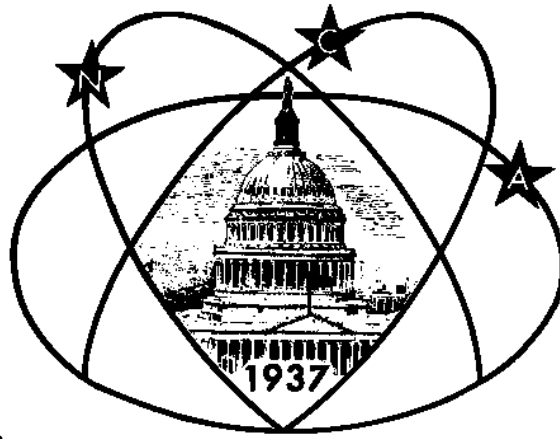


Star



Dust

National Capital Astronomers, Inc.

<http://capitalastronomers.org>

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September 2002

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September Talk: Dr. David DeVorkin, “Building the Universe (Gallery)” *Submitted by Gary Joaquin*

My talk will be a behind-the-scenes tour of how we built the Explore the Universe gallery at the National Air and Space Museum, which opened in September 2001 for an indefinite run. Learn how we brought into one room many of the most

significant telescopes in all of human history, from an original Huygens aerial telescope lens and William Herschel's original 20-foot telescope tube and mirror, to the actual Newtonian Mirror Cage from the

(Continued on page 6)

September Meeting Notice

The September meeting of the National Capital Astronomers will be held on the **14th** of September.

“Gamma-Ray Bursts, Galaxies, and Supernovae” A Talk by Dr. Jerry T. Bonnell *Reviewed by Dr. Wayne H. Warren Jr.*

An NCA First

Gamma-ray (hereinafter γ -ray) bursts (GRBs) are exciting, and nerve-wracking as well — so NCA members and guests learned during a lecture by Dr. Jerry Bonnell of USRA at Goddard's Laboratory for High-Energy Astrophysics. Dr. Bonnell's talk, given at the Bethesda-Chevy Chase Regional Services Center of Montgomery County on May 4, 2002, was an NCA first in the sense that it was given at the same meeting as his son, James M. Bonnell, was awarded an NCA science fair certificate for his Prince George's County Regional

Science Fair project (see the May 2002 issue of *Star Dust*).

What are γ -ray Bursts?

γ -ray bursts are the most energetic events in the Universe. They are observed over (now generally accepted) cosmological distances and are not yet explained; i.e., we do not know as yet what physical phenomena (there may be several) cause these tremendous releases of high-frequency electromagnetic radiation.

About γ rays

Dr. Bonnell began by displaying a diagram of the electromagnetic spectrum from γ rays, which have a size scale comparable to the atomic nucleus, to radio waves, whose wavelengths are about human-body to buildings in size. Recalling that wavelength, λ , is inversely related to frequency, ν , by the relation $\nu = c/\lambda$, where c is the velocity of light, and that the energy is related to frequency by $E = h\nu$, γ rays are, with the exception of cosmic rays, the highest energy radiation.

(Continued on page 3)

“Extrasolar Planets: First Reconnaissance” A Talk by Dr. R. Paul Butler *Reviewed by Dr. Nancy Grace Roman*

Dr. R. Paul Butler presented the featured talk at the June 15 meeting of National Capital Astronomers, “Extrasolar Planets: First Reconnaissance”.

Dr. Butler's colleagues in the search for extrasolar planets are Geoff Marcy, Steve Vogt, Debra Fischer, and Chris McCarthy.

Debra Fischer is doing all of the observing at Lick; Gregory Laughlin is responsible for the dynamics studies.

Late-breaking News

The introduction to this talk was a slide reminding the audience that 15 new planets had been announced during the week. As

we learned later, two of these were in a system with three planets. As earlier announced, 55 Cnc also has three planets. Several systems have two. More information on these and other extraterrestrial planets can be found on the Web site: www.exoplanets.org. No extrasolar planets

(Continued on page 4)

NCA Events This Month

The Public is Welcome!

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

Fridays, September 6, 13, 20, and 27, 6:30 to 9:30 P.M., NCA Mirror-Making Classes at the Chevy Chase Community Center, at the northeast corner of the intersection of McKinley Street and Connecticut Avenue, NW. For more information, e-mail Guy Brandenburg at gfbranden@earthlink.net or call 202-262-4274. See more information at right.

Fridays, September 6, 27, 8:30 P.M., Saturday, September 14, 8:30 P.M. Open nights with NCA's 14-inch telescope at Ridgeview Observatory near Alexandria, Virginia. See below.

Saturday, September 14, 3:00 P.M. - NCA meeting in the Bethesda-Chevy Chase Regional Services Center of Montgomery County, 4805 Edgemore Lane, (Second Floor), Bethesda, MD. See map and directions on Page 8. Dr. David DeVorkin, Curator, History of Astronomy and the Space Sciences at the National Air and Space Museum will present the featured talk "Building the Universe (Gallery)".

Saturday, September 14, following the meeting, dinner with the speaker and NCA members at
Heritage India
4931 Cordell Ave
Bethesda, MD
301-656-3373
(Indian food)

ETX-60 for Sale

MEADE ETX-60 AT ASTRO-TELESCOPE

with Autostar Hand Controller

\$450 or best offer

Phil Barringer 202-244-3492

or pbarringer@aol.com

NCA Telescope/ Mirror-making Workshop Guy Brandenburg

The NCA telescope- and mirror-making workshop has a new location, the wood shop in the basement of the Chevy Chase Community Center at the northeast corner of the intersection of McKinley Street and Connecticut Avenue, NW. There is parking in the back of the building. We meet every Friday evening from 6:30 to 9:30 p.m. We have glass, abrasives, polishing agents, and measuring instruments such as Foucault and Ronchi testers, and even an aluminizing chamber. We have access to some woodworking equipment and a metal-working lathe, so that much of the rest of your telescope can be manufactured here as well. "Classes" are very informal, and you can start and finish your project at any time. If you are merely curious, you can also come to see what telescope-making is all about. If you have an already-completed homemade or commercial mirror that you would like tested, we can do that as well. Prices for materials available upon request, but a full kit for a 6-inch diameter mirror, with instruction, is currently about \$70. During the month of September, we will meet on the 6th, 13th, 20th, and 27th. For more information, call Guy Brandenburg at 202-262-4274 or e-mail him at gfbranden@earthlink.net

The deadline for the October *Star Dust* is September 15. (Your cooperation in adhering to the deadline would be appreciated.)

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

Text must be in ASCII, MS Word, or WordPerfect.

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

Thank you.

***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 ngroman@erols.com, or via telephone at 301-656-6092 (home).

Observing with the NCA C-14 by Bob Bolster

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

Friday, September 6

Saturday, September 14

Friday, September 27

Prime Objects

M13, M57

Crescent Moon

Uranus, Neptune, M13, M57

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.

"More National Capital Area Astronomical Doings"

will not appear this month because of the space required to print reviews of two monthly NCA meetings.

"More National Capital Area Astronomical Doings" will reappear in the October *Star Dust*.

Review of “Gamma-Ray Bursts, Galaxies, and Supernovae”

(Continued from page 1)

Imaging γ rays

A comparison of whole-sky images of our galaxy in visible and γ -ray radiation is enlightening. A visible-light image, in this case a famous painting supervised by the Swedish astronomer Knut Lundmark, ca. 1950, shows a wide swath of stars, gas, and dust. The γ -ray image, compiled from data taken by the EGRET instrument aboard the Compton Gamma-Ray Observatory (CGRO), shows a very narrow band along the galactic plane — no stars are visible at all, only a glow from γ rays emitted by cosmic-ray interactions with galactic gas and dust. Away from the plane, we see only individual galactic sources identified as pulsars and other galaxies.

Mapping γ rays

A map of γ -ray burst events, as measured by the Burst and Transient Source Experiment (BATSE), also on CGRO, shows a random (isotropic) distribution of sources over the whole sky, an early indication of the cosmological distribution of the burst events.

History of γ rays Bursts

History credits the first γ -ray detection to the Cold War and the treaty banning nuclear weapons tests in the atmosphere. To monitor compliance with the treaty, the U.S. launched a series of so-called *Vela* satellites that could presumably detect γ rays given off by hydrogen bomb explosions. However, in 1967, a *Vela 4* satellite pair detected an event that was eventually interpreted as cosmic in origin. The *Vela* satellites eventually recorded 73 events. No further events were observed until the Compton Gamma-Ray Observatory was launched in 1991 April, after which BATSE observed an average of one event per day. Thus, it was found that γ -ray bursts are not the rare phenomena that they were once thought to be, but rather common. Of course, this is because they are seen over distance scales comparable to the size of the known Universe.

Origin of the Bursts

Unfortunately, BATSE did not have the resolution to pinpoint the burst sources; it was not until other observations were made of burst afterglows, initially by an x-ray satellite, later by optical observations, that the bursts were found to originate in distant galaxies. Numerous optical transients observed with HST show conclusively that very distant galaxies are the sources of all γ -ray

bursts observed to date.

Finding to Date

Dr. Bonnell showed a sample of BATSE time profiles of specific bursts. Amazingly, no two events are alike, leading to the expression quoted by Dr. Bonnell: “If you’ve seen one γ -ray burst, you’ve seen one γ -ray burst.” The one common factor for all bursts is that they are composed of pulses and, it turns out that the pulses range from narrow symmetric to broad trailing shapes only. It was also discovered that the pulses have measurable lags that can be correlated with the burst luminosities (as determined only for bursts identified with galaxies whose red shifts have been measured). The lag-luminosity relation shows that the shorter the lag, the lower the luminosity.

A Close One

One GRB was seen to fall way below the line in luminosity. This event was GRB 980425 and was determined to have occurred in a relatively nearby galaxy; it appears to have been associated with the supernova explosion SN1998vw. The host galaxy, rather than being billions of light years (ly) away, is only about 100 million ly distant and the GRB is underluminous by orders of magnitude.

There’s a Plot

A plot of GRBs using supergalactic coordinates (a system defined by the distribution of matter within about 100 Mpc of the Milky Way) shows a concentration of sources toward the plane, thus lending some evidence for a supernova origin.

GRB models include merging neutron stars and hypernovae, which are merely supernovae involving massive stars that implode to form black holes.

Dr. Bonnell then briefly discussed SN1987A, concentrating on the evolution of the central clump over the 15 years since the event. Although many detailed studies have been made of SN1987A and we do know that a strong burst of neutrinos was emitted during the initial stages of the core collapse, there is no way to determine if a γ -ray burst accompanied the explosion because the event occurred during a period when no GRB detectors were operating.

In the Future

Although the mechanisms that produce GRB events are still poorly understood, the future holds some promise for understanding these important phenomena through observations that will be provided by SWIFT. SWIFT is a Goddard-managed mid-sized explorer mission (MIDEX) specifically designed to detect and analyze GRBs for purposes of surveying the sky and analyzing data on individual bursts. The mission is tentatively scheduled for launch in 2003 September. Additional information may be obtained at the official SWIFT website <http://swift.gsfc.nasa.gov>.

The NCA thanks Dr. Bonnell for presenting this highly exciting talk about highly excited objects. The reviewer thanks Dick Byrd for operating his camcorder to produce a useful record of the lecture that was used to prepare this review.

Meteor Showers

September Radiants

Full Moon: September 21

Major Activity – None

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

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

Review of "Extrasolar Planets: First Reconnaissance"

(Continued from page 1)

were known 10 years ago. We now know of at least 75 or 80.

Up Close

In our solar system, the only known life is on the Earth. Mars did have water and still may, but it has not been observed directly. Jupiter has about 300 times the mass of the Earth. Its large Galilean satellites are interesting because they may have water. Europa is the most enticing. The surface looks very much like cracked ice with water having risen through fissures and frozen. Subsurface water can be heated by the tides raised by Jupiter. Titan, the large satellite of Saturn, has an atmosphere with organics. It might have oceans of methane. Methane could serve the same role as a solvent for chemical reactions that water plays on the Earth.

It was Giordano Bruno, in the 17th century, who first proposed that the Sun is a star and the Earth, a planet.

The Earth, as seen from another star, would be 1/1,000,000,000 as bright as the Sun. Trying to see it would be like looking for a firefly next to an atomic bomb at a distance of 1000 miles! Thus, direct observation of Earth-like planets from afar is unlikely. However, another way to detect at least larger extrasolar planets is by their effect on their star's motion.

The Sun's Periodicity

The Sun is 1050 times as massive as Jupiter. If no other planets were present, the center of the Sun would describe a circle with a period of 12 years. However, Saturn also has an effect. Although this is smaller, it superimposes a thirty-year periodicity on the Jupiter circle so that the actual path of the center of the Sun looks more like an irregular spiral.

Search for Extra-Solar Periodicity

For many years, astronomers have searched for this motion astrometrically in other systems without success. Some years ago, van de Kamp announced the detection of binary motion for Barnard's star on the basis of thousands of observations. This was rejected in part because the derived orbit was eccentric and, because of the geometry of our solar system, it was assumed that all planetary orbits would be circular. We now know that this is not the usual case. Other astrometrists have been unable to confirm the motion with many fewer observations. Van de Kamp tried to explain

the orbit with two planets in circular motion. Although this was somewhat less successful than the eccentric orbit, it was more widely accepted.

Theory of Doppler Detection

Currently, with the new large telescopes, it is possible to look for the Doppler component of the motion of the center of a star using a very high-resolution echelle spectrograph. The echelle gives good wavelength coverage from the ultraviolet to the infrared, as well as high resolution. It uses a grating for the resolution and then sends the beam through prisms that separate the various orders from the grating. In the Lick program, they are currently observing 350 stars of all ages brighter than 7.5, of types F, G, and K. Only the youngest, chromospherically active, and rapidly rotating stars are omitted. Eventually, they plan to observe all 2000 stars in this range. They are observing 650 stars with the Keck telescope, which they first used in 1996. They began using the Anglo-Australian telescope in June 1998. The first observations with the Magellan telescope (in Chile) will be in late November this year.

Practice of Doppler Detection

The first attempt to detect extrasolar planets by Doppler was at the Dominion Astrophysical Observatory in Victoria. Campbell and Walker realized that a comparison source that traversed the spectrograph in the same way as the starlight was needed. They used an absorption tube with LiF gas with the 3.5-m Canadian, French, Hawaii telescope. LiF is very poisonous, has a weak absorption, and is useful only in the far red where the stars have little light. Butler spent a year experimenting with various chemicals (his undergraduate degree was in chemistry) and finally settled on iodine vapor. Iodine has very strong absorption in the visible spectrum with very many lines. It is placed in a Pyrex tube at a pressure of 1/1000 atmosphere. The tube is completely evacuated before the iodine gas is inserted so the iodine is very pure. The cell containing the iodine is placed before the grating to provide the same path through the spectrograph as the starlight. Butler projected an illustration of a star spectrum containing lines of ionized calcium, sodium, and hydrogen; most of the very many lines were from iron and nickel.

Doppler Difficulties

The CCD pixels are about 15 micrometers

wide. To get the required accuracy for the Doppler measurement, the displacement must be determined to 10^{-3} of a pixel or about 80 silicon atoms on the CCD. This is achieved by measuring a large number of lines. Only Jupiter and Saturn size planets can be observed at present. The Earth causes a Doppler amplitude of about 10 cm/s; the 5-minute seismic variation of the Sun has an amplitude of 25 cm/s. At the present accuracy of 3 m/s, it would take about 100 years to disentangle the effect of Saturn from that of Jupiter.

An Example

16 Cyg is a double star with components separated by about 1000 AU. The B component is nearly identical to the Sun; A is slightly brighter. B shows a perturbation with a 2.2-year period. Far from being sinusoidal, the velocity drops from maximum positive to maximum negative in only 60 days! At first, it was thought that this was a result of the companion but we now know that the orbits of most planets are eccentric; only about 10% are circular. The minimum mass of the planet is 1.7 times that of Jupiter.

Mass Distribution of Planets

The mass distribution shows that there are few planets heavier than 8 times the mass of Jupiter although these should be easiest to detect. By contrast, there are many whose mass is less than that of Jupiter, although these are the hardest to detect. Thus, there must be many small planets even though we have not detected them. The shortest period is 2.98 days but there are many periods near 3 days. It is hard to explain this cut-off.

Upsilon Andromedae (υ And)

υ And is the first system found to have more than a single planet. The motions can be decomposed into a 4.6-day period for a 1-Jupiter mass planet, a 0.7-year period for a 2-Jupiter mass planet, and a 3.5-year period for a 4-Jupiter mass planet. The orbit for the 4.6-day object is nearly circular. (Close orbits are nearly always circular; more distant orbits are eccentric.)

A Planet around an M-type Star

The only planet found around an M-type star is around Gliese 876. (Most M-type stars are too faint to observe at the high dispersion needed.) The system has two planets: P = 61 day, M = 1.9 Jupiter, e = 0 and P = 30 day, M = 0.56 Jupiter, e = 0.27.

(Continued on page 5)

Review of "Extrasolar Planets: First Reconnaissance"

(Continued from page 4)

P1 approximately equals 2 times P2. This 2:1 resonance is quite stable. A 3:1 resonance is also stable. Planets around M dwarfs cannot have water unless the period is about 4 days as the star must be quite close to the planet. It would probably be possible to detect a planet with five times the Earth's mass around an M star, but a very large telescope would be needed. Butler hopes to use Magellan, which might be able to do this.

A Planet about a G8-type Star

55 Cnc is a G8 star with about 95% the mass of the Sun. A planet with a period of 14.6 days had been announced previously. A planet whose nearly circular orbit has a period of about 14 years with approximately the mass of Jupiter has now been announced. The system also contains a planet with a 44.3-day period, similar to that of Mercury, with about the mass of Saturn. The system may contain another planet. The middle and near planet periods are in 3:1 resonance. A planet in an orbit like the Earth's would be stable; a close planet with a large eccentricity would not be. Most large planets have radii very close to Jupiter's because the cores are degenerate.

Proto-planets about Star Disks

In the solar system, the planet orbits are nearly in the plane of the Sun's rotation. Most planet rotation axes are perpendicular to this plane. This led early to the sugges-

tion that the planets formed from a disk around the primitive Sun. In the 1980s, we first observed such a disk in another system. We now have found that about half of the young stars have disks. In our portion of the disk, protoplanets are driven in toward the star by viscous forces in the disk, which is much more massive than the planets. It is moving and pushes the planets with it. The problem is how to keep the protoplanets from falling into the Sun. That might result from stabilization by planetary resonance. Also, planets can change their relative distances from the Sun; some can even be ejected from the system. Any force must push the planet out of a circular orbit.

An Interesting System

HD209458 was the sixth system discovered with a planet in a 51 Peg-like orbit. It has a 4-day period. In such a short period orbit, there is about a 10% chance that the planet will transit the star as this planet does. From the transit, the physical size of the planet can be determined, as we know the approximate radius of the star and, now, the portion of its light blocked by the planet. In this case, the planet blocks about 1.4% of the area of the star indicating that the planet diameter is about 40% larger than that of Jupiter. This is close to the theoretical prediction. Since the fact that the planet transits indicates that the inclination is near zero, we can determine that the density is about 1/2 that of Saturn and, hence, that the planet is composed mainly

of H and He as is Saturn. Large surveys are looking for other transits but none have been detected.

Looking for Earth-like Planets

We are anxious to find Earth-like planets. The Terrestrial Planet Finder (TPF) is designed for this. It may use four large telescopes in space as a nulling interferometer to cancel the light from the star but other designs are also being studied. The TPF could provide spectra of an Earth-like planet if it found one. The presence of oxygen would probably indicate the presence of life. Also, a chronograph system might be used with a very large telescope.

SETI Help

Finally, SETI (Search for Interstellar Intelligence) might receive a picture of a planet sent by another civilization. Observations are taken with both Arecibo and the Parks telescope in Australia. SETI@home, which scans the signals received, is the largest computer project in the world. A crater on the back of the moon would be an ideal site for an Arecibo type telescope as it is shielded from terrestrial radiation. The Allen telescope at Hat Creek near Mt. Lassen will be an array of satellite dishes covering a square hectare to detect extraterrestrial signals. It is the prototype for a square kilometer array that might be placed in western Australia

The author thanks Dr. Butler for a careful editing of this review.

Support
the
IDA

Join the International Dark-Sky Association
3225 N. First Avenue Tucson, AZ 85719-2103
www.darksky.org

Come See the Stars!

by Joe Morris

Exploring the Sky 2002 Schedule

Date	Time	Notes
October 5	7:30 P.M.	New Moon at perigee October 6
November 2	7:00 P.M.	Leonid meteor shower November 17 and 19

Exploring the Sky is an informal program that for nearly 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 immediately next to the field.

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

Questions? Call the Nature Center at (202) 426-6829 or check the Internet sites: <http://www.nps.gov/rocr/planetarium> and <http://www.capitalastronomers.org>
A presentation of the National Park Service and National Capital Astronomers.

NCA TREASURER'S REPORT

Jeffrey Norman

July 1, 2001 to June 30, 2002

INCOME

Dues	\$ 7081.00
Gifts	632.00
Interest	215.47
Telescope-making Classes	290.00
Total Income	\$ 8218.47

EXPENSES

IDA Dues	\$ 100.00
Miscellaneous	158.10
Purchase of New Projector	1775.46
Secretary	249.18
Sky & Telescope Subscriptions	3534.10
Speakers' Dinners	402.00
Star Dust	4478.42
Total Expenses	\$ 10697.26

Balance - July 1, 2001	\$ 13803.79
Excess Expenses over Income	2478.79
Balance - June 30, 2002	\$ 11325.00 *

Total number of paying members joining or renewing from 7-1-00 to 6-30-01	162 **
Total number of paying members joining or renewing 7-1-01 to 6-30-02	154 **
Decrease in Membership (4.9%)	8

MEMBERSHIP REVIEW

Total paying memberships as of 6-30 of each fiscal year

1992 - 223	1995 - 201	1998 - 169	2001 - 162
1993 - 184	1996 - 179	1999 - 173	2002 - 154
1994 - 163	1997 - 194	2000 - 174	

* The Balance includes \$4643.25 from the NCA Travel account

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

NCA BUDGET - FISCAL 2003

Income

Dues	7100
Gifts	600
Interest	200
Telescope-making Classes	300
Total Income	8200

Expenses

Int. Dark-Sky Assn. Dues	100
Miscellaneous	50
Secretary	250
Sky & Telescope subscriptions	3500
Speakers Dinners	400
Star Dust	4500
Total Expenses	8800

Deficit	600
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September Talk

(Continued from page 1)

100-inch Mount Wilson reflector that Edwin Hubble used in the 1920s to discover that galaxies exist and that they are all moving away from one another, to the pristine back-up mirror to the Hubble Space Telescope, among many other objects of recent astronomical history.

Bio

David DeVorkin is Curator, History of Astronomy and the Space Sciences at the National Air and Space Museum. His major research interests are in the origins and development of modern astrophysics during the 20th Century and the origins of the space sciences in the V-2 and early Aerobee eras through the IGY. He is the author/editor/compiler of nine books and over ninety scholarly and popular articles, most recently *Beyond Earth: Mapping the Universe* (2002), *Henry Norris Russell: Dean of American Astronomers* (2000) and *The American Astronomical Society's First Century* (1999). Dr. DeVorkin holds the Ph.D. in the History of Astronomy from the University of Leicester (1978) and the Master of Philosophy in Astronomy from Yale (1970). He has curated "Stars" (1983-1997); "V-2: The World's First Ballistic Missile System" (1990-); and most recently "Explore the Universe" (2001-)

For Your Information Submitted by Nancy Grace Roman

Jim Dwyer wrote: Christina is spending the summer doing asteroidal research as a Caltech student at JPL. (Maureen hopes to become a planetary scientist.) Thanks to you for her [Christina's] scholarship award last year at the science fair! It was much appreciated.

(Jim Dwyer is the father of Christina Dwyer who was a Science winner last year.)

Bruce Becker wrote: San Diego is switching street lighting to higher level unshielded lighting. Mount Palomar observatory, north of us might not have a future. We are lucky to see 3 1/2 magnitude stars from our location — otherwise, must travel for to the desert for viewing.

(Bruce Becker is a long-time member.)

Mid-Atlantic Occultations and Expeditions

by David Dunham

Asteroidal Occultations through early October 2002

DATE	Day	EST	Star	Mag	Asteroid	dmag	Dur s	Ap. in.	Location
Sep 16	Mon	5: 38	TYC07322818	10. 5	Hi drun	5. 2	3	6	Carolinas
Sep 25	Wed	22: 01	TAC- 12 7192	11. 8	Comaci na	2. 5	9	8	Mexi co
Sep 28	Sat	0: 46	PPM 144222	9. 3	Cl aris sa	4. 3	4	3	DC area

Grazing Occultations through early October 2002

DATE	Day	EST	Star	Mag	% alt	CA	Location
Sep 24	Tue	23: 18	SAO 093029	7. 6	89- 29	17N	Brandywine & Annapolis, MD
Sep 26	Thu	5: 20	X04557	8. 8	81- 65	14N	Falls Church, VA; DC; Lanham, MD
Sep 28	Sat	5: 25	SAO 077053	8. 8	63- 74	12N	Clinton to Kent Is., MD
Oct 3	Thu	5: 08	eta Leoni s	3. 5	13- 25	8N	Indi an River, MI

Total Lunar Occultations

DATE	Day	EST	Star	Mag	% alt	CA	Sp.	Notes
Sep 12	Thu	21: 40	D ZC 2388	7. 5	42+ 12	79S	F3	
Sep 15	Sun	20: 29	D ZC 2852	7. 3	73+ 25	86N	K0	
Sep 18	Wed	0: 06	D 33 Cap	5. 4	89+ 27	53S	K0	ZC 3130
Sep 23	Mon	0: 19	R 33 Ceti	6. 0	98- 46	81S	K4	ZC 170
Sep 23	Mon	6: 21	R 89 Pi sci um	5. 1	97- 24	58S	A3	ZC 192
Sep 26	Thu	5: 54	R ZC 517	6. 1	80- 51	38N	K1	ZC 517; graze in OH &PA
Sep 26	Thu	21: 53	R 43 Tauri	5. 5	75- 1	87S	K2	ZC 614; Azi muth 65 deg.
Sep 27	Fri	1: 19	D omega Tau	4. 9	73- 39	-27N	A3	ZC 628
Sep 27	Fri	2: 09	R omega Tau	4. 9	73- 49	60N	A3	possi ble close double
Sep 27	Fri	5: 15	R ZC 642	6. 8	72- 72	63N	F5	close double
Sep 27	Fri	5: 39	R ZC 646	5. 9	72- 70	50S	M0	close double
Sep 27	Fri	6: 39	R ZC 651	6. 0	72- 63	65S	B8	close double?, Sun - 5
Sep 30	Mon	4: 01	R SAO 079054	6. 9	43- 42	16S	K8	wi de double
Oct 1	Tue	2: 16	R ZC 1208	6. 3	33- 12	12S	K1	close double
Oct 1	Tue	2: 43	R SAO 079868	7. 3	33- 17	83N	K0	
Oct 3	Thu	4: 40	D eta Leoni s	3. 5	13- 25	-46N	A0	cl. dbl.; graze in Mi ch.
Oct 3	Thu	6: 33	R eta Leoni s	3. 5	13- 35	64N	A0	ZC 1484; Sun alt. - 7

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

2002 VAAS Convention

Submitted by Nancy Byrd

From: "Terry Barker" <teebark@netzero.com>

To: "Nancy Byrd" <nancy@pangean.com>

Subject: VAAS 2002

Date: Wed, 14 Aug 2002 21:18:31 -0400

Announcing the 2002 VAAS Convention!
The event this year will take place in Ashland, VA (10 miles north of Richmond), at

Randolph-Macon College, and will be hosted by RAS (Richmond Astronomical Society). It's on Sat., Oct. 5, and we have put together an exciting program! You can get the lowdown on our web page, <http://www.richastro.org/vaas.htm>.

Some quick highlights:
- We have three GREAT morning speakers.
- Workshops on telescope making,

Herschel objects, CCD photography, a Charles Messier re-enactment, a renaissance navigator, and much more.

- Door prizes
- A picnic that afternoon
- Star gazing into the morning hours

You can respond to this email, but I'd rather you send a response to my real home, tbarker@i2020.net (I'm temporarily working away from home.)

Getting to the NCA Monthly Meeting

Saturday, September 14

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. David DeVorkin will present the featured talk for the September meeting of National Capital Astronomers, "Building the Universe (Gallery)".

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

Heritage India
4931 Cordell Ave
Bethesda, MD
301-656-3373
(Indian food)

Directions to the Meeting Place

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.

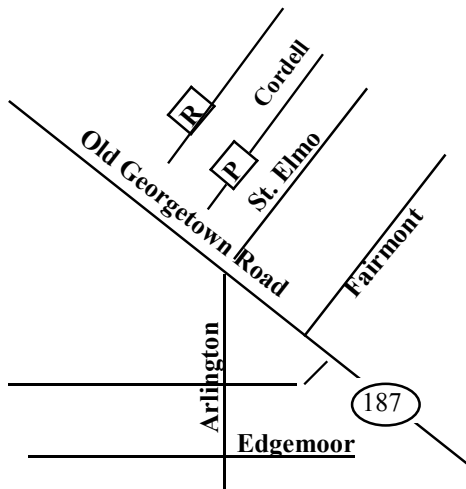
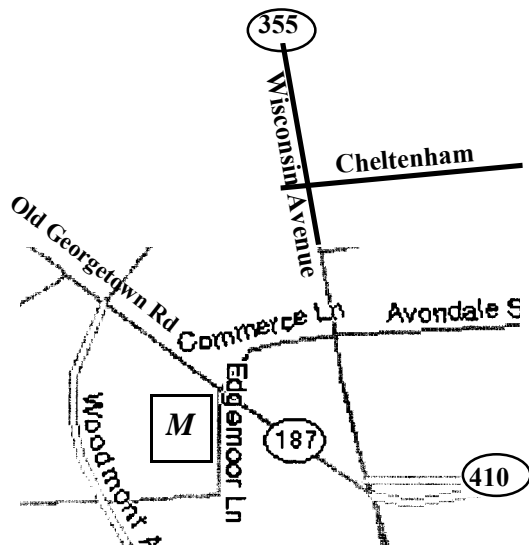
From South of Bethesda

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.

Directions to the Restaurant

1. Following the meeting, turn right out of the parking garage.
2. Continue on Edgemoor Lane and cross Woodmont Ave.
3. Turn right onto Arlington Road.
4. Turn left onto MD-187/Old Georgetown Rd.
5. Turn right at Cordell Ave. The restaurant, Heritage India, will be on your left, #4931, across the street from Il Forno and the public parking garage.
Have change available for meters (still in operation at that time) or use the public parking garage near the restaurant.



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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).

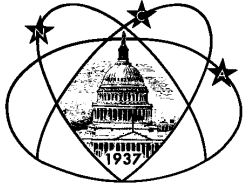
Junior members only: Date of Birth: _____ Only members under the age of 18 may join as juniors.

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



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If undeliverable, return to
NCA c/o Nancy Roman
4620 N. Park Ave., #306W
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**FIRST CLASS
DATED MATERIAL**

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