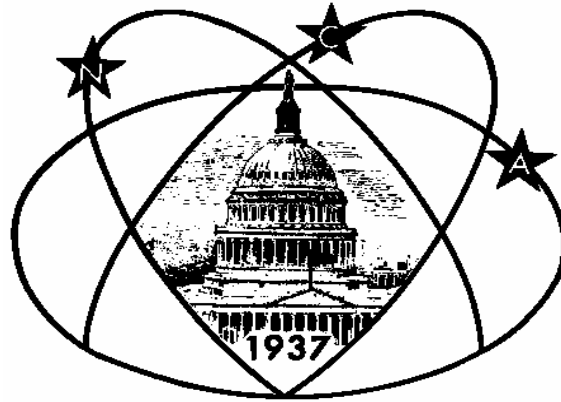


Star



Dust

National Capital Astronomers, Inc.

<http://capitalastronomers.org>

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March Talk: Dr. Edward Wollack, “WMAP – A Glimpse of the Early Universe” *Submitted by Gary Joaquin*

Dr. Edward Wollack will present the featured talk for the March 1 meeting of the National Capital Astronomers: “WMAP – A Glimpse of the Early Universe.” The meeting will be held at 3:00 P.M. in the Bethesda-Chevy Chase Regional Services Center of Montgomery County, 4805 Edgemoor Lane (Second Floor), Bethesda, MD.

Abstract: The early Universe was incredibly hot, dense, and homogeneous. A powerful probe of this time is provided by the relic radiation which we refer to today as the Cosmic Microwave Background (CMB). Images produced from this light contain the earliest glimpse of the Universe after the “Big Bang” and the signature of

the evolution of its contents. By exploiting these clues, precise constraints on the age, mass density, and geometry of the early Universe can be derived. The history of this intriguing cosmological detective story will be reviewed. Recent results from NASA’s *Wilkinson Microwave Anisotropy Probe* (WMAP) will be presented.

Biography

Dr. Wollack graduated with Honors in Physics from the University of Minnesota’s Institute of Technology in 1987. He obtained a Ph.D. in Physics from Princeton University in 1994. While at the National Radio Astronomy Observatory’s Central

(Continued on page 4)

“The Untranquil Universe” A Talk by Dr. Nancy Grace Roman *Reviewed by Gary Joaquin*

At the January 4 NCA meeting, Dr. Nancy Grace Roman gave a presentation entitled, “The Untranquil Universe,” where her premise was that the Universe isn’t such a quiet place at all. In fact, there are numerous astronomical phenomena of great violence that can be safely observed within the span of a human lifetime. She then served as our personal escort and expert as we embarked on a grand tour of the Universe.

Getting Ready for Our Journey

To prepare us for our journey, Dr. Roman

stated that it is essential that we understand the principles of accretion and magnetism. She began with an illustration of two stars, one small, densely compacted star and a larger less-dense companion that were so close together that they shared a common envelope of dust and gas. The gravitational pull of the dense star attracts matter from the larger star, which falls toward it. Because this matter has momentum, it does not fall immediately to the surface of the dense star. Instead, it forms an accretion disk of dust and gas encircling the dense star. Periodically, the accretion disk be-

Judges Needed

Every year, NCA presents an award for the best astronomy-related project at the various local science fairs. Please volunteer to assist judging. Even if you are not an expert in astronomy there will be other members judging with you. We would like to have two or three people at each fair. The dates for the area fairs are:

- March 15 — Fairfax County
- District of Columbia
- Northern Virginia, Arlington
- March 22 — Montgomery County
- April 5 — Prince George’s County

Please let me know if you are willing to work with others to judge at a fair, jhmiller@os2bbs.com, or 301-530-7942 (home). Thanks.

Jay H. Miller

I’ve just received word that NIST has cancelled the use of their facility for the Montgomery County Fair. If the county can’t find another location such as Montgomery College, Rockville, which they used last year, they will have to cancel this year’s fair. I should know by the time of the March meeting.

comes so dense that matter falls to the surface of the dense star.

Magnetism is the other primary principle essential to appreciate the tour on which we were about to embark. Most particles in the Universe have an electromagnetic charge. They may be free electrons, positive ions, molecules, even grains of dust. The Universe is full of charged particles.

When you place a piece of paper over a bar magnet and sprinkle iron filings on top of the paper, the filings align themselves

(Continued on page 3)

NCA Events This Month

The Public is Welcome!

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

Fridays, March 7, 14, 21, and 28, 6:30 to 9:30 P.M., NCA Telescope-making Classes at the Chevy Chase Community Center, at the northeast corner of the intersection of McKinley Street and Connecticut Avenue, N.W. For more information, see article below. Contact instructor Guy Brandenburg at 202-635-1860 or email him at gfbrandenburg@yahoo.com.

Saturday, March 1 and Fridays, March 7, 14, 21 & 28, 8:30 P.M. Open nights with NCA's 14-inch telescope at Ridgeview Observatory near Alexandria, Virginia. For more information, see below.

Saturday, March 1, 3:00 P.M.

NCA meeting in the Bethesda-Chevy Chase Regional Services Center of Montgomery County, 4805 Edgemoor Lane, (Second Floor), Bethesda, MD. See map and directions on Page 6.

Dr. Edward Wollack will give the featured talk, "WMAP – A Glimpse of the Early Universe"

Saturday, March 1, following the meeting, dinner with the speaker and NCA members at

To be announced at the meeting. Bethesda, MD

Observing with the NCA C-14 Bob Bolster

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

Prime Objects

Saturday, March 1 Jupiter, Saturn, M42, M44 Double Cluster

Friday, March 7 Crescent Moon, Jupiter, Saturn

Friday, March 14 Gibbous Moon, Jupiter, Saturn

Friday, March 21, 28 Jupiter, Saturn, M42, M44 Double Cluster

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

NCA Telescope/Mirror-Making Workshop Guy Brandenburg

The weekly NCA telescope- and mirror-making classes continue at the Chevy Chase Community Center on Friday evenings, from 6:30 to 9:30 p.m. The CCCC is located at the northeast corner of the intersection of McKinley Street and Connecticut Avenue, NW, in Washington, D. C.4.9 a couple of blocks inside the Maryland line at Chevy Chase Circle, near the Avalon Theater. There is off-street parking in back of the center. We have lots of glass blanks, all necessary abrasives, pitch, and testers on hand. We also have use of some power woodworking and metal working tools, and we also have a vacuum chamber/aluminizer to put the final reflective

coating on your finished mirror. Currently, we have people of ages 8 to 60 working on various sized mirrors and other projects. (The youngest participants need a parent to be present to help with the work.)

We could use clean, empty squeeze bottles to put slurries of fine abrasives in. Empty shampoo, lotion, or soap containers work great. We also use a lot of newspaper to cover the benches and absorb messes. If you can bring in a week's worth of any daily newspaper, that will help, too. For more information, email instructor Guy Brandenburg at gfbrandenburg@earthlink.net or call him at 202-262-4274.

The President's Corner

A recent email to NCA's e-mail group questioned whether we had an outreach program. Since we are a tax-exempt organization, we have to do something to justify this designation. It turns out we are quite active in interacting with the community. The most obvious are our monthly meeting which includes an advertised public lecture, our telescope-making class run by Guy Brandenburg, and our Exploring the Sky program with the National Park Service run by Joe Morris and regularly assisted by Andrew Seacord. However, we do much more. Every year we present awards in the area science fairs for outstanding astronomy related projects. Members volunteer at the Air and Space Museum. Jeff Guerber and I were at the University of Maryland observatory last month assisting at their clinic for new telescope owners. At all of these events, NCA is mentioned and publicized. Harold Williams is assisting a group of children and I have been asked to help a scout group and a Rockville neighborhood that want to have star parties. Harold and I have helped a Bethesda elementary school with their monthly observing sessions. I am sure there are other events that I am forgetting. Obviously, however, we need more assistance. It seems to be the same group of individuals each time. Even if you feel you lack astronomical expertise, you can learn. You may find out you are more knowledgeable than you thought. If you don't have a telescope, you can assist at Exploring the Sky as Nancy Roman has done, by explaining the sky. I'm not a whiz at finding "faint fuzzies" in the sky, but there are enough bright objects that I can get by. Science-fair judging doesn't require a vast amount of astronomical knowledge, just a desire to judge the merits of the projects. And speaking of the science fairs, they will be coming up in March and April, so now is the time to volunteer. Montgomery County's is 22 March at NIST from 9:30 to noon. Anyway, while I don't know what the other local clubs are doing, we must be near or at the top in interacting with the community.

Jay H. Miller

www.darksky.org

Review of talk by Dr. Nancy Grace Roman, continued

(Continued from page 1)

along the magnetic lines of force that begin and end with the oppositely charged poles of the magnet. Charged particles will not cross these lines of force. Instead, they will move along the lines of force and come into contact with the magnet at its poles.

When charged particles move, they create a magnetic field around the path in which they are moving. Since almost everything in the Universe has an electrical charge, almost everything in the Universe creates a magnetic field. When there are a lot of particles in proximity to one another, it doesn't necessarily mean that they will induce a collectively stronger magnetic field. If they are moving in random directions, then their magnetic fields tend to cancel each other out. However, if they are all moving in the same direction, the result can be an enormous magnetic field.

Dr. Roman noted that there are many examples of this in nature. Our Sun has a magnetic field, but not a very strong one, because it doesn't rotate very fast. The Earth generates a magnetic field because of the motion of the charged fluid beneath its crust. Moving a little further away from home, Dr. Roman, showed a star about which an accretion disk of charged particles was revolving, which induced a magnetic field manifesting itself with ejected jets of particles at the star's magnetic polar regions. These particles can approach close to the speed of light, shooting off into space like two giant searchlights.

The Grand Tour

Now that we had just enough knowledge to understand our journey, Dr. Roman led us on a grand tour of the Universe, so we could see for ourselves that the Universe is not such a tranquil place.

Young Protostars

Our first stop was to visit a young protostar, a star that is primarily accreting material in a surrounding disk. Protostars are just becoming hot enough to burn hydrogen in their nuclei. Periodically, the protostar's accretion disk becomes overloaded and matter falls to the surface of the star. When this material strikes the surface of the star, the impact creates heat and the star brightens proportionately. The outburst of heat and light can last about two hundred days.

Some protostars are so enshrouded with

dust that the dust blocks all of the visible light from view. This doesn't mean that events of extraordinary violence are not occurring. X-ray telescopes have imaged flares on the order of 100,000 times brighter than those observed from our Sun.

Red Dwarfs

Just heavy enough to convert hydrogen into helium, faint red dwarf stars are another example of rapid change in the Universe. They emit flares that are much brighter than their own normal luminescence, on the order of 18 times brighter, during events that last about a minute.

Solar Flares

Violent forces are at work in our Sun. Sunspots look darker because they are cooler than the surrounding area. They are cooler because they are areas where the intensity of the magnetic field inhibits convective heat transport to the surface of the Sun. The surface of the Sun is organized into cells with strong lines of force rising up from the center and falling down along the perimeter of the cell. Often these dynamics are much less uniform, giving rise to turbulence and dramatic flares; some that stretch out beyond the surface of the Sun a distance equal to a fraction of the Sun's diameter while others reach out a total of 10 solar diameters. When flares eject plasma in the direction of the Earth, it can have serious consequences. Within two or three days, solar plasma ejections strike the Earth's magnetic field and ionosphere, causing widespread communications interference. Just recently, concentric solar surface patterns have been observed about regions where flares have just occurred. Dr. Roman suggested that these rapidly appearing and disappearing patterns might be called "helioquakes."

Planetary Nebula

These really have nothing at all to do with planets; however, when astronomers discovered them, they thought that they resembled "planets," thus the name "planetary nebula" stuck. This phenomenon is the result of a star, typically one much older than our Sun, having consumed its hydrogen fuel, expanded into a red giant and collapsed into a white dwarf, while ejecting a ring of material.

Sooty Red Giants

The atmospheres of red giants contain oxygen and carbon, most which will combine to form carbon monoxide. Typically, there

is an excess of oxygen. Less frequently, red giants will have excess carbon which forms soot so dense that it can conceal the star sufficiently to lower its brightness. Dr. Roman showed one example where a star became about 300 times dimmer and took 10 days to burn away the soot and resume its normal brightness.

Cataclysmic Variables

Once a star less than 1.4 times the mass of our Sun goes through its red giant stage, it doesn't have any more fuel to burn to keep it extended, so it condenses into a white dwarf. A star like our Sun will condense into a body about the size of the United States. When such a star has a stellar companion, it accumulates material from its companion into an accretion disk, as was described earlier. As the material builds up in the accretion disk and falls to the surface of the dwarf, the impact raises the surface temperature of the dwarf, increasing its brightness. Dr. Roman showed an example of such a recurrent event which lasted about 15 minutes and recurred every 100 days. In this example, hydrogen was added to the dwarf's atmosphere such that the bursts on the dwarf's surface were hot enough to restart nuclear fusion.

Recurrent Novae

These are like cataclysmic variables except that the period of this event is on the order of 30 to 100 years or more. In fact, novae that we do not commonly think of as repeating, probably do so at intervals of thousands or even tens of thousands of years. This assertion is supported by the fact that almost all known novae are in binary systems with fresh supplies of accreted material, and there is typically no indication that they change between their pre-explosive state and post-explosive state, i.e., after the explosions, novae looks exactly as they did before. Dr. Roman showed a typical example of a light curve of a nova in which its brightness rose to 4th magnitude and fell to 13th magnitude.

X-ray Novae

When stars more than 1.4 times the mass of the Sun run out of nuclear fuel they condense into a body that is so dense that the atomic nuclei and its electrons are completely dissociated and combined. These stars are called "neutron stars"; they are much denser than white dwarfs, e.g., a star that is twice the mass of the Sun would

(Continued on page 4)

Review of talk by Dr. Nancy Grace Roman, continued

(Continued from page 3)

condense into a neutron star that is about the size of the District of Columbia. When material from an accretion disk surrounding a neutron star falls to its surface, the neutron star's gravity accelerates it so much that the impact results in the emission of x-rays.

An unusual neutron star phenomenon was first observed about 25 years ago. Spectrum observations yielded shifts on the order of 1/3 the speed of light, but, amazingly enough, every 160 days the material observed shifted from 1/3 the speed of light moving toward Earth to 1/3 the speed of light moving away! What was actually being observed were high-speed jets of material emitted from the neutron star poles like gigantic cosmic searchlights.

Black Holes

When stars exceed three times the mass of the Sun, they ultimately collapse to become black holes with gravity fields so strong that even light cannot escape. A companion star can provide material for an accretion disk which is hot enough to emit x-rays outside the black hole's event horizon, the boundary before which light can still escape. It is now generally accepted that every spiral galaxy has a black hole in its center, often comprising millions of solar masses. The black hole in the center of the Milky Way is much more modest in size, about a few hundred thousand solar masses. Recently, it has been observed that a black hole appears to be wandering throughout the Milky Way, accreting material; little is known of its dynamics.

Supernovae

When a massive star exhausts the hydrogen in its core, and when the core contracts, a hydrogen-fusion shell ignites,

swelling the star into a giant. As a giant, it fuses helium in its core and then in a shell, leaving behind a carbon-oxygen core that contracts and grows hotter. When the star finally develops an iron core, energy production declines and the iron core eventually contracts. As inner and outer layers collapse too fast, a shock wave develops and begins to move outward. Such a shock wave can blast the outer part of the star into space and produce the explosion we see as a supernova. Increases in luminosity can be on the order of 10,000 times like SN1987A in the Large Magellanic Cloud.

Colliding and Cannibal Galaxies

About 45 years ago, astronomers laughed when it was suggested that two galaxies were colliding in the region of Cygnus. Today, observations and computer modeling confirm that galaxies do collide. Dr. Roman displayed one such collision where galaxies are interacting gravitationally to create extended tidal tails in one another. It is now believed today that most elliptical galaxies are the results of galactic collisions. Dr. Roman also noted that collisions between galaxies like the Milky Way with much smaller galaxies like the Magellanic Clouds area good examples of "cannibal galaxies" where the larger galaxy ultimately consumes the smaller galaxy.

Gamma Ray Bursts

In the early 1970s, the U.S. Air Force launched a series of satellites to detect nuclear tests. While they didn't detect evidence of nuclear tests, they did detect bursts of gamma radiation. This had to be at great cosmological distances. These short bursts, ranging in duration from a fraction of second to as long as a minute or two, made it initially difficult to detect their source. Spacecraft equipped with both

gamma-ray and optical cameras have been able to detect the gamma-ray bursts. The optical camera slews to image the same area of the sky, confirming the region of the sky in which the burst originated. Tremendous red shifts have been observed, as high as 4.5, indicating distant events going back almost as far in time as the Big Bang. Such phenomena may be caused by very distant collisions of neutron stars or black holes; however no one is entirely sure at this time.

Gamma ray bursts do occur within the Milky Way galaxy, originating in neutron stars with very strong magnetic fields called magnetars. One such burst emanating from a distance of 20,000 light years was strong enough to affect the Earth's ionosphere and cause communications problems.

In Summary

Dr. Roman has conclusively demonstrated that our Universe is anything but tranquil. We are indeed fortunate to have been given such a personal and compelling tour by an explorer who has devoted her life to understanding the cosmos. NCA expresses its appreciation to Dr. Roman for a fascinating presentation.

Dr. Wollack's March Talk

(Continued from page 1)

Development Laboratory, he contributed to the design, fabrication, and characterization of cryogenic millimeter-wave High-Electron-Mobility-Transistor (HEMT) amplifiers for ground-based and space-based applications. He joined the NASA Goddard Space Flight Center's Infrared Astrophysics Branch in 1998 where he concentrated on integration and test of the Wilkinson Microwave Anisotropy Probe (WMAP) satellite. He presently serves on the WMAP's science working group and received the NASA Exceptional Achievement Medal for his contributions to the realization of the instrument.

His research interests include astrophysical and cosmological observations at radio through submillimeter wavelengths. These research goals drive his interests in the advancement of astronomical instrumentation, precision measurement techniques, and fundamental investigations of detector noise properties.

Star Dust is Now Available Electronically

Any member wishing to receive *Star Dust*, the newsletter of the National Capital Astronomers, via e-mail as a PDF file attachment, instead of hardcopy via U.S. Mail, should contact Nancy Grace Roman, the NCA Secretary, at nancy.roman6@verizon.net or 301-656-6092 (home).

**The deadline for the April Star Dust is March 15.
Please send your material to Elliott Fein by that date to ensure inclusion.**

**Send submissions to Elliott Fein at
elliott.fein@erols.com.**

**Text must be in ASCII, MS Word (97 or earlier),
or WordPerfect.**

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

Mid-Atlantic Occultations and Expeditions

by David Dunham

Asteroidal Occultations

Date	Day	EST	Star	Mag	Asteroid	dmag	dur. Ap.		Location
Mar 1	Sat	6:02	TYC49440158	10.3	Atalante	3.1	8	5	s.e. MD, VA
Mar 8	Sat	2:29	TYC19100493	11.4	Backlunda	3.2	12	8	s. N. Carolina
Mar 9	Sun	19:32	TYC07860180	11.1	Suevia	2.6	12	7	DE, seMD, e. PA
Mar 15	Sat	23:01	TYC01622791	11.5	Gerlinde	2.8	13	8	Quebec
Mar 16	Sun	22:08	TYC14160054	10.3	Lomia	2.5	15	5	s. Ont., n. NY
Mar 21	Fri	2:11	SA0 98075	8.3	Jupiter	0.5	230m	6	North America
Mar 23	Sun	5:02	SA0 96908	6.7	Interamnia	5.0	66	2	Hawaii
Mar 29	Sat	6:36	TYC62960177	11.1	Chiron	6.2	14	7	cen. Calif.
Mar 31	Mon	2:46	TYC61500220	10.0	Klytaemnestra	3.2	8	5	Virginia

Grazing Occultations

DATE	Day	EST	Star	Mag	% alt	CA	Location
Mar 7	Fri	20:32	SA0 093028	8.7	20+ 22	4S	Sunbury & Allentown, PA
Mar 11	Tue	21:43	ZC 0902	6.6	57+ 51	2N	Bethesda, Lanham, & Bowie, MD
Mar 12	Wed	19:27	ZC 1049	6.8	66+ 76	5S	Germantown and Laurel, MD
Mar 12	Wed	23:45	40 Gem	6.4	68+ 38	5N	Scranton, PA & HighBridge, NJ
Mar 20	Thu	4:53	82 Vir	5.0	95- 25	13S	Scranton, PA & HighBridge, NJ
Mar 22	Sat	2:52	ZC 2217	5.5	80- 30	15S	Mt. Airy, Beltsville, & Bowie, MD
Apr 3	Thu	19:47	SA0 092910	8.8	4+ 6	6S	Laurel & e. Beltsville, MD

Total Lunar Occultations

DATE	Day	EST	Ph Star	Mag	% alt	CA	Sp.	Notes
Mar 4	Tue	19:10	D ZC 0049	6.1	3+ 5	78N	K1	azimuth 263 deg.
Mar 7	Fri	22:09	D ZC 0394	7.5	21+ 4	74N	K0	azimuth 284 deg.
Mar 8	Sat	20:50	D SA0 093415	8.1	29+ 29	88S	G5	double, 6" sep., see next
Mar 8	Sat	20:51	D SA0 093414	9.1	29+ 29	88S	G5	D 9s after SA0 93415
Mar 10	Mon	0:09	D 51 Tauri	5.6	39+ 4	26N	F0	ZC631; az. 295; close dbl.
Mar 10	Mon	21:30	D SA0 076952	7.3	48+ 43	63S	K0	
Mar 10	Mon	21:34	D SA0 076942	7.8	48+ 42	9S	K0	bright graze, s. of DC
Mar 11	Tue	19:33	D SA0 077736	7.8	57+ 73	46S	A2	2nd mag 10.3, ".4 in PA35d
Mar 11	Tue	21:35	D ZC 0902	6.6	58+ 51	5N	K0	dark graze, n. of DC
Mar 11	Tue	23:57	D ZC 0918	7.0	58+ 26	89S	K0	
Mar 12	Wed	23:30	D 40 Gem	6.4	68+ 42	34N	B8	Graze in NJ; see above
Mar 13	Thu	0:44	D ZC 1068	7.1	68+ 27	56S	A2	
Mar 13	Thu	0:56	D SA0 078995	7.4	68+ 25	42S	A3	
Mar 14	Fri	1:48	D SA0 079868	7.3	78+ 25	21S	K0	
Mar 15	Sat	0:02	D ZC 1334	7.0	86+ 54	44N	G5	
Mar 15	Sat	1:35	D ZC 1342	7.6	86+ 36	21S	G5	
Mar 15	Sat	18:34	D ZC 1436	6.8	92+ 37	46N	K0	Sun alt. -5 deg.
Mar 16	Sun	21:13	D ZC 1569	6.9	97+ 52	66S	A2	
Mar 19	Wed	22:03	R 72 Vir	6.1	95- 21	83N	F2	ZC 1937
Mar 20	Thu	3:40	R ZC 1951	7.1	95- 42	74S	K0	eq. dbl., sep. 2.8", PA 41d
Mar 25	Tue	8:02	D phi Sgr	3.2	45- 22	-67N	B8	ZC 2721; Sun alt. +22d
Mar 25	Tue	9:18	R ZC 2721	3.2	45- 15	72N	B8	close double?; Sun +36d
Mar 27	Thu	5:11	R SA0 189469	7.7	26- 12	64S	K0	

Phone the IOTA occultation line, 301-474-4945, for updates,
 or check the local IOTA Web site at <http://iota.jhuapl.edu>
 David Dunham, e-mail dunham@erols.com, phone 301-474-4722

Getting to the NCA Monthly Meeting

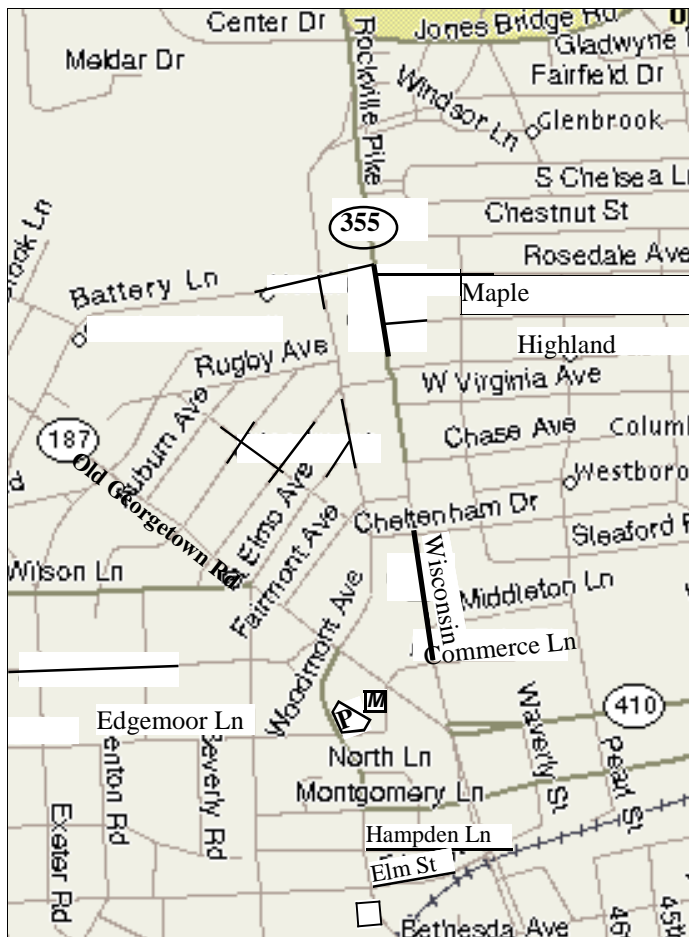
Saturday, March 1

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

Dr. Edward Wollack will give the featured talk, “WMAP – A Glimpse of the Early Universe”.

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

To be announced at the meeting.



Directions to the Meeting Place

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

From North of Bethesda

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

From South of Bethesda

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

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

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Editor: Elliott Fein, Co-editor: Adele Fein, Editorial Advisor: Nancy Byrd. Consultant: Jeffrey Norman
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National Capital Astronomers, Inc.

Jay H. Miller, NCA President, jhmiller@os2bbs.com, 301-530-7942 (home).

Gary Joaquin, NCA Vice-president, glj1@erols.com, 703-750-1636 (home).

Dr. Nancy Grace Roman, NCA Secretary, nancy.roman6@verizon.net, 301-656-6092 (home).

Jeffrey Norman, NCA Treasurer, jbnorman2@aol.com, 5410 Connecticut Avenue, NW, Apt. #717,
Washington, DC 20015-2837.

Trustees: Jeff Guerber, Dr. Andrew W. Seacord, II, Dr. Wayne H. Warren, Dr. Harold Williams

NCA Webmaster, Dr. Harold Williams, hwilliam@mc.cc.md.us, 301-650-1463 (planetarium), 301-565-3709 (home).

Elliott Fein, NCA *Star Dust* Editor, elliott.fein@erols.com, 301-762-6261 (home), 5 Carter Ct. Rockville, MD 20852-1005.

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

Appointed Officers and Committee Heads: Exploring the Sky - Joseph C. Morris; Meeting Facilities - Jay H. Miller;

Observing - Robert N. Bolster; Telescope Making - Guy Brandenburg; Travel Director - Sue Bassett; *Star Dust* Editor - Elliott Fein

SERVING SCIENCE & SOCIETY SINCE 1937

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

SERVICES & ACTIVITIES:

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

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

Publications received by members include the

monthly newsletter of NCA, *Star Dust*, and an optional discount subscription to *Sky & Telescope* magazine.

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

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

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

“Calendar of Monthly Events”.

Tours: On several occasions, NCA has sponsored tours of astronomical interest, mainly to observatories (such as the National Radio Astronomy Observatory) and to the solar eclipses of 1998 and 1999. Contact: Sue Bassett wb3enm@amsat.org

Discounts are available to members on many publications, products, and services, including *Sky & Telescope* magazine.

Public Sky Viewing Programs are offered jointly with the National Park Service, and others. Contact: Joe Morris. joemorris@erols.com or (703) 620-0996.

Members-Only Viewing Programs periodically, at a dark-sky site.

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

Fine Quality Telescope, 14-inch aperture, see “Calendar of Monthly Events”.

Yes! I'd like to join the NATIONAL CAPITAL ASTRONOMERS

Date:

Name(s): _____

Address: _____

Telephone: _____ E-mail: _____

Other family members who should receive a membership card: _____

Dues:

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

___ \$27 With *Star Dust* ONLY.

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

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

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

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

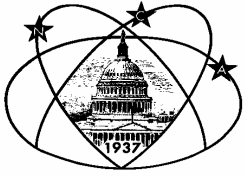
Junior members only: Date of Birth: _____ Only members under the age of 18 may join as juniors.

Tax deductible contribution: ___ Thank You.

___ I prefer to receive *Star Dust* by e-mail.

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

Mr. Jeffrey Norman, NCA Treasurer, 5410 Connecticut Ave NW #717, Washington DC 20015-2837



National Capital Astronomers, Inc.

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NCA c/o Nancy Roman
4620 N. Park Ave., #306W
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DATED MATERIAL**

Inside this issue:

March Speaker and His Talk	1
January's Speaker and Her Talk	1
Judges Needed	1
NCA Events This Month	2
President's Corner	2
Observing with the NCA C-14	2
NCA Telescope/Mirror-Making Workshop	2
Mid-Atlantic Occultations and Expeditions	5
Directions with Map to Meeting Place	6
About NCA & Membership Application	7