brightness, the outer shell separates from the rest of the stellar body. The core, without the continued energy output from conversion of hydrogen to helium, undergoes renewed gravitational collapse, finally settling down as a white dwarf. The separated outer shell may continue expansion, and the system becomes a planetary nebula with a central white dwarf. In all probability, that is the final state of the sun.

If we look at the Milky Way Galaxy, we observe about 1500 planetary nebulae. Because we observe so many, we can figure that these objects are common, as these puffs of outer atmosphere material are not very visible, nor are they visible for very long. The incipient white dwarf star at the center is very hot, about 150,000°K to 200,000°K compared to only 6000°K for the surface of the sun. The central star in a planetary nebula has a lot of high energy emission, ultra-violet and x-rays that are being pumped out into the nebula, exciting the gas, which is glowing like a fluorescent light. Estimating from the observed velocities of expansion of these nebulae, their lifetimes are only about 30,000 years before they are too diffuse and faint to see. We estimate, states Dr. Lutz, that there are about 40,000 planetary nebulae in the Milky Way Galaxy.

Dr. Lutz displayed and described several less symmetrical planetary nebulae. In a binary system, the gravitational field of a companion star could strongly affect the form of a nebulae. The fact that binary star systems are very common probably accounts for many of the less than symmetrical shapes of most planetary nebulae. With recent observations in the ultraviolet region, using the International Ultraviolet Explorer (IUE) satellite, Dr. Lutz and colleagues have discovered that the central stars of planetary nebulae are still emitting significant mass. This emission may also be controlling the form of these less than symmetrical nebulae.

EXCERPTS FROM THE IAU CIRCULARS

By R.N. Bolster

1. **September 16** - J. Luu, Harvard-Smithsonian Center for Astrophysics, and D. Jewitt, University of Hawaii, observed that the nucleus of periodic comet Chernykh had split into two nuclei 57" apart.

2. **September 30** - R.H. McNaught and S.M. Hughes, Anglo-Australian Observatory, discovered a comet (1991y) of 17th magnitude in Aquarius with the U.K. Schmidt Telescope at Siding Springs.

3. **October 2** - C.S. and E.M. Shoemaker and D.H. Levy discovered a comet (1991z) of 16th magnitude in Cetus with the 46-cm Palomar Schmidt.

4. **October 6** - The Shoemakers and Levy discovered another comet (1991a1) of 16th magnitude in Triangulum. The orbital elements by Green indicate that it will reach perihelion on July 29 at a distance of 0.88 AU. (Note: This comet will be a circumpolar object in June and early July as it approaches to 0.93 AU from the Earth.)

OCCULTATION EXPEDITIONS PLANNED

Dr. David Dunham is organizing observers for the following occultations. For further information call the IOTA information line: (301) 474-4945 (Greenbelt, MD).

Date *Grazing Lunar:*	Time (EST)	Place	Visible Magnitude	Percent Sunlight	Cusp Angle	Minimum Aperture
Nov. 11	20:05	Gaithersburg, MD	8.3	26	16S	20 cm
Nov. 25	06:26	Buchanan, VA	5.9	84	14S	8 cm
Dec. 3	05:39	Newton, NJ	6.4	7	16S	5 cm

Asteroidal:	Time	Place	Star Mag.	Delta Mag.	Name	Aperture
Nov. 1	01:44	Labrador*	9.1	3.2	(386) Siegena	5 cm
Nov. 14	00:04	Bermuda*	10	1.4	(51) Nemausa	8 cm
Nov. 14	01:54	n. Canada*	11	0.9	(511) Davida	13 cm
Dec. 3	22:54	Lake Ontario*	11	0.6	(51) Nemausa	20 cm

*Appulse to be observed for possible satellites or path shift. Observers should obtain a finder chart from Dunham or IOTA.

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of the Moon which David was given in Germany. The data had been converted from an IBM mainframe data set to PC data for David, and the fellow who did the work did not want to send the diskettes by mail because of the cost and because the package might be x-rayed.

We have been told not to put film, software, computers, or cameras in checked baggage because that might be x-rayed or mishandled. Or put on the wrong plane, as our bags were.

The security and carry-on checking and rules are very inconsistent from location to location. In one country, we were told "Federal rules allow 2 carry-ons per passenger". At the next stop, another country, same plane, same passengers, it was "Federal rules allow 1 carry-on per passenger". We did not notice passengers rushing forward to check carry-on number 2. We had a baby stroller and we were asked each time we got on a plane to check it. After the first ticket agent wrote a baggage tag for the stroller for the wrong destination, I found I needed it to get the child to his seat. Once there, I folded it up and put it in the overhead storage bin. It has fit in every flight we have taken it except one, on an Lockheed L1011, which had very narrow storage bins. On that same flight, we found that we could be skewered by our portable if we were using it on the tray and the passenger in front of us pushed his seat all the way back.

At one security check, the baby and his stroller were pushed through unexamined along the outside of the metal detector while his mother and father and belongings were x-rayed and metal-detected. (I've always thought that the metal tubing of a stroller would make a good hiding place.) Another time, I was asked to hold the baby while he was searched. I must have looked as startled as I felt, because the security person explained that I could easily fool a metal detector by holding something between the two of us. So she waved a metal detector over his Pamper to make sure I hadn't put a film cartridge or diskette or machine pistol in there. I was told more than once that, if the stroller did not fold up into a small enough package to fit through the x-ray machine, it did not have to be x-rayed. Perhaps we should have attached the computer to the stroller and said it was a non-folding computer-operated stroller.

Does this security checking accomplish much besides annoying lots of travelers? To a security guard who does not use computers, a computer is a collection of wires, metal and perhaps a battery. A bomb is a collection of wires, metal, perhaps a battery, and some explosive. What can be learned by x-raying either one? The computer, under an x-ray, looks like a collection of wires, metal, and perhaps a battery. A bomb must not look much different. I suppose the x-rays are useful to prove that we have not concealed a gun in the computer. Then what purpose is served by x-raying computer diskettes or cans of film?

I can see that at some point, we may be asked to prove that the object that has just been x-rayed is indeed a computer. We will be asked to turn it on. That is when we want the autoexec.bat file that says "ready....aim...<pause>" (Note for he record —This is a joke. If you do this, you are on your own. This is not an official position of NCA. You should also know that on another trip in another country, the author, her husband, and their baggage were driven out to an airplane on a baggage cart by nervous security personnel for inspection by the pilot before they and their luggage were allowed on the plane. Do you want to take advice from somebody so suspicious she makes Riyadah Airport personnel nervous?)

The lead foil bags sold for film protection are not much protection against the airport x-ray machines. If you use them, then the next time you travel, send it through the x-ray by itself and position yourself so you can see the screen as it goes through. You will have no trouble determining what is inside the bag. (You might already have concluded this from the fact that you are rarely asked to open the bag after it is x-rayed.) You might also ask yourself just how safe is an x-ray machine that can punch through a lead foil bag.

National Capital Astronomers, Inc.

is a non-profit, public-service corporation for advancement of the astronomical sciences and is the astronomy affiliate of the Washington Academy of Sciences. For information, call NCA: (301) 320-3621.

SERVICES AND ACTIVITIES:

A Forum for dissemination of the status and results of current work by scientists at the horizons of their fields is provided through the monthly NCA Meeting. (See monthly ***Stardust*** for time and location.) All interested persons are welcome; there is no charge.

Expeditions frequently go to many parts of the world to acquire observational data from occultations and eclipses which contribute significantly to refinement of orbital parameters, the coordinate system, navigation tables and timekeeping. Other results of this work under continuing study include the discovery of apparent satellites of some asteroids, discovery of apparent small variations in the solar radius, and profiles of asteroids.

Discussion Groups provide opportunities for participants to exchange information, ideas, and questions on preselected topics, moderated by a member or guest expert.

Publications received by members include ***Sky & Telescope*** magazine and the monthly publication of NCA, ***StarDust***.

The NCA Public Information Service answers many astronomy-related questions, provides predictions of the paths and times of eclipses and occultations, schedules of expeditions and resulting data, assistance in developing programs, and locating references.

The Telescope Selection, Use, and Care Seminar, held annually in November, offers the public guidance for those contemplating the acquisition of a first telescope, and dispels the many common misconceptions which often leads to disappointment.

Working Groups support areas such as computer science and software, photographic materials and techniques, instrumentation, and others.

Telescope-Making Classes teach the student to grind and polish, by hand, the precise optical surface that becomes the heart of a fine astronomical telescope.

NCA Travel offers occasional tours, local and world-wide, to observatories, laboratories, and other points of interest. NCA sponsored tours for comet Halley to many parts of the southern hemisphere.

Discounts are available to members on many publications and other astronomical items.

Public Programs are offered jointly with the National Park Service, the Smithsonian Institution, the U.S. Naval Observatory, and others.

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If family membership, list names of additional participating immediate family members in same household, with birthdates of all those under 18 years old: _____

Note: If you already subscribe to ***Sky & Telescope***, please attach a recent mail label, or indicate the expiration date: _____. A prorated adjustment will be made. Make check payable to National Capital Astronomers, Inc., and send with this form to:

Leith Holloway 10500 Rockville Pike Apmt. M-10, Rockville, MD 20852.

The following information is optional. Please indicate briefly any special interests, skills, vocation, education, experience, or other qualifications which you might contribute to NCA

Thank you, and welcome!

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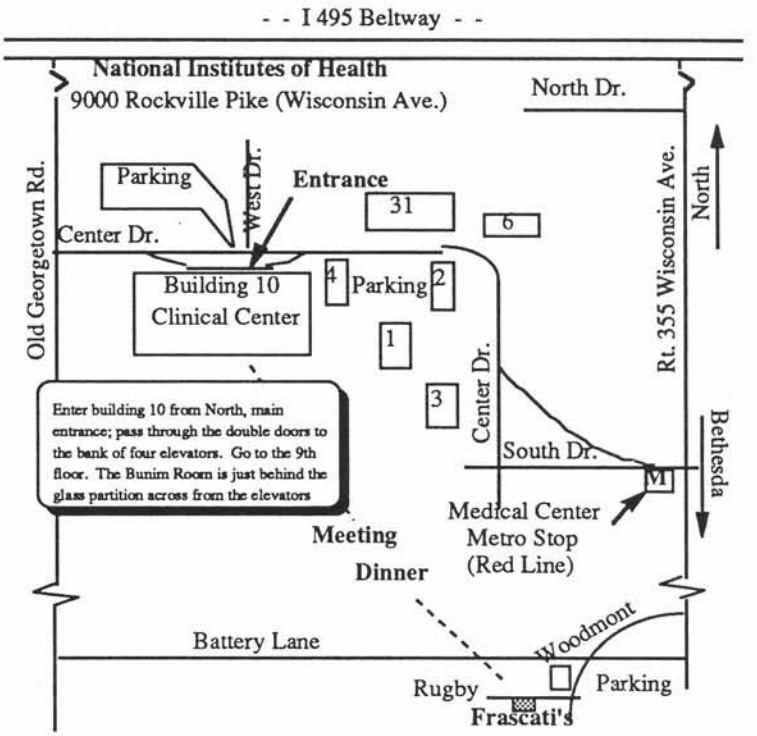
Getting to the November NCA Monthly Meeting

•Subway Riders - From the Medical Center Metro: Walk down the hill, pass the bus stops and turn right at the anchor (onto Center Dr.). Continue uphill to building 10, the largest building on campus.

•To Frascati's: Proceed down Wsconsin Avenue toward Bethesda. Bear right onto Woodwont (or the next right onto Battery Lane), follow Woodmont across Battery, take a right onto Rugby and park. The restaurant will not guarantee seats after 5:30.



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