Star Dust

National Capital Astronomers, Inc.

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Jim Condon to Talk on the NRAO VLA Sky Survey

submitted by Nancy Byrd

The Saturday, February 5, 2000 meeting of the National Capital Astronomers (NCA) will be held in the Lipsett Auditorium in Building 10 (Clinical Center) of the National Institutes of Health in Bethesda at 7:30 P.M. This month's speaker will be Dr. James J. Condon, of the National Radio Astronomy Observatory in Charlottesville VA and the project scientist for the new 100-meter Green Bank Telescope. He will talk to NCA about the NRAO VLA Sky Survey. He submits the following abstract:

Recent advances in electronics and computing have made possible a new generation of large radio surveys with much higher sensitivity, resolution, and positional accuracy. The largest of these surveys is the NRAO VLA Sky Survey (NVSS) which covered the sky north of -40 deg. declination with 45-arcsec resolution and detected nearly 2 million radio sources. Combined with the unique properties of the radio universe, these quantitative gains open up qualitatively different and exciting new scientific applications of radio surveys.

All of the survey results (source catalog, images, etc.) are available to the entire astronomical community via the NRAO web page at http://www.nrao.edu.

Recap of Michael A'Hearn's Talk on Mission "Deep Impact"

*by **Harold Williams***

Mission to explore the cometary nucleus

On January 8, 2000, Dr. Michael A'Hearn, (http://www.astro.umd.edu/~ma/) professor at the University of Maryland, a long time member of NCA, and Principal Investigator of the just funded NASA spacecraft Mission "Deep Impact" told the assembled crowd about the planned mission to Comet P Tempel 1. This is a new kind of mission for a new kind of science, (http://www.ss.astro.umd.edu/deepimpact/). This mission will impact a 500kg mostly copper actively steered missile that will make a crater on the comet while the firing spacecraft will image and take infrared spectra of the comet and cratering event.

This mission will explore the interior of a cometary nucleus by recreating a natural phenomenon under controlled circumstances, excavating a crater estimated to be the size of a football field, seven stories deep. Ball Aerospace, (http://www.ball.com) vacuum jars in space, will be the spacecraft manufacturer. The University of Maryland and JPL, the Jet Propulsion Laboratory, (http://www.jpl.nasa.gov) will be the main scientific institutions involved.

The reason for doing this mission is that we have profound ignorance about the cometary nucleus. Comets are thought to contain the most primitive accessible material in the solar system, but we do not know what is hidden below the evolved surface layer. Comets eventually become dormant, i.e., stop out-gassing, but we do not know whether ice is exhausted or sublimation inhibited. There must be many dormant comets masquerading as asteroids, but we do not know how to identify them. We know more chemical and physical details of comets than of other small solar system bodies like asteroids, but we cannot use these details to constrain our physical models.

Models but no data

There are at least four major models of the gross structure of comets. They are: the icy-conglomerates model by Whipple 1950, the fractal-pieces model by Donnet 1985, the primordial-rubble-pile model by Weissman 1986, and the ice-glue model by Gombosi and Houpis 1986. The abundance of gases in the coma is widely used to infer the ices in the protoplanetary disk, but we do not know the relationship between the coma abundance's and those of the nucleus.

Comets break apart under small stress, but nothing is known about the variation of material strength with scale. If this mission is able to gather data, we are guaranteed of learning many things. The only image of a cometary nucleus that we have is of Halley, taken in 1986 by the Giotto spacecraft flyby. The resolution of the "Deep Impact" flyby should improve our image resolution of the nucleus and give us another picture of a comet's nucleus.

At the moment, we have a list of cometary surface processes, but almost no data from real cometary surfaces. Some of the surface processes are cosmic ray irradiation of the crust, interstellar matter accretion, surface eroded by dust impact, gardening by debris impact, warming by stars, super-

(Continued on page 2)

NCA Events This Month

The Public is Welcome!

NCA Home Page: http://capitalastronomers.org

Fridays, February 4, 11, 18, and 25, 7:30 P.M. - Telescope making classes at American University, McKinley Hall Basement. However, on Feb. 4, if the weather is clear, there may not be a class, because the instructor will be out star-gazing; call to confirm on that date. Information: Guy Brandenburg, 202/635-1860

Fridays, February 4, 11, 25, 8:30 P.M. - Open night 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.

Saturday, February 5, 5:30 P.M. - Dinner with the speaker and NCA members at the Athenian Plaka Restaurant, 7833 Woodmont Ave., Bethesda, MD, phone: 301/986-1337. See map and directions on Page 5.

Saturday, February 5, 7:30 P.M. - NCA meeting, at Lipsett Auditorium in Building 10 at NIH, will feature Dr. James J. Condon, of the National Radio Astronomy Observatory in Charlottesville VA and the project scientist for the new 100-meter Green Bank Telescope. He will talk to NCA about the NRAO VLA Sky Survey

See Page 4 for more National Capital area astronomical doings. Other events too numerous to list in *Star Dust* are listed in the publications, *Sky & Telescop*e, the *Astronomical Calendar 1999*, the *Observer's Handbook 1999*. NCA members can purchase all these (and much more) at a discount. Information can also be found in numerous software packages, and links available on the NCA Home Page. To join NCA, use the membership application on another page in this publication.

Recap of Michael A'Hearn's Talk on Mission "Deep Impact", continued

(Continued from page 1)

nova, and our own sun, ruptures from gas pressure, and thermal stress fractures and venting. Is there a crystalline layer over an amorphous core? Has the core melted and recrystalized? While "Deep Impact" will not definitively answer every question about comets, we will learn much more than is presently known.

We realize that comets change their outgassing surface properties with the number of orbits around the sun, but since we know so little about the surface of the nucleus, we cannot even model this with any certainty. A single transparency can summarize the six things currently known about twenty-five cometary nuclei.

Flyby spacecraft to observe impact

This is what "Deep Impact" will do to answer some of these questions about this cometary nucleus. The dual spacecraft will separate one day before impact. The impactor will be made mostly of copper so that it will not affect the infrared spectra or contaminate the comet. Comets are thought to have very little copper; aluminum is the other metal comets have some of, that would make a good impactor. Aluminum will not be used because radioactive aluminum 27 to magnesium 27 heating is thought to be important in the early solar system. Minimizing contamination for our observations in later missions is considered important.

The flyby spacecraft will slow down by 120 m/s to fall 10,000 km behind the impactor and pass within 500 km of the nucleus in closest approach. This slowdown delay will provide 16 minutes to view impact, and ejecta, and cratering before closest approach.

The images and near infrared spectra should help determine the following properties: structural strength, variation of strength with spatial scale, density, stratification, compressibility, and buried volatiles (gas or ice). The way the crater grows will help determine much of these things. The way the crater rim folds back the material should reveal much. Change in natural activity after impact is thought to be profound enough so that a major earth-based observatory component is planned. Impact observability from earth was shown and some discussion of why Chile might be better to see the impact from than our position in the National Capital area. The details of exactly which places get the best view depend upon details in the last few hours of active targeting.

The current time-line for the spacecraft is to launch January 1, 2004, with earth flyby and gravitational assist in orbital transfer to occur on December 30, 2004, with encounter on July 4, 2005. The comet has a 5.5 year orbit. Pieces knocked off have no chance of colliding with the earth. The relative velocity between the impactor and the comet will be 10 km/s and this is where the impactor gets most of its large kinetic energy to excavate such a large crater. Because so little is really known about the material strength of a comet nucleus, the size of the crater can only be estimated within very large margins. Unless the comet is constructed of really unexpectedly weird stuff, the crater will be more than large enough to see lots of detail within it. The Hubble Space Telescope light curve of this comet indicates that its radius is around 3 km and that its period of rotation is longer than 24 hours. The slow rotation of the comet is considered important because we don't want the crater rotating out of view too soon.

This mission has been planned quite conservatively, with large fuel margins so that accurate impact can be assured. Ball Aerospace is the only American spacecraft manufacturer that is engineering in a completely metric way.

This mission should make the summer of 2005 a particularly eventful one for us. The increase in the comet's activity may even be seen with our own telescopes in the National Capital area.

The Milky Way Galaxy

by Nancy Grace Roman

How do galaxies form?

A popular problem in astronomy today is how to decipher the way in which galaxies form. One approach is to look at very distant galaxies that we see as they were when the universe was only 5% of its present age. Obviously, these cannot have changed greatly after their formation and should provide clues to that formation. Nevertheless, these are so faint and distant that we cannot discern many details. An alternative is to study a bright galaxy in which we can see many details, our own Milky Way. This presents two other problems: we are in its midst so cannot see the overall structure easily, and it is old.

However, by combining a detailed study of the Milky Way and of a few other nearby, old galaxies with our view of very distant ones, we can hope to piece together a coherent picture. The January 7 issue of the magazine, *Science*, has a section devoted to the structure of the Milky Way galaxy. The following draws heavily from this issue.

Several decades ago, the picture of the formation of our galaxy seemed straightforward. It started with a very large nearly spherical cloud of gas from which the first stars formed. Presumably, the very first stars had no metals (elements heavier than helium). Only after these had evolved to supernovae, were metals distributed in the gas from which new stars could form. The puzzle was why we could not find any of these first generation stars. As the galaxy aged, collisions of the gas and dust clouds increasingly flattened the regions in which stars could form. Increasingly younger stars with more metals were formed closer and closer to the central plane of the galaxy. Although the bulge contains stars of all ages, its components are predominantly old, but there is some disagreement as to whether it is more closely related to the baryon halo or to the thin disk.

Big galaxies eat little galaxies.

Most astronomers today divide the galaxy into a halo, a thick disk, a thin disk, an extreme disk, a bar-like bulge, a nucleus and a dark halo. However, it may be that the three disks are a single system. As noted, the bulge may be related to the disks or to the baryon halo. Today, we are aware that galaxies are cannibals, and that large galaxies, such as the Milky Way, gradually absorb smaller galaxies that come too close. We see this happening as the Milky Way pulls material from the Sagittarius dwarf galaxy and, probably, from the Magellanic Clouds. The galaxy may have formed originally from the merger of several dwarf galaxies, which explains the lack of first generation stars. Moreover, there is evidence of later acquisitions in groups of high velocity stars with similar motions. It has also been suggested that globular clusters may have formed as a result of mergers or even that they may be the remnants of dwarf galaxies.

As the name implies, the nearly spherical halo system is the most extended component; its stars also have the fewest metals and are the oldest. It is also the least dense. Note that although stars in the halo and thick disk reach large distances from the galactic plane and spend much of their lives in those regions, their orbits must cross the disk and thus some are found quite close to the sun. As would be expected for systems that are not greatly flattened, their orbital velocities around the galactic center are low and thus, the velocities with respect to the sun, with its nearly circular orbit, are high; of course, these stars have high velocities perpendicular to the galactic plane. The halo shows a mixture of metallicities and ages and no metallicity or dynamics gradients. Thus, it has been suggested that it is composed of aggregations that were born and evolved at different times. A major puzzle at the present time is the nature of an extensive spherical dark halo.

This dark halo appears to be 20 times as massive as the visible disk and to occupy 1000 times the volume of the disk. However, it dominates only the outer halo. Other galaxies show similar dark halos. It was hoped that gravitational lensing surveys might uncover the components of this dark matter, but this has not happened.

The thick disk has a minor- to major-axis ratio of <0.6 and, near the sun, about 4 to 10% of the density of the thin disk. It lags circular rotation by about 60 km/s, but stars farther from the plane may have slower rotation. Stars in the thick disk have about 10% of the metal abundance of the sun.

The thin disk probably contains most of the stars near the sun. These have approximately solar metal abundances. The molecular clouds in which stars are forming today and very young stars comprise the extreme disk with slightly higher metal abundances. It is unclear how these various disks are related. There appears to be an abrupt change in vertical velocities between the thin and thick disks that may or may not indicate separate systems. Together, these disks supply 90% of the brightness of the Milky Way but only 5% of the mass.

The bulge appears to contain stars of various ages. Most are similar in age and metallicity to those in the thick disk. The bulge is triaxial, indicating a bar structure.

The center of the galaxy

"The region bounded by the inner tens of light-years at the center of the Milky Way Galaxy contains five principal components that coexist within the deep well of gravitational potential. These constituents are a black hole candidate (Sgr A*) with a mass equivalent to $2.6 \pm 0.2 \times 10^6$ solar masses, a surrounding cluster of evolved stars, a complex of young stars, molecular and ionized gas clouds, and a powerful supernova-like remnant. The interaction of these components is responsible for many of the phenomena occurring in this complex and unique portion of the Galaxy."[1] The mass of the black hole that lies within 4.6 light days of the galactic center candidate is determined by Keplerian motion. This high density is underluminous, as would be expected for a black hole. Although this source could be a collection of smaller black holes, this is unlikely. There is a ring of fragile molecules in neutral gaseous material orbiting only a few light years from the center. This 10^4 solar mass ring is clumpy and rotating around a cluster of hot stars. These hot stars are embedded within a cluster of evolved and cool stars that extends over the central 1600 light years (ly) of the Galaxy. Within the cool molecular ring is ionized gas, known as Sgr A West. There is a non-thermal radio continuum on a scale of 30 to 70 ly that lies behind Sgr West. The gravitational interactions among these components are complicated by strong magnetic fields and relativistic particles as indicated by the radio radiation.

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[1] F. Yusef-Zadeh, F. Melia, M. Wardle, Science, 287, 85, 2000

Mid-Atlantic Occultations and Expeditions
February - Early March 2000

by David Dunham

Asteroidal Occultations and Appulses

DATE	Day	EST	Star	Mag	Asteroid	dmag	Dur s	Ap. in.	Location
Feb 7	Mon	18:42	SAO 93783	8.9	Elpis	3.8	15	3	Lake Michigan
Feb 14	Mon	23:07	SAO 58392	8.3	Eurykleia	5.6	24	2	IL-IN; w. KY
Feb 15	Tue	1:56	SAO 97095	6.8	Miriam	7.0	9	1	SC to w. KY
Feb 26	Sat	0:57	SAO 139386	9.3	Nysa	1.3	25	3	cen. PA, ne MD
Feb 28	Mon	23:38	SAO 76874	8.4	Khama	8.3	4	2	sw VA, ne NC

Grazing Occultations

DATE	Day	EST	Star	Mag	%	alt	CA	Location
Feb 9	Wed	20:08	SAO 129029	7.9	19+	19	6S	Chesapeake, VA
Feb 15	Tue	18:00	nu Gem	4.1	82+	48	9S	Annapolis, MD; Sun alt. -5*
Feb 27	Sun	3:45	ZC 2391	7.0	48-	21	13S	Lancaster, PA & n. DE

*The path also passes north of Woodbridge and south of Alexandria, VA, and over Temple Hills, MD, but the Sun alt. is -4 deg. there; it will help to observe from the Annapolis area.

Total Lunar Occultations

DATE	Day	EST		Star	Mag	%	alt	CA	Notes
Feb 7	Mon	19:05	D	psi1 Aqr	4.2	6+	7	76S	ZC 3419; Moon az. 252 deg.
Feb 11	Fri	23:23	D	mu Ceti	4.3	40+	7	86S	ZC 0405; Moon az. 278 deg.
Feb 12	Sat	20:06	D	ZC 0516	6.9	50+	54	88N	possible double?
Feb 12	Sat	23:32	D	ZC 0526	6.7	52+	17	20S	
Feb 13	Sun	22:31	D	SAO 094019	6.7	63+	41	51S	
Feb 15	Tue	17:54	D	nu Gem	4.1	82+	47	17S	Sun alt. -3; graze, Annapolis
Feb 15	Tue	18:04	R	nu Gem	4.1	82+	49	1S	Sun alt. -5; ZC 0995
Feb 17	Thu	4:02	D	ZC 1186	6.0	92+	14	15S	Terminator 11" away
Feb 17	Thu	22:54	D	delta Cnc	3.9	97+	69	86S	
Feb 18	Fri	4:34	D	X Cancri	6.3	98+	18	63S	semi-regular var., ZC 1331
Feb 18	Fri	5:14	D	ZC 1335	6.2	98+	10	71S	Spectral type K1
Feb 23	Wed	4:49	R	ZC 1923	6.8	84-	42	54S	Spectral type K0
Mar 1	Wed	5:22	R	ZC 2802	6.4	21-	14	88S	Spectral type K0

Phone the IOTA occultation line, 301-474-4945, for updates and details, or check IOTA's Web site at http://www.lunar-occultations.com/iota

David Dunham, 2000 January 16, home 301-474-4722; office 240-228-5609;

Meteor Showers

Full Moon: February 19

Major Activity: None

Minor Activity

Radiant	Duration	Maximum
Aurigids	January 31-February 23	Feb. 5-10
Alpha Centaurids (ACE)	February 2-25	Feb. 8/9
Beta Centaurids	February 2-25	Feb. 8/9
Delta Leonids (DLE)	February 5-March 19	Feb. 22/23
Sigma Leonids	February 9-March 13	Feb. 25/26

Daylight Activity

Radiant	Duration	Maximum
Capricornids-Sagittariids	January 13-February 28	January 30-February 3
Chi Capricornids	January 29-February 28	February 13/14

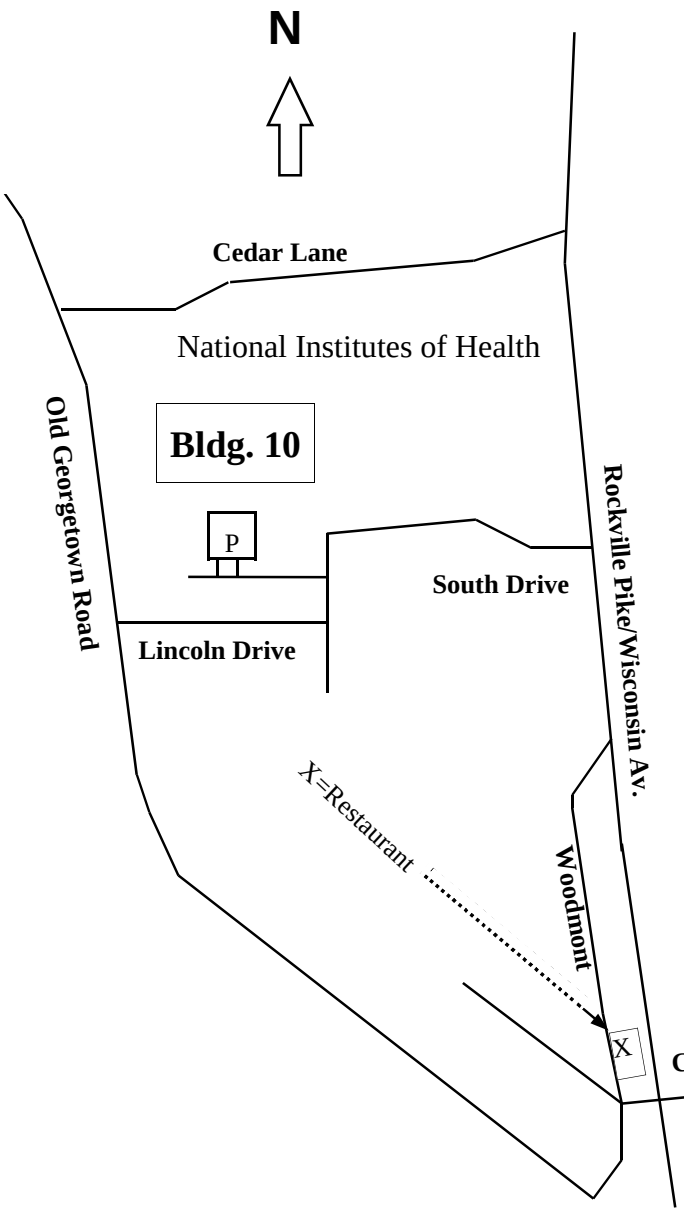
Source:http://comets.amsmeteors.org/meteors

Getting to the NCA Monthly Meeting

Saturday, February 5

5:30 P.M. - Dinner with the speaker and NCA members at the Athenian Plaka Restaurant, 7833 Woodmont Ave., Bethesda, MD

7:30 P.M. - NCA Meeting at Lipsett Auditorium in Building 10 at NIH,



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.

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, pass 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 amphitheater.
[Jay Miller, thank you for your help in revising these directions.]

Directions to the Restaurant

Dinner before the meeting will be at the
Athenian Plaka Restaurant,
7833 Woodmont Ave.
Bethesda MD
phone: 301/986-1337

If coming from the District, when going north on Wisconsin Avenue, ignore all signs for Woodmont Avenue until you pass Old Georgetown Road on your left. (Those signs put you on the wrong end of Woodmont Ave., which becomes one-way against you.) Once past Old Georgetown Rd., follow the direction below. [Thank you, Victor J. Slabinski, for this clarification.]

If coming from south of Bethesda, go north on Wisconsin Ave., turn left at onto Cheltenham Dr.(traffic light). Turn right onto Woodmont Ave. **(alpha)** Continue North on Woodmont Ave. for 1.5 blocks to the restaurant, which is on the right side of Woodmont Ave. Free parking on the upper level of the Suburban Bank lot

If coming from north of Bethesda, go south on the Rockville Pike (Rt. 355) which becomes Wisconsin Ave. Turn right at Cheltenham Dr. (traffic light). Turn right onto Woodmont Ave. See **alpha** above.

After dinner, go north on Woodmont Ave to the traffic light at Rockville Pike (=Wisconsin Avenue) and turn left. Proceed north on the Rockville Pike and follow "directions to the meeting place" at the top of this page.

Other National Capital Area Meetings, etc.

U.S. Naval Observatory (USNO)
Mondays, February 7, 14, 28 7:30 PM - USNO public nights in Northwest Washington, D.C. (off Massachusetts Avenue). Includes orientation on USNO's mission, viewing of operating atomic clocks, and glimpses through the finest optical telescopes in the Washington-Baltimore region. Held regardless of cloud cover. Information: USNO Public Affairs Office, 202/762-1438. Home page: http://www.usno.navy.mil.

Department of Terrestrial Magnetism (DTM) Carnegie Institute — Wednesdays at 11:00 a.m. in the Seminar Room of the Main Building. Call (202) 686 4370 to confirm.
February 2, Joseph A. Nuth II, Laboratory for Extraterrestrial Physics, NASA GSFC, "Crystalline Stardust and The Formation Age of Comets: New Insights from Laboratory Studies"
February 9, Anahita Tikku, Laboratory for Satellite Altimetry, NASA GSFC/ NOAA, "Tectonics of the Northern Natal Valley"
February 16, Vera C. Rubin, DTM, "Galaxies in the Virgo Cluster"
February 23, Emilie E. E. Hooft, DTM and Department of Geological Sciences, University of Oregon, "The New and the Old of Imaging Volcanoes on Thick and Thin Crust"

Goddard Scientific Colloquium — All seminars will be held in GSFC Building 3 Auditorium at 3:30 P.M. Contact Carol Krueger, at (301) 286-6878 to confirm.
February 11, Gary Hinshaw, GSFC, "Observing the Cosmic Microwave Background: A Unique Window on the Early Universe"
February 18, Mario Acuna and Jack Connerney, GSFC, "Update on Mars Magnetism"
February 25, Pierre Sokolsky, University of Utah, "The Highest Energy Cosmic Rays"

Laboratory for Astronomy and Solar Physics (LASP) — Seminars are on Thursday at 3:30 PM in GSFC Bldg. 21, Room 183A.
February 3, George Sonneborn, GSFC, "First Science Results from FUSE"
February 10, Neil Gehrels, GSFC, "Recent Gamma Ray Burst Discoveries and the Swift MIDEX Mission"
February 17, Giovanni Fazio, Harvard University, "The Space Infrared Telescope Facility"
February 24, David Schlegel, Princeton University, "Interstellar Dust Emission as a CMBR Foreground"

Laboratory for High Energy Astrophysics (LHEA) Tuesday Seminar Series
NASA GSFC Building 2, Ground Floor Conference Room, 3:30 P.M.
February 08, Dr. Igor Moskalenko, NRC, "Diffuse Gamma-Ray Emission from Cosmic Rays"
February 15, Dr. George Sonneborn, LASP/GSFC, "First Scientific Results from the FUSE Mission"
February 22, Dr. Theodore Gull, LASP/ GSFC, "Eta Carinae: Dance of the Veils"
February 29, Dr. Reba M. Bandyopadhyay, NRL, "Science Results from the USA Experiment"

LASP Stellar & Extra-Galactic Astronomy Lunch — Talks are Wednesdays at 12:00 Noon in Room 242 of Building 21.
February 2, Stephen G. Benka American Institute of Physics *Physics Today* Today
February 9, Bernie Rauscher STScI Optical & Near-IR Imaging of Spiral Galaxy Halos
February 16, Jason Pun GSFC/NOAO Dynamic Structure of SN 1987A Debris
February 23, Eleni Chatzichristou GSFC/ NRC Evolution vs. Orientation in Seyfert Galaxies

Maryland Space Grant Observatory — Open House every Friday evening (weather permitting), Bloomberg Center of Physics and Astronomy, Johns Hopkins University, Baltimore, MD. Information: 401/516-6525 or www.pha.jhu.edu/facilities/observatory/telescope.html.

Montgomery College's Planetarium, Takoma Park — Saturday, February 19 at 7:00 P.M. "African Skies"

University of Maryland College Park Astronomy Department Colloquia — All colloquia are held on Wednesdays at 4:00 PM. Location will vary. Please check their web site at http://www.astro.umd.edu/colloquia/ for current listings.
February 2, Dr. Romeel Dave, Princeton University, "The Evolution of the Intergalactic Medium" 4:00-5:00 p.m., CSS 2400

Northern Virginia Astronomy Club (NOVAC) a group dedicated "To Observe and Help Others to Observe" meets the second Sunday of each month at Lecture Hall 1 on the Fairfax campus of George Mason University. The Lecture Hall is next to Fenwick Library, on the North side of campus across Patriot Circle from the parking lots. Park in lots G and F. Parking in these lots is free on Sundays. Meetings start at 6:00 p.m. Web site is http://astro.gmu.edu/~novac

University of Maryland Observatory on Metzerott Road open house on 5 and 20 of each month.
February 5: 8:00 p.m.

Greenbelt Astronomy Club meets 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.

National Air & Space Museum – Free Lectures at the Einstein Planetarium and Other daily events. 202-357-1550, 202-357-1686, or 202-357-1505 (TTY) Home page: http://www.nasm.edu.

Science Fair Judges Needed

The various county science fairs are coming up and we will need volunteers to judge projects for the NCA awards. NCA gives a special award in these fairs consisting of membership in NCA with a year's S&T subscription.

The Montgomery County Science fair is Saturday, 1 April, at NIST. Interested judges can contact Jay Miller at 301-530-7942.

Contact Bob Bolster to volunteer as a judge for the Virginia Science Fair, and Jeff Norman for the D.C. Science Fair.

Newsletter Deadline for March *Star Dust*, February 15

Please send submissions to Elliott Fein at elliott.fein@erols.com. **Text must be in ASCII or Word. Graphics submitted must be in TIFF, GIF, or JPEG**.
Thank you.

National Capital Astronomers, Inc.

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Harold Williams, NCA Webmaster, hwilliam@mc.cc.md.us, 301-650-1463 planetarium, 301-565-3709 home.
Leith Holloway, NCA contact for Junior members, jleithh@aol.com, 301-564-6061, please no calls during 6-8 pm.
Elliott Fein, NCA Star Dust Editor, elliott.fein@erols.com, 301-762-6261 home.
NCA Web Page: http://capitalastronomers.org/

SERVING SCIENCE & SOCIETY SINCE 1937

NCA is a nonprofit, membership supported, volunteer run, public-service corporation dedicated to advancing astronomy, space technology, and related sciences through information, participation, and inspiration, via research, lectures, presentations, publications, expeditions, tours, public interpretation, and education. NCA is the astronomy affiliate of the Washington Academy of Sciences. All are welcome to join NCA.

SERVICES & ACTIVITIES:

Monthly Meetings feature presentations of current work by researchers at the horizons of their fields. All are welcome; there is no charge. *See* monthly *Star Dust* for time and location.

NCA Volunteers serve in a number of capacities. Many members serve as teachers, clinicians, and science fair judges. Some members observe total or graze occultations of stars occulted by the Moon or asteroids. Most of these NCA members are also members of the International Occultation Timing Association (IOTA).

Publications received by members include the monthly newsletter of NCA, *Star Dust*, and an optional discount subscription to *Sky & Telescope* magazine.

Consumer Clinics: Some members serve as clinicians and provide advice for the selection, use, and care of binoculars and telescopes and their accessories. One such clinic is the semiannual event held at the Smithsonian Institution National Air and Space Museum.

Fighting Light Pollution: NCA is concerned about light pollution and is interested in the technology for reducing or eliminating it. To that purpose, NCA is an Organization Member of the International Dark Sky Association (IDA). Some NCA members are also individual members of IDA.

Classes: Some NCA members are available for educational programs for schools and other organizations. The instruction settings include star parties, classroom instruction, and schoolteacher training programs that provide techniques for teaching astronomy. NCA sponsors a telescope-making class, which is described in the Star Dust "Calendar of Monthly Events".

Tours: On several occasions, NCA has sponsored tours of astronomical interest, mainly to observatories (such as the National Radio Astronomy Observatory) and to the solar eclipses of 1998 and 1999.

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, the Smithsonian Institution, the U.S. Naval Observatory, and others.

NCA Juniors Program fosters children's and young adults' interest in astronomy, space technology, and related sciences through discounted memberships, mentorship from dedicated members, and NCA's annual Science Fair Awards.

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