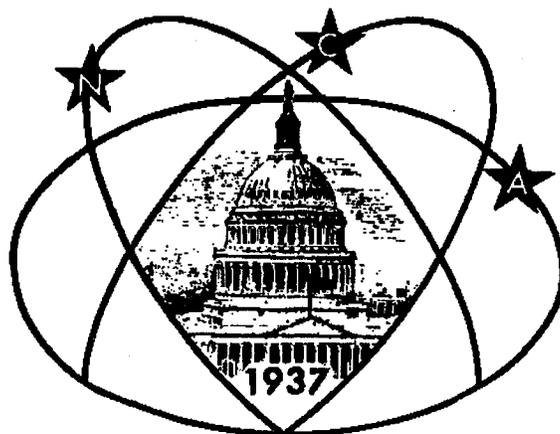


Star



Dust

National Capital Astronomers, Inc.

301/320-3621

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Virginia Trimble to Speak on "The Universe You Don't See: Existence and Nature of Dark Matter"

by Harold Williams

The next meeting of the National Capital Astronomers will be held on Saturday, December 3rd, at 7:30P.M., in the Bunim room on the ninth floor of the Clinical Center (Building 10) at the National Institutes of Health (NIH). Virginia Trimble of the University of Maryland will speak on "The Universe You Don't See: Existence and Nature of Dark Matter." The speaker sent the following abstract: "Many different lines of observational evidence indicate strongly that 90% or more of the gravitational potential of the universe comes from matter which does not emit its fair share of light or other electromagnetic radiation. This is the infamous dark matter, and its existence has been firmly established for nearly 20 years. But we know remarkably little about what it is. Candidates range from neutrinos with rest masses of a few eV through other, even stranger particles, to substellar objects and 10^6 solar mass black holes. A range of laboratory experiments and astronomical searches, currently in progress, could identify the most likely candidate(s) in the near future, but could also leave the issue unresolved indefinitely."

The largest unsolved problem in all of astronomy and physics is the "Dark

Matter Problem." The *5th Annual Astrophysics Conference* in Maryland October 10 through 12 at College Park was devoted to this topic this year. There is much diverse evidence leading to the conclusion that most of the universe is dark. The most convincing evidence is the flat rotation curves of disk galaxies. The argument goes as follows—stars in disk galaxies move in predominately circular orbits. Newton's Laws and Newtonian Universal Gravity tell us that the mass enclosed in a spherical or cylindrical symmetric is determined by the velocity of the orbiting bodies. The mass, as measured in light and the velocity of stars, do not agree. The mass in stars in the center of most galaxies decreases as a power law to the minus 3.4 power. The mass, in stars in the disk of most galaxies decreases exponentially. The mass as measured by its doppler shifted light of the stars whirling around the galaxy, in fact, not only does not decrease like the mass in luminous stars, but it increases linearly with the distance away from the galaxy. The dark matter phenomenon is indeed this glaring error between these two different techniques for measuring mass, by its luminous effect and by its gravitational potential, as evidenced by the motions of the stars that we see doppler shifted.

The mathematics needed to understand this in detail are only what is required in the first part of any physics class. How many scientific fields can you be put on the frontier when you take the first introductory course? I think very few.

The mathematics follows. For those who this does not make physical and algebraic sense you may skip to the end of the article where the speaker is described.

Newton's Universal Law of Gravity:

$$F = \frac{GMm}{R^2}$$

where F is the force, G is the Newtonian gravitational constant, M is one mass, m is the other mass (the one whose acceleration we will consider), and R is the distance between M and m .

Since gravity is a central force, it acts only on the mass internal to radius R , if the mass distribution is symmetric in R . Since disk galaxies are symmetric in R , we can write the force on a star of mass m as:

$$F = \frac{GM(R)m}{R^2}$$

See Trimble, Page 3

December Calendar

The Public is Welcome!

Friday, December 2, 9, and 30, 1994, 8:30 PM-Open nights with NCA's Celestron 14-inch (0.36 meter) telescope at Ridgeview Observatory, 6007 Ridgeview Drive (off Franconia Road between Telegraph Road and Rose Hill Drive). Information: Bob Bolster at 703/960-9126.

Fridays, December 2, 9, 16, 23, and 30, 1994, 7:30 PM-Telescope making classes at American University, McKinley Hall Basement. Information: Jerry Schnall, 202/362-8872.

Saturday, December 3, 1994, 7:30 PM-The December NCA meeting will feature Virginia Trimble speaking about "The Universe You Don't See: Existence and Nature of Dark Matter."

Saturday, December 3, 1994, 5:30 PM-Dinner with the speaker at the La Posada Restaurant, 8117 Woodmont Ave., Bethesda, MD., before the monthly meeting. Reservations are for 5:30 p.m., sharp.

Saturday December 3, 1994, Night (After The Meeting)-December's best Saturday night for dark-sky observing, and "absorbing" (Moon sets by 8:15 p.m., providing nine hours of "Deep Night," weather permitting, until dawn, Sunday morning). Several relatively light-pollution-free sites are available for NCA members's use. Information: Daniel Costanzo, 703/841-4765.

Mondays, December 5, 12, 19, and 26, 1994, 8:30 PM-Public nights at U.S. Naval Observatory (USNO), in Northwest Washington, DC (off Massachusetts Avenue). Includes orientation program on USNO's mission, viewing of operating atomic clocks, and glimpses through the finest optical telescopes in the

Washington-Baltimore region. Information: USNO Public Affairs Office, 202/653-1541.

Tuesdays, December 6, 13, 20, and 27, 1994, 7:30 PM-Telescope making classes at Chevy Chase Community Center, Connecticut Avenue and McKinley Street, NW. Information: Jerry Schnall, 202/362-8872.

Wednesday, December 7, 1994-December "Sky Watch" column by Blaine P. Friedlander, Jr. appears in *The Washington Post* "Style" section. It lists many other events for the month.

Saturday, December 17, 1994 7:30 PM-"Exploring the Sky" telescope viewing at the open field in Rock Creek Park nearest to the Nature Center. NCA members please bring telescopes. For more information, call John Lohman, 703/820-4194

Saturday, December 24, 1994, Night-December's second best night for dark-sky observing and "absorbing" ("Moon-dark" until around Midnight). See December 3rd listing.

Saturday, December 31, 1994, Night-December's third best night for dark-sky observing and "absorbing" ("Moon-dark" until around Midnight). See December 3rd listing.

Friday, January 6, 1995, 7:00-8:30-Sandy Spring Friends School Presents, Star Party: Astronomy Activities. Free to the public. See the ad on page 5.

Saturday, January 7, 1995, 7:30 PM-The January NCA meeting will feature Dimitris Christodolou speaking about "The Formation of Binary Stars through Fission of a Single Mass: Past and Present."

Mark Your Calendar! - Next Six NCA Meetings

Below are dates for the next six NCA meetings coming up after this December's meeting unless otherwise indicated.

January 7	April 1
February 4	May 6
March 4	June 3

TRIMBLE, from page 1

where $M(R)$ is the mass enclosed within a radius R .

Newton's second law of motion:

$$F = ma.$$

The geometry of acceleration in a circle:

$$a(R) = \frac{v(R)^2}{R}$$

Combining the equations:

$$m \frac{v^2}{R} = \frac{GM(R)m}{R^2}$$

Solving for the velocity of a star m at radius R yields:

$$v(R) = \sqrt{\frac{GM(R)}{R}}$$

Keplerian motion results when all of the mass is concentrated in the center so

$$v(R) = \sqrt{\frac{GM}{R}}$$

This would make the velocity fall off proportional to $\sqrt{1/R}$.

The velocity of the planets around the sun and the velocity of the moons around a planet follow Keplerian rotation to fairly high order falling off proportional to $\sqrt{1/R}$.

BUT Disk Galaxy rotation is **FLAT**. To first order it does not vary with radial distance except in the very center of the galaxy. There is a huge difference between decreasing proportional to $\sqrt{1/R}$ and remaining constant or nearly flat.

One can go one step further and invert the equation, solving for the mass within a radius R and one finds

$$M(R) = \int_0^R \rho(r) 4\pi r^2 dr = \text{constant } R.$$

So the mass density ρ of the dark matter is

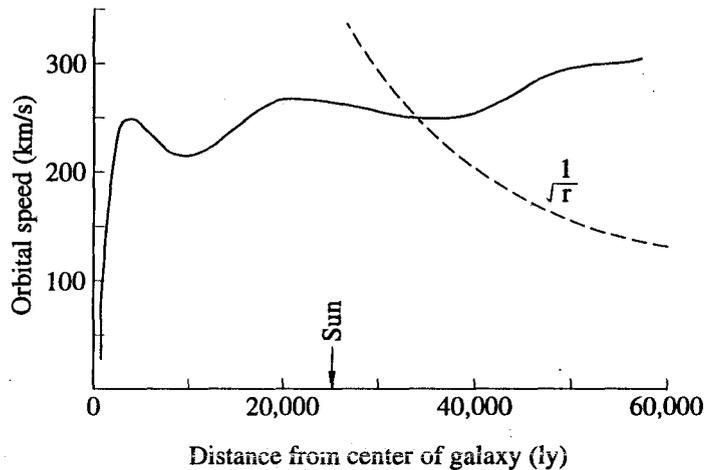
$$\rho(r) = \frac{\text{Konstant}}{r^2}$$

At least the mass density does decrease, but a density of r^{-2} falls off much slower than $r^{-3.4}$ or exponential like the disk of stars falls off. In case, there are any experts reading this, it is well worth

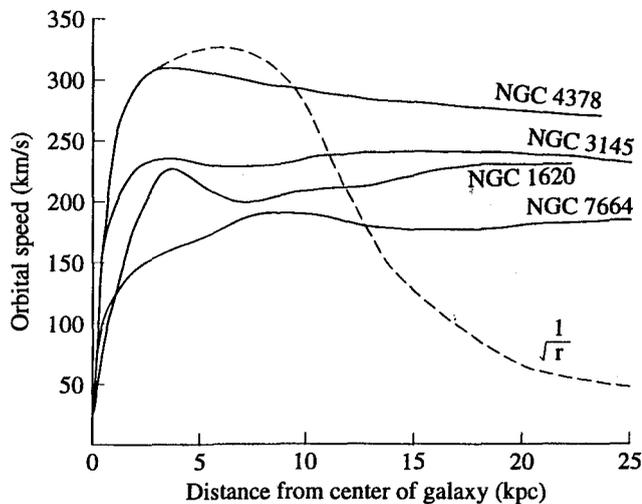
remembering that an isothermal sphere—uniform temperature sphere where the temperature causes pressure which is balanced by the inward force of gravity has a mass distribution proportional to r^{-2} . What the creator is trying to tell us here has not been fully fathomed by anyone yet.

Our speaker, Virginia Trimble, is both bicoastal and biacademic and is professor at the University of Maryland at College Park and the University of California at Irvine. She is a member and

fellow of many learned societies and serves on advisory panels and committees too numerous to mention. Her service as an article reviewer, writer of reviews, editor, and speaker are legion. She is currently the associate editor of the *Astrophysical Journal*. Her publications are also legion. Her résumé is so well organized that I have never seen a better one. I am going to modify my résumé along the lines of hers as soon as I get time. Once you have heard her speak, you will go out of your way to hear her speak again.



The rotation curves of stars within our own galaxy. (Kaufmann: UNIVERSE, Third Edition © 1991, W. H. Freeman and Company)



The rotation curves of four spiral galaxies. This graph shows the orbital speed of material in the disks of four spiral galaxies. Many galaxies have flat rotation curves, indicating the presence there of extended halos of low-luminosity material (adapted from V. Rubin and K. Ford)

The β Pictoris Phenomenon in Herbig Ae/Be and A-shell Stars

Reviewed by Harold Williams

On Saturday November 5, 1994 at the National Institutes of Health (NIH), Carol Ann Grady of the Applied Research Corporation spoke to us on "The β Pictoris Phenomenon in Herbig Ae/Be and A-shell Stars." Carol got her B.S. from Washington University in Saint Louis and her Ph.D. from the University of Colorado, where Ted Snow was her dissertation advisor. Her Ph.D. dissertation was titled, "Stellar Winds in Classical Be Stars." Carol has held a number of NASA support positions when she worked for the Computer Sciences Corporation (before Hubble Space Telescope was launched) as a systems analyst during calibration. Instead of serving in a NASA support position to assist other scientists, she now holds a NASA long-term space astrophysics five year grant to do her own research. So instead of supporting NASA she is supported by NASA. Carol is principal investigator or lead PI on several projects. She coordinates observations with the International Ultraviolet Explorer (IUE), which was launched in 1978 and is controlled from the Goddard Space Flight Center. This satellite is still going strong and is one of the most successful space-based telescopes of all times. She is mining the IUE digital archived data as well as taking new IUE data. This spacecraft has control in real time. Due to

its high Earth orbit, objects in the sky are not constantly occulted by the Earth.

The Infrared Astronomical Satellite (IRAS), discovered circumstellar dust disks around several stars like β Pictoris and α Lyrae—Vega. Vega, in fact, is a primary spectrophotometric standard star and its infrared excess emission from the dust disk causes some problems in its use as a primary spectrophotometric standard. These dust disks cannot be fit with a single temperature spatially extended disk, but with a spatially extended multitemperature disk. The light in the ultraviolet (UV) obtained from the IUE shows silicate features from dust less than one micron. In fact, some of the spectral features look like Halley's comet. β Pictoris has dust which is warmer than most A-shell stars. At least one third of nearby A stars show dust disks like Vega, Formalhaut, and ϵ Eridani.

One of the questions that can be asked is how typical is β Pictoris and, in fact, how old is the star? Stars with spectral class A are very hot compared to G stars like our Sun. The Sun has a large convective zone so it has a lithium abundance clock. But A stars being much hotter have very small convective zones only near the surface so no mixing occurs

with the regions where lithium would be destroyed by fusion in the core. Because of this fact A stars do not have a lithium abundance clocks like G stars do.

For a star to be a Herbig Ae/Be star it must have emissions in at least one of the Balmer series transitions. Since the dust has an excess in the infrared, one might ask why we look in the UV. The reason why the UV is so interesting is because at those wavelengths, it is easier to look at the gas. Also, there are transitions in the UV for Fe, Mg, Mn, Cr, Ti, Zn, Si, C, and N. In fact, at IUE UV wavelengths one can see SiII, SiIII, and SiIV. Silicon is one of the main ingredients of a terrestrial planet. Of the 62 stars observed, 32 have been observed with high spectral resolution so that motion caused by doppler shifts in spectral lines can be detected as small as 25 km/s. When these stars are observed, they show that gas is being accreted into these pre-main-sequence stars because material is observed spectroscopically to be falling into the star. Sometimes the dust clouds, as they orbit the central star, will occult the star and allow us to get spectra of the stars atmosphere as if you had a stellar coronagraph like the solar coronagraph machines.

As usual, we are indebted to NIH and NCA member Jay Miller for arranging to meet at NIH, where he works, and to use the Bunim room on the ninth floor. It was even a little fun see Jay perplexed at himself when he realized that he had left the keys to the room and his identification as an NIH person at home or in his NIH office in another building, and he had to charm the guard into letting us in. Fortunately Jay's charm prevailed rather rapidly. For those of us who sometimes forget things, it was nice to see that Jay, too, is human.

Montgomery College's Public Planetarium

Exciting public planetarium programs are offered at Takoma Park's own planetarium. Astronomy is one of the few sciences accessible to any inquiring mind. All programs begin at 7:00 p.m. There is no admission charge.

Thursday, December 22, 1994

"The Day of the Sun's Return"

The planetarium is located on Fenton Street on the Takoma Park campus of Montgomery College. It is attached to the Science South building on the ground level and has a conspicuous silver-colored domed roof.

Occultation and Grazing Updates

by

David Dunham

Although the November 18th occultation event has passed, we decided to include it in this newsletter to give members who are inexperienced with occultations a flavor for the activity. Unfortunately, weather precluded good observations of this event. We hope that this edition is delivered to all interested members before the November 26th occultation event in Maryland. — Eds.

On November 16th, Petr Pravec, Ondrejov Observatory, obtained 5 CCD images of 442 Eichsfeldia, occult the 9.0-mag. star SAO 129245 on November 18 at 5h U.T. (Thursday, night). The observations show a strong northward shift of the path, crossing central Canada from east to west, but passing a little south in the western part, so that Edmonton, Alberta, has a reasonable chance for an occultation. I think the uncertainties are large enough that observers throughout southwestern Canada are encouraged to monitor the star for a possible occultation, and observers in the northern U.S.A. may also want to watch from pairs of stations for possible secondary occultations by possible satellites of the asteroid. The correction to my nominal path predic-

tion is 1.04" north (18.6 path widths), probably +/-0.2" (3.6 path widths) and the time correction is +4.5 minutes +/-0.6 minute. The closest approach time should be 5:08 UT in Newfoundland, 5:10 UT in the northeastern USA, 5:13 UT at Winnipeg, 5:15 UT in Alberta, and 5:17 UT in the Vancouver, BC area.

Please alert others in your area to the possibility of this event so that we can get better coverage of the occultation, and practice finding the target star. If an occultation occurs, the magnitude drop should be about 5 and the expected central duration is 10.6 seconds. The event will occur at rather high altitude for all potential observers, with no twilight interference, but the full Moon will be 37 deg. away. No finder chart has been published for this event in Sky and Telescope, and it is also not in the main 1994 Asteroidal Occultation Supplement to Occultation Newsletter distributed to O.N. subscribers over a year ago. A finder chart is in the extra supplement, if you requested and obtained that from the McManuses in Topeka. If you don't have this chart, you can locate the star on Uranometria 2000 or Atlas Eclipticalis in northern Cetus several tenths of a degree south of a point

midway between 42 and 43 Ceti; the J2000 coordinates of SAO 129245 are R.A. 1h 21m 13.8s, Dec. -1 deg. 06' 52"; the B1950 position is R.A. 1h 18m 40.6s, Dec.-1 deg. 22' 33".

Both objects were on the CCD exposures, so the results, although reduced with Guide Star Catalog (GSC) data, should be fairly accurate. The formal uncertainty in the path is 0.09", 1.5 times Eichsfeldia's angular diameter of 0.06" (linear diameter expected to be 67 km), but due to a relatively poor distribution of the reference stars, Pravec thinks that the error is about 0.2", just over three path widths +/- . There is some chance that Pravec can get more measurements shortly after sunset Thursday at Ondrejov, when the objects will be close enough to eliminate the poor distribution problem of the Nov. 16th observations. That could allow a very accurate prediction. Such an update might be available as early as 21h UT Nov. 17, and if so, I will distribute it by e-mail. The status can be found by telephoning the IOTA occultation line at 301-474-4945.

Detailed path information will be sent in a separate message to Douglas Hube in Edmonton, and will be supplied to others upon request. On Nov. 26 at about 3:15 UT (Friday evening Nov. 25 local time in North America),

See UPDATES, on page 6

Though this image is shown in black and white, the original color image is made from images taken by the imaging system on the Galileo spacecraft about 14 minutes before its closest approach to asteroid 243 Ida on August 28, 1993. This picture is made from images through the 4100-angstrom (violet), 7560 A (infrared), and 9600 A (infrared) filters. The camera is sensitive to near-infrared wavelengths of light beyond human vision. Shadings in the image indicate changes in illumination angle on the many steep slopes of this irregular body as well as subtle color variations due to differences in the physical state and composition of the soil (regolith).



UPDATES, from Page 5

the 110-km asteroid 514 Armida will occult the 10.6-mag. star PPM 117739. Preliminary astrometry by Pravec indicates a path crossing Switzerland, central France, southern Georgia, and central Mexico, but the uncertainties in the GSC-based observations are large; the event could occur anywhere in the U.K., southwestern Europe, southeastern Canada, the eastern and southcentral USA, and Mexico. Attempts will be made next week to improve that prediction; if you won't have e-mail access during the Thanksgiving holiday, you might want to call the IOTA occultation line to get updates for that rather good event. Occultation Newsletter subscribers in the areas mentioned above might want to request the chart for that event from the McManuses in Topeka, if they don't have the EXTRA supplement (again, it's not in the main one that was distributed to North American subscribers) to the North American Asteroidal Occultation Supplement for 1994.

December Lunar Grazings

On December 26th, at 3:22 AM EST, near Hamden, Connecticut, there will be a lunar grazing of χ Virginis, a 4.8 magnitude star, at a cusp angle of 4°S, when the moon is 44% sunlit.

On December 29th, at 6:42 AM EST, near Aberdeen, Maryland, there will be a lunar grazing of 40 Libra, a 5.5 magnitude star, at a cusp angle of 2°S, when the moon is 13% sunlit.

Newsletter Deadline for

January Star Dust

**Thursday,
December 15, 1994**

Send Submissions to Gary & Alisa Joaquin, at 7821 Winona Ct., Annandale, VA, 22003, or send an ASCII file via E-Mail at 71561.1747@compuserve.com or fax to 703/658-2233. Submissions must be on time or they may not get in. Happy Holidays.

Sandy Spring Friends School Presents . . .

Star Party: Astronomy Activities

Third Program in Science Symposium Series

Co-sponsored by Sandy Spring Museum Astronomy Club

Friday, January 6, 1995

7:00 - 8:30 p.m.

Yarnall Hall

Free To The Public — Everyone Invited

Sandy Spring Friends School • 16923 Norwood Road • 301-774-7455

Important Numbers For Information

Smithsonian Sky Watchers' Report

Non-technical information recording on astronomical events, objects, and phenomena in the Washington, D.C. region's sky. Updated weekly.
202/357-2000

Sky & Telescope's "Skyline"

Moderately technical information recording on latest in space technology, astronomy, and related sciences. Updated weekly, or sooner if necessary.
617/497-4168

McDonald Observatory's "Star Date"

Non-technical information on space technology, astronomy, and related subjects. Broadcast weeknights, around 8:00 PM, by listener-supported public radio station WAMU FM 88.5

U.S. Naval Observatory's Time Service

Accurate Eastern Time (in 24 hour mode) and Universal Time given every few seconds. Excellent for synchronizing clocks and watches. (Voice Recordings) 202/653-1800, 900/410-TIME, and 303/499-7111; (Modem Time Service) 202/653-0351

NOAA "Space Weather" Indices

Highly technical, but quite useful recording on Solar activity and its effect on Planet Earth. From the National Oceanic and Atmospheric Administration (NOAA). Updated every three hours. 303/497-3235 (anytime) or WWV at 2.5, 5, 10, 15, and 20 MHz (18 minutes after every hour)

Weather, Sunrise/Sunset, & UV Index

Recording of latest weather forecast out to five days, plus Sunrise/Sunset times, and forecasted Solar ultraviolet radiation index. Covers Washington, DC and vicinity. 703/260-0307

NCA Artificial Satellite Prediction Service

Customized prediction of viewing opportunities. These objects are frequently clearly visible with unaided eyes or binoculars, even from light polluted areas. Contact Walter I. Nissen, Jr., (voice phone) 216/243-4980, (modem) dk058@cleveland.freenet.deu

National Capital Astronomers, Inc.

SERVING SCIENCE & SOCIETY SINCE 1937

NCA is a non-profit, membership supported, volunteer run, public-service corporation dedicated to advancing space technology, astronomy, 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 (WAS). All are welcome to join NCA. For information: 301/320-3621 or 703/841-4765.

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 as skilled observers frequently deploying to many parts of the National Capital region, and beyond, on campaigns and expeditions collecting vital scientific data for astronomy and related sciences. NCA volunteers serve by assisting with international scientific conferences, judge science fairs, and interpreting astronomy and related subjects during public programs.

Discussion Groups exchange information, ideas, and questions on preselected topics, moderated by an NCA member or guest expert.

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

NCA Information Service answers a wide variety of inquiries about space technology, astronomy, and related subjects from the public, the media, and other organizations.

Consumer Workshops on selection, use, and care of binoculars and telescopes, provide myth-breaking information, guidance, and demonstrations for those contemplating acquiring their first astronomical instrument.

Dark-Sky Protection Efforts educate society at large about the serious environmental threat of light pollution, plus seek ways and means of light pollution avoidance and abatement. NCA is an organizational member of the International Dark-Sky Association (IDA), and the National Capital region's IDA representative.

Classes teach about subjects ranging from basic astronomy to hand-making a fine astronomical telescope. NCA's instructors also train educators in how to better teach astronomy and related subjects.

Tours travel to dark-sky sites, observatories, laboratories, museums, and other points of interest around the National Capital region, the Nation, and the World.

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 space technology, astronomy, and related sciences through discounted memberships, mentorship from dedicated members, and NCA's annual Science Fair Awards.

Fine Quality Telescopes up to 36-cm (14-inch) aperture are available free for member's use. NCA also has access to several relatively light-pollution-free sites in Maryland, Virginia, and West Virginia.

YES! PLEASE ENROLL ME AS A MEMBER OF THE NATIONAL CAPITAL ASTRONOMERS, INC.

Enclosed is my payment for the following membership category:

Regular

Sky & Telescope and *Star Dust*. (\$46 per year)

Star Dust only (\$24 per year)

Junior (Only open to those under age 18) Date of birth: _____

Junior members pay a reduced rate.

Sky & Telescope and *Star Dust*. (\$32 per year)

Star Dust only (\$10 per year)

_____	_____	_____	(____) _____	
First name	Middle	Last name	Telephone	

_____	_____	_____	_____	_____
Street or Box	Apartment	City	State	Zip

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

Note: If you already subscribe to *Sky & Telescope*, please attach a recent mailing label. You may renew this subscription through NCA for \$22 when it expires.

Make check payable to: **National Capital Astronomers, Inc.**, and send with this form to:

NCA c/o Jeffrey B. Norman, Suite #717, The Garfield Building, 5410 Connecticut Avenue, NW, Washington, D.C. 20015.

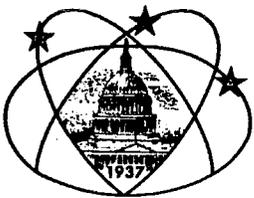
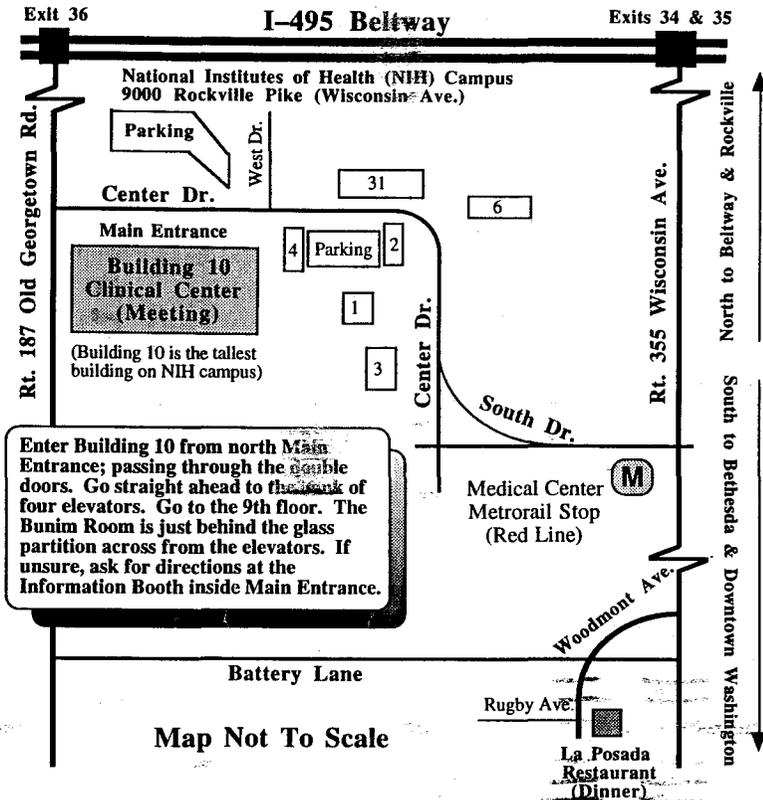
The following information is optional. Please indicate briefly any special interests, skills, education, experience, or other resources which you might contribute to NCA. **Thank you, and welcome to NCA!**

Getting to the NCA Monthly Meeting

Metrorail Riders - From Medical Center Metro Stop: Walk down the hill, pass the bus stops and turn right at the anchor onto Center Drive (walking time about 10 minutes). Continue uphill to Building 10, the largest building on campus. Also, the J2 bus line connects the Bethesda (7:16 PM) and NIH (7:23 PM) Metro stops with Building 10 (7:25 PM).

La Posada Restaurant - Take Wisconsin Avenue toward Bethesda and bear right onto Woodmont Avenue (or take the next right onto Battery Lane). Follow Woodmont to Rugby Avenue (1 blocks south of Battery) and look for the restaurant on your left (across from Rugby, 8117 Woodmont). Parking may be found on Woodmont, on Rugby, in a local parking lot one block down on Rugby from Woodmont, and opposite the restaurant entrance. Seats are not guaranteed after 5:30PM.

Star Dust is published ten times yearly (September through June) by National Capital Astronomers, Inc. (NCA), a non-profit, astronomical organization serving the entire National Capital region, and beyond. NCA is the astronomy affiliate of the Washington Academy of Sciences (WAS) and the National Capital region's International Dark-Sky Association (IDA) representative. NCA's Phone Numbers: 301/320-3621 or 703/841-4765. President, Wayne H. Warren, Jr., 301/424-0814. Deadline for *Star Dust* is the 15th of the preceding month. Editors Alisa & Gary Joaquin, 7821 Winona Ct., Annandale, VA 22003, 703/750-1636/71561.1747 @compuserve.com.



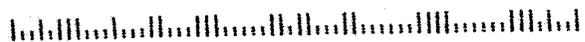
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Addendum to Newsletter

GEOSTATIONARY SATELLITE GRAZES ORION NEBULA THIS MONTH

The communication satellite IS5F13 (Intelsat Series 5, No. 13) passes about one-half degree south of the trapezium in the center of the Orion Nebula each night this month at convenient times and at a near full phase. This satellite is 37,000 kilometers up in space and appears about 11th magnitude. I have seen it twice with the NCA's Celestron-14 at Bob Bolster's observatory just south of the Beltway in Alexandria. Under darker skies it probably can be seen with a telescope having an aperture as small as ten inches.

With clock drive turned off, this satellite appears stationary as the background stars drift slowly westward by it. One gets the illusion that the satellite is moving eastward, but it never leaves the field as long as the telescope is not moved.

In the Washington metropolitan area IS5F13 will pass about four arcminutes south of a fourth-magnitude double star (SAO 132298 & 132301) that is just southwest of 2.8-magnitude 44 iota Orionis. Both the double and 44 Ori are prominent near the lower edge of the cover of the December issue of *Sky & Telescope* magazine.

The dates and times of these passages are as follows:

Date	Time EST	Date	Time EST
Dec. 1	11:11 p.m.	Dec. 23	9:45 p.m.
5	10:55	27	9:29
9	10:40	31	9:13
13	10:24		

(Note: Moon interferes between 13th & 23rd.)

Notice that the satellite passes the vicinity of this double star about four minutes earlier each night. Times for intervening dates can be determined by subtracting multiples of four minutes from the times on earlier dates. I would appreciate getting observations of the timings of the passages due south of the double and estimates of its brightness then. Good luck!

Leith Holloway 301/ 564-6061

OBSERVER'S HANDBOOK

Copies of the "Observer's Handbook" for 1995, published by the Royal Astronomical Society of Canada, will be on sale for \$12 apiece at the December 3, 1994 NCA monthly meeting and at all subsequent meetings until they are sold out. Please bring a check made out to "National Capital Astronomers" rather than cash. If you wish to buy a copy but cannot attend the meeting, please call me evenings or weekends to make other arrangements. Thanks.

Jeff Norman, (202) 966-0739