Star Dust

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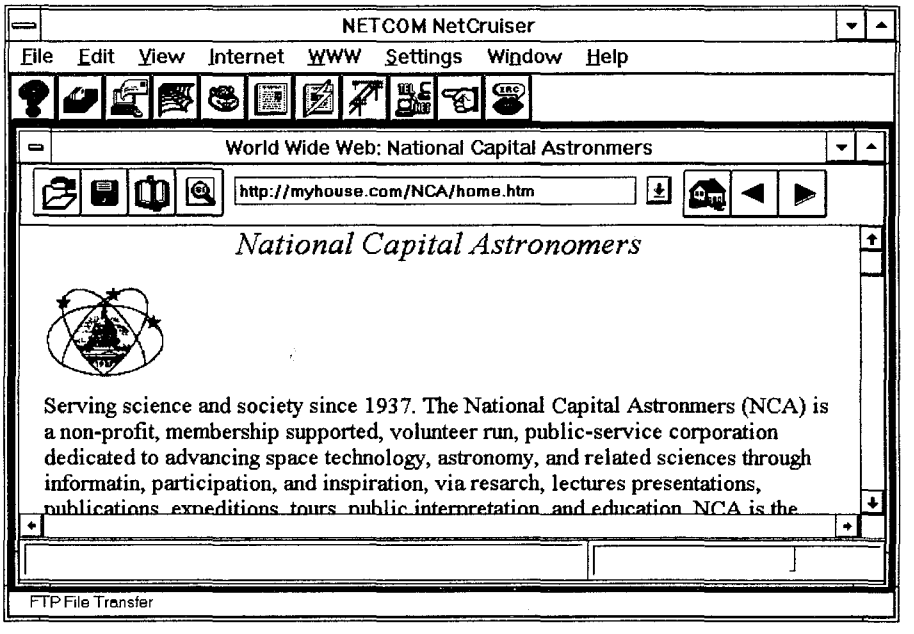
NCA and Astronomy on the World Wide Web

by Harold Williams

The next meeting of the National Capital Astronomers will be held Saturday, January 6, at 7:30 P.M. in the Lipsett Amphitheater of the Clinical Center (Building 10) at the National Institutes of Health (NIH). We will have another nontraditional NCA meeting, but this one will not be a panel discussion like the September meeting on Charge Coupled Devices (CCDs); instead the topic and main performer will be the World Wide Web itself, particularly the astronomy resources on the Web. Various NCA members, Tom Van Flandern, Michael Marie, Jay Miller, Wayne Warren, and others, will demonstrate information retrieval on the World Wide Web, we hope in real time, with the results viewable by all by use of a projection screen lighted by a bright overhead projector. We have already had two partial tests of the equipment to be used in the Lipsett Amphitheater. The amphitheater has both phone lines and high-speed ethernet cables that are already wired into the Internet. Those who have already surfed the World Wide Web, please bring you favorite Universal Resource Locator (URL), relevant to astronomy.

We want to demystify the Internet and help each other use this communication resource that is leading us to no-one-knows-quite what or where. The Twentieth Century has already seen the invention and use of the telephone and television, one active and one passive medium. The Nineteenth Century introduced the telegraph, and the Fifteenth Century, publishing. The World Wide Web conveys element of all of these technologies. We want to answer the following questions within the confines of NCA member interest: What is the World Wide Web, what resources are available for me to use, and is it worth the effort? How do I use what is out there once I have a World Wide Web browser? How do I get a World Wide Web browser up and running on a computer without becoming a full-time network engineer and UNIX system administrator? We hope that everyone who attends will leave knowing all the buzz words, such as SLIP, PPP, Shell account, Windsock, HTML, URL, gopher, FTP, WAIS, search engine, service provider, GIF, JPEG, MPEG, Quicktime, PDF, and realize that most of these terms are no big hairy deal—just like you don't have to understand Maxwell's equations to wire a lamp.

Among the things that we want to discuss are the possible uses for NCA's home page and the other pages you might see. NCA's URL is http://myhouse.com/NCA/home.htm. We would like to determine how many of our members would be willing to learn enough HTML to become web authors to help us with NCA's web presence.



NCA's new web page. This image is reproduced as line art while the image seen on a computer screen would be in full color. — Alisa Joaquin, ed.

Calendar of Monthly Events

The Public is Welcome!

Tuesdays, January 2, 9, 16, 23, and 30, 7:00-9:30 PM-Mirror-making classes with Jerry Schnall at the Chevy Chase Community Center at Connecticut Avenue and McKinley Street, NW in Washington. Information: 202/362-8872. *See* article on page 4

Wednesday, January 3-January "Sky Watch" column appears in *The Washington Post* "Style" section. It lists many events for that month.

Friday, January 5, 7:00-9:30 PM-Quadrantid meteor shower peak. Unfortunately, largely drowned out by nearly Full Moon. *See* January *Sky & Telescope*, and "Meteors" section of *Astronomical Calendar 1996.*

Fridays, January 5, 12, 19, and 26, 7:00-9:30 PM-Mirror-making classes with Jerry Schnall In the basement of McKinley Hall at American University off Nebraska Avenue, NW in Washington. Information: 202/362-8872. *See* article on page 4.

Saturday, January 6, 5:30 PM-Dinner with our speakers will take place at Nam's, 4928 Cordell Avenue, Bethesda, Maryland, before the monthly meeting. Reservations are for 5:30 PM sharp. *See* the map on the back page of this issue for directions.

Saturday, January 6, 7:30 PM-The January NCA meeting will feature various NCA members speaking and demonstrating "NCA and Astronomy on the World Wide Web." Meeting will take place at the National Institutes of Health in the Lipsett Amphitheater, Room 1c114 in the Clinical Center (Building 10). *See* back page for directions.

Mondays, January 8, 22, and 29, 8:30 PM-Public nights at the U.S. Naval Observatory (USNO), in Northwest Washington, D.C. (off Massachusetts Avenue). Includes orientation on USNO's mission, viewing of operating atomic clocks, and glimpses through the finest optical telescopes in the National Capital region. Information: USNO Public Affairs Office, 202/653-1541.

Fridays, January 12, 19, and 26, 8:30 PM-NCA's Celestron-14 telescope open nights with Bob Bolster, 6007 Ridgeview Drive, south of Alexandria off Franconia Road between Telegraph Road and Rose Hill Drive. Call Bob at 703/960-9126.

Saturday, January 13, Night-Nearly Last Quarter Moon provides this month's *second longest* Saturday night "deep night" period, including completely Moonless skies from dusk through Midnight EST. *See* explanation below.

Saturday, January 20, Night-Nearly New Moon provides this month's *longest* Saturday night "deep night" period. Deep night begins after Moonset very early Saturday night, and continues for rest of night. *See* explanation below.

Tuesday, January 30, 1996, 6:30PM—The Carnegie Institution of Washington's Capital Science Lectures will feature Irwin Shapiro, Director of Harvard-Smithsonian Center of Astrophysics. His topic will be "Peering at the Universe Through Gravitational Lenses." *See* ad on page 5.

Saturday, February 3, 1996, 7:30PM—The February NCA meeting will feature Peter Chen speaking on "Robotic Telescopes on the Moon."

Wednesday, February 7, 1996-February "Sky Watch" column appears in *The Washington Post* "Style" section. It lists many events for that month.

The Calendar's Saturday "Deep Night" Periods—Astronomy is quite unique among the sciences in that the original specimen of study, the Universe itself, is accessible to each of us possessing the gift of sight. We need only look up at the sky with wonder. And there is no better place to experience that original specimen than at a dark-sky site during "deep night" periods. For many, Saturday nights represent the most convenient times to do that.

The Saturday deep night periods listed in this issue's "Calendar of Monthly Events" are continuous time intervals, of three or more hours duration, that start on Saturday night before Midnight EST, when neither daylight, twilight, nor Moonlight interferes with experiencing the dark sky. They occur on two to three Saturday nights each month. Several relatively dark-sky sites are available for NCA members' use in Maryland, Virginia, and West Virginia. Information: Daniel Costanzo, 703/841-4765.

Understanding Active Galaxies Through Observations of Their Ionized Gas

Review by Harold Williams

On Saturday December 2, 1995, at the National Institutes of Health (NIH) in the Lipsett Amphitheater, Richard Gelderman, a National Research Council, National Aeronautics and Space Administration (NASA) Research Fellow at Goddard Space Flight Center (GSFC), spoke to us on "Understanding Active Galaxies through Observations of Their Ionized Gas." Richard first informed us that active galaxies were called by many different names, depending on the wavelength of observation and the appearance. Some of these names are Quasars, Blazers, BL Lacertae objects, Liners, Seyfert galaxies — type I, type II, and radio galaxies. He reminded us that galaxies typically were collections of 100 billion or more stars with a small fraction of the galactic mass in gas-forming stars and gas ejected by massive star explosions, all held together by the common gravitational attraction of the luminous and nonluminous matter in the galaxy. To be active, a galaxy must have a nucleus that is as bright as the rest of the galaxy in some part of the electromagnetic spectrum; their common name is AGN, Active Galactic Nuclei. How much brighter must the nucleus be? Imagine looking at Los Angeles and seeing the city lights from above (with apologies to those fighting light pollution). Now imagine that a phone booth in the center of town is as bright as the rest of the city without the phone booth. Further imagine, with increasing telescopic resolution, that you are able to resolve the phone booth and then see a phone within the phone booth, and that the phone is as bright as the rest of Los Angeles — impressive contrast, to say the least. The gas near this bright source would be ionized and would emit a discrete line spectra, described by Kirchoff's second law. Kirchoff's three spectral laws are that the hot objects emit continuous spectra that peak according to Wien's law:

$$\lambda_{max} = 0.0029 \times T^{-1}$$

where λ_{max} is the peak radiation in meters and T is the temperature in Kelvin — and the Stefan-Boltzmann law:

$$F = \sigma T^4$$

where F is the energy flux and $\sigma = 5.67 \times 10^{-8}$ W m^{-2} K^{-4}. Cool things such as human beings emit continuous spectra, too, because of our body temperature of 310 K. Since some of the best lines to observe are of ubiquitous hydrogen, he briefly reviewed the Bohr model of hydrogen with its discrete energy levels, and he explained the discrete absorption and emission line spectra of hydrogen. It was pointed out that bright emission line spectra, even of a distance-dimmed active galaxy, will quite often be much brighter than the metro-area light-polluted sky in a very narrow spectral range. Besides the Hα and Hβ lines of hydrogen, [O III] — a doubling ionized oxygen line — and [N II] — a singly ionized nitrogen line — are often the best lines to spectrally image the ionized gas. Richard then showed us images of several active galaxies in the light of these emission lines or as ratios of different emission lines. The most beautiful AGN was NGC5252 with a central source, ionization cones, and star isophotes. The width of the spectral lines, broad or narrow, and the Doppler shift tell us something about the engine in the center, which is supposed to be a back hole, though this currently cannot be resolved at the distances of external galaxies. The viewing angle or geometry to the bipolar flow of matter coming out of the central engine chiefly determines what type of AGN we see — Quasar, Blazer, radio lobed, or Seyfert. Lieth Holloway asked if the Milky Way Galaxy might be an AGN or whether we would want to live in a galaxy that was an AGN. Richard answered that at the present time the galaxy is not an AGN, and as for the hazards, only a narrow, generally highly columnated region within a galaxy is in serious jeopardy; our position away from the Galactic Center makes it improbable that we would be hit by the narrow beam if the Galaxy were to become an AGN.

As usual, we are indebted to NIH and NCA member Jay Miller for arranging to meet at NIH, where he works.

Corrections, Clarifications & Amplifications for the December Issue

A note from *Star Dust*'s Editorial Staff: Leith Holloway's use of the word "hobby" (*see* correction 1) to describe his longtime devotion to astronomy represents Leith's experience of the role of astronomy in his life. It is not used in this issue in any way to trivialize his interest, his long years of service to NCA and astronomy, or to make *Star Dust* appear as an amateurish publication. Sadly, "hobby" is a word frequently used by some in the S*T*A*R*S community (Space Technology, Astronomy, and Related Sciences) to trivialize and marginalize the interest of others. That is why it is important to emphasize here that in NCA, we are all astronomers. We all share equally in this grand experience of Cosmic Discovery, especially since our very own tax dollars fund practically all of it. In NCA, we can all learn from each other and from this vast wonder-filled Universe around us.

The following are corrections, clarifications, and amplifications to the December issue of *Star Dust.*

1. In the article on Leith Holloway the following paragraph should have read: "Astronomy has been a hobby of mine for most of my life. I did, however, work my way through college partly by lecturing at the planetarium in the Boston Museum of Science

See CORRECTIONS, page 5

How to See The Universe, Make A Telescope, And Get The Biggest Bang For Your Buck With The Help of Mirror-Making Classes Conducted by NCA's Jerry Schnall

Part III

by Guy Brandenburg

Basics

Who should NOT build a telescope? In my opinion, you should not begin grinding a mirror and making a scope if you have a habit of starting projects and never finishing them. It might also be a mistake if you have no manual dexterity at all. The mirror itself is pretty easy if you have someone like Jerry Schnall guiding you through every step, but then you have to mount it in a tube or box so that you can use it to look at stuff, and that is a bit involved.

If you have had reasonably successful experiences at things like building model airplanes as a kid, or performing basic home or car maintenance like changing a tire, simple carpentry, painting, plumbing, then you can make a scope from start to finish. But think it over before committing yourself.

You have to also really enjoy the night sky. I never had a scope when I was younger, and really didn't know much about the stars, but I always really enjoyed looking. My parents used to take us kids out into the back yard on the farm we grew up on in what's now suburban Maryland, showing us the Milky Way, constellations, and even Sputnik. After college I spent some time in northern Vermont and was lucky enough to see the Northern Lights a few times. I read and reread an article in *Scientific American* when I was in my teens about making a telescope, but figured it was really impossible. After I turned 40, I decided that I had the time and the money and the desire to own and use a scope — the question then was, "What type?" I got a copy of Richard Berry's book on making a telescope, and I said to myself, "This is easy! I can do this! This is no problem at all!" — except for the mirror, which I thought I would just purchase. But then I talked to some people in NCA, went to a star party at Virginia's Crockett State Park, and then talked to Jerry Schnall, who convinced me that making a mirror was not so difficult. And he was right.

There are three books on the process of making a scope that I would highly recommend borrowing from a library or perhaps buying from a scientific book club of some sort: *Build Your Own Telescope* by Richard Berry, *Why and How to Make a User-Friendly Sidewalk Telescope* by John Dobson, and *How to Make a Telescope* by Jean Texereau. You may be aware that John Dobson is responsible for a revolution in telescope making inventing a new type of altazimuth mounting that enables one to make really LARGE telescopes and still mount them and use them without needing a master machinist. Dobson's book is hard to find and idiosyncratic, and will fall apart before you finish reading it, but is probably worth purchasing (through Kalmbach publishing — they also publish *Astronomy*) to help finance the work of John Dobson and his Sidewalk Astronomers. There are occasional articles on telescope making in *Astronomy* and *Sky and Telescope*, as well as a now-defunct magazine called *Telescope Making*. I understand that there is another similar magazine being published today but I haven't seen a copy. Better public libraries will stock most of these books and magazines.

You also need to have to have some chunks of time to devote to the project. I found that the labor for a 15 to 20 centimeter (6 to 8 inch) mirror was about 30 to 40 hours, spread out over several months of one or two hours of grinding and polishing per night, one or two nights a week. The mounting took about the same time, but could have been less if I hadn't been trying to reinvent the wheel and continually changing my mind about how I was going to do it. If I was a better carpenter, it would have been faster also. If you have no free time in the evenings or weekends, then obviously this project is not for you.

Costs

What does it cost to make a Newtonian Dobsonian? That depends. When I made my first 15 centimeter (6-inch), f/8 scope a couple of years ago with much help from Jerry Schnall, the price for the mirror kit was $45. Aluminizing the mirror was another $12. I spent about $30 for a mirror mount, another $50 for a diagonal mirror and spider, and about $53 for a focuser. I probably spent another $60 on Teflon, plywood, screws, formica, lumber, primer, paint, and the like. As for eyepieces, they will run anywhere from $30 to $300 depending on quality. You can subscribe to the *Starry Messenger* and get decent used eyepieces for about 60% of retail costs. I spent about $0 each for mine, and they're pretty good. (I don't see the point of buying a Nagler eyepiece that costs as much as the rest of the scope.) I also bought a Telrad reflex sight for about $50 and a small finder scope, used, for $30. I am not going to add in the eyepiece prices. My total cost (which could have been less had I scrounged more): about $250. By the time I made my second scope, prices had risen on some of the parts, and the mirror glass and kit was more ($75 for the mirror and $16 for aluminizing) but I was able to use the same Telrad on the second scope and I also made my own mirror mount.

To be quite honest, there is no way you can get any commercially-made scope of a comparable quality for that price. The cheapest ones are the flimsy pieces of junk with really disgusting optics that one sees in department stores. They are not worth buying at all. The cheapest decent reflectors that are available through reputable optical

*See **TELESCOPES**, page 5*

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mail-order places or astronomy retailers, like Company 7 and Gary Hand, do not have any of the goodies on them that I mentioned (Telrad, finder, decent focuser, decent spider mount), although the Meade comes close. The mirrors in them sometimes are good, sometimes not — there is no way to tell unless you test them out (which you can do in the NCA). The mirror that I made in Jerry's class was better than the commercially made one that a colleague of mine purchased (which became part of a telescope used by classes at the School Without Walls High School in DC). Mind you, the commercial mirror produces decent images, but mine was better and much cheaper.

I could have made several of these parts and really brought the price down: the focuser, the spider, the diagonal holder, the mirror holder. The books by Dobson and Berry give ideas on doing just that. I could also have done without the Telrad, but not without some sort of a finder scope. But I made the choice of buying all these on my first scope. On the second one, I made the mirror holder, saved about $40 or $50, and got a superior product that neither rattles nor damages the mirror while it's riding in the car. If you decide to make a scope, then you will have to make similar decisions for yourself.

The mounting takes about as long as the mirror itself. You will need the use of a basement or garage and access to some hand or power tools such as saws, sanders, and drills. If you have access to a real carpenter's shop (I do not) and really good woodworking skills, then so much the better for you.

Once your mount is done, you have to align the various mirrors, focuses, and eyepieces. This can be tricky, so get some help. I found Jerry to be extremely helpful on this and all other aspects of telescope making. If you go to star parties or observing sessions, even in the daytime, you will probably find somebody else who can give you a hand on straightening things out.

Uses

Before it comes time for "first light," I hope that you have been trying to learn where stuff is in the sky all during your time of making your scope. But if you are like me, you didn't get out to dark-sky sites very often, and you spent so much time in the workshop that you didn't get out to observe. I didn't know where stuff was, except from night sky guides (which are never perfect). I didn't even know where I could go to avoid light pollution. Now I do know where to go and where to look, and have spent some serious hours and nights trying to nail all 108 Messier Objects from spots on Shenandoah National Park's Skyline Drive and at Sky Meadows and Crockett State Parks in Virginia, and a few other locations.

Then, once you have your telescope working properly and you have learned where some of the "good stuff" is in the sky, then I feel you have a duty to share this with others. They will generally be quite pleased — it's quite different from being a couch potato and channel-surfing!

Carnegie Institution of Washington

Capital Science Lectures

Tuesday
January 30, 1996

Irwin Shapiro

"Peering at the Universe Through Gravitational Lenses"

Will gravitational lenses help astronomers determine the size and age of the universe?

All lectures are free and open to the public. Seating is subject to availability. Doors open at 6:00 pm. Lectures are sign interpreted for the hearing impaired.

Carnegie Institution of Washington
1530 P Street, NW
Washington, DC 20005-1910

Three blocks east of
Dupont Circle Metro Station.
Street parking available.

For more information on the 1995-96 Capital Lectures, or on the Carnegie Institution of Washington, call
Sherril Berger
(202) 328-6988.

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from 1950 to 1952. I earned BS and MS degrees in Meteorology from the Massachusetts Institute of Technology in 1952 and 1953. My entire scientific career was in meteorology."

2. The National Oceanic and Atmospheric Administration (NOAA) laboratory where Leith was a research meteorologist for many years was incorrectly named. It is the Geophysical Fluid Dynamics Laboratory (GFDL).

3. The listing in the "Calendar of Monthly Events" of an NCA "Exploring the Sky" program being given at Rock Creek Park on December 9 was entirely in error. No such program was scheduled for that date. " Exploring the Sky" programs are not given during the cold weather season (December through March). The next " Exploring the Sky" is being scheduled for April.

4. The close-up image of the nucleus of the Andromeda Galaxy (M31) accompanying the article about the December speaker's presentation, the

See CLARIFICATIONS, page 7

Newsletter Deadline for February *Star Dust*
JANUARY 15, 1995

***** DO NOT BE LATE!!! *****

Send submissions to Gary & Alisa Joaquin, at 7821 Winona Ct., Annandale, VA, 22003. Leave a message on voice mail 703/750-1636 or send an ASCII file via E-Mail at 71561.1747 @compuserve.com or AGJOAQ@ix.netcom.com or fax to 703/658-2233. Submissions must be on time or they may not get in.

Mark Your Calendar! – Next Six NCA Meetings

By Daniel Costanzo

NCA meetings themselves provide approximately, once a month, a sample of what Planet Earth is doing relative to the Sun's position in Northern Hemisphere mid-latitudes. Thanks to modern microcomputers, data about the sky on meeting nights is now rather easy to calculate with public domain software.

Listed below, along with last December's and this January's meeting, are the next six NCA meeting dates, along with Sunset times, the Sun's azimuth on the horizon at Sunset, and Astronomical Twilight ending times, all for the Bethesda, Maryland area. For consistent comparison, all Eastern Daylight Time (EDT) times have their respective Eastern Standard Time (EST) times given in parentheses below them. Also inserted in the table are dates and distances when Earth reaches perihelion (innermost part of orbit around the Sun) and aphelion (outermost part of orbit), with Earth's respective distances from the Sun on those dates given in kilometers (km) and Astronomical Units (AU).

Inspection of this table brings out several notable points to watch for when attending upcoming NCA meetings. Most dramatic of all, it shows the Sun's "climb" out of the "depths" of the December Solstice (December 22). This is marked in two ways. First and foremost is the slow lengthening of the day between January and June. Second is the slow advance towards north, over the same period, of the point where the setting Sun touches the western horizon. This can be seen by noting from the same spot, say the NIH campus, where the setting Sun is from month to month with respect to the same landmarks. Also note that though last December's meeting night was farther from the December Solstice date than this January's meeting, the December meeting had the earliest Sunset (4:46 p.m. EST) of this 1995-1996 meeting season's September through June meetings. I'll leave it up to other NCA members to explain why.

Beginning with the February meeting, the Sun will still be above the horizon (though on February 3 by just barely one minute) for diners entering the restaurants at 5:30 p.m. for dinners with the speaker. Direct Sunlight will light their way (clear weather permitting) all the way through the September meeting. The arrival of the Equinoxes also shows up on this table. The March and April meeting dates bracket the March Equinox. This is shown by the fact that the Sun sets a little south of due west (azimuth 270 degrees) on the March date, and a little north of due west on the April date. Likewise, the March and April meeting dates reflect roughly equal length days and nights around this time of year, as measured by Sunrise and Sunset times falling near 6:00 a.m. and 6:00 p.m. EST, respectively. The September meeting date shows a similar pattern, but in reverse: the Sun is again setting near the due west point, and days and nights are roughly equal length. ("Equinox" = "Equal Night")

Thanks to EDT kicking in come the first Sunday morning in April (within only hours of the April meeting's end), the Sun will be well above the horizon for the May and June meetings' start. But if there was no "Daylight Saving" time in effect, then even the June meeting would start after Sunset (though only one minute after). Assuming the May and June meetings end around 9:45 p.m., for each of those two months the entire NCA meeting will occur during daylight or twilight; the year's only NCA meetings when this happens. Light pollution will probably drown the twilight out come the end of the May meeting (try to take a look and see). But a little bit of twilight will probably still be visible after the June meeting ends, even from NIH. Watch for it. So June should be the year's only meeting when twilight can be seen lingering in the west come meeting's end. The September meeting, starting only one minute after Sunset, just barely marks the beginning of the Sun's being below the horizon come meeting time.

But most of all, I always find it amazing that the deepest, darkest, bitterest, and coldest NCA meeting nights occur when Earth is closest to the Sun. The table bears this fact out. The January meeting, for instance, is scheduled when Earth is essentially still at perihelion (Sun-Earth distance on January 6 = 0.983 AU). And at perihelion this year, Earth will be closer to the Sun than at any time since 1972, though only very slightly so. Do you feel any warmer? Contrast that with the June meeting, which frequently possesses the

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NCA Meeting Nights

NCA Meeting Date (95-96)	Sunset	Sunset Azimuth (Degrees)	Astronomical Twilight Ending
Dec. 2	4:46 p.m. EST	242	5:49 p.m. EST
Perihelion = Jan. 4 @ 147,088,320 km (0.983 AU)			
Jan. 6	5:01 p.m. EST	241	6:36 p.m. EST
Feb. 3	5:31 p.m. EST	249	7:03 p.m. EST
Mar. 2	6:03 p.m. EST	262	7:31 p.m. EST
Apr. 6	6:37 p.m. EST	280	8:10 p.m. EST
May 4	8:04 p.m. EDT (7:04 p.m. EST)	292	9:48 p.m. EDT (8:48 p.m. EST)
Jun. 1	8:29 p.m. EDT (7:29 p.m. EST)	300	10:24 p.m. EDT (9:24 p.m. EST)
Aphelion = Jul. 5 @ 152,099,040 km (1.017 AU)			
Sep. 7	7:29 p.m. EDT (6:29 p.m. EST)	278	9:01 p.m. EDT (8:01 p.m. EST)

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warmest outside temperature of the year's NCA meeting nights. Then Earth is approaching aphelion (Sun-Earth distance on June 1 = 1.014 AU). These facts provide something to think about when braving the elements, be they bitter or balmy, to attend the January and June meetings.

This above fact also demonstrates the overwhelmingly greater influence Earth's quite significant axial tilt has on causing the seasons, when compared to Earth's much slighter changing distance from the Sun. (In terms of solar energy dumped on Earth's land, oceans, and air, this tilt shows up mainly in the changing angle above the horizon reached by the Sun at local Noon, plus the changing amount of time the Sun is above the horizon.) When stacked up against the tilt's decisive influence, Earth can be said to stay essentially the same distance from the Sun throughout the year. However, as NCA Vice President Harold Williams likes to point out, the decided majority of Harvard University graduates think otherwise, when asked in their caps and gowns on graduation day about what caused the seasons. That should give one pause to shudder when contemplating the number of those same Harvard graduates placed in positions of great authority across this Nation and around the World. What other things did they get wrong? To my knowledge, Yale and Princeton graduates have yet to be similarly tested. But I'll give them the benefit of the doubt.

So be aware of the Sun and its changing positions when attending NCA dinners and meetings. For those new to NCA, our meetings are customarily held ten times a year, once each month, September through June (no meetings in July or August), on the first Saturday night of that month, at the National Institutes of Health (NIH). They start at 7:30 p.m., and are preceded by a dinner at 5:30 p.m., with the speaker at a restaurant near NIH. The meetings typically end around 9:30-9:45 p.m. As always, NCA welcomes all, members and nonmembers alike, to attend both functions. Please come.

(The ephemeris data used here was prepared by Daniel Costanzo from data generated by Jay Miller using MICA, the *Multiyear Interactive Computer Almanac*, created by the U.S. Naval Observatory. Additional information was provided by consulting *Sky & Telescope*'s 1996 January issue.)

CLARIFICATIONS, from page 5

galaxy's three spiral dust lanes, while visible on the original image, did not reproduce in the image put in *Star Dust*

5. "C-11" stands for a Celestron-11 Schmidt-Cassegrain telescope of 28 centimeter (11 inch) aperture.

6. The correct title of the review of Jeff Goldstein's November presentation to NCA was "The Winds of Other Worlds." In the review's text, the winds of Titan can be measured to within 3 kilometers/hour (2 miles/hour), and the number of atmospheric circulation cells in a planet like Mars actually changes between Mars' Vernal Equinox and Summer Solstice.

7. We apologize for the type being unreadable in the illustrations of the new planets discovered orbiting the pulsar PSR-1257+12. They were reproduced in Star Dust at much too small a size. The downloadable originals look much better, and Internet users are encouraged to download them from the World Wide Web site given in the December issue.

8. In the article on Internet access to the information on the newly discovered planetary systems, "URL" and URLs" stand for "Universal Resource Locator" and "Universal Resource Locators," respectively. URLs will be extensively covered in the January meeting.

9. The month for the newsletter for the next deadline date was incorrect. It should have been identified for January not December.

10. David Dunham's E-mail address should read as follows: David-Dunham@jhuapl.edu.

We apologize for any inconvenience that may have been caused due to the errors in question.

Editorial Note

Any and all contributions to Star Dust, whether in hardcopy or electronic form, are submitted with the contributors' understanding that they will be subject to editing and proofing in order to comply with *Star Dust*'s style and format. These standards apply equally to all submissions including titles, text, tables, captions, figures, and illustrations. While every effort will be made to respect and accommodate contributors' wishes, by making a contribution to *Star Dust*, they give their tacit approval that it will be subject to this editing and proofing process. In this way, *Star Dust* will continue to maintain its fine standard of consistent editorial style and format that since 1958 has made it the high quality publication it remains today.

Announcing: The editorial staff of *Star Dust* has acquired a color scanner. Members may submit illustrations and photos at meetings without the need for them to be on disk. We are still looking for bios and other interesting topics to include in the newsletter. Let us know if you have anything to share.

1996 Observer's Handbook

Copies of the *1996 Observer's Handbook*, published by the Royal Astronomical Society of Canada, will be on sale for $12 apiece at the NCA monthly meetings until they are sold out. This means you can obtain this fine annual publication at a substantial discount through NCA, making it another astronomical shopping benefit of NCA membership. 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

Astronomical Calendar

The "Astronomical Calendar" for 1996, is available for $19.95. If you wish to order a copy, please inform Wayne Warren (NCA President). The price of the calendar goes down to $15.95 when four or more are ordered. For more information: 301/474-0814

A Book Review

by Gary Joaquin

Secrets of the Night Sky by Bob Berman
William Morrow and Company, Inc.,
New York, 1995, $23.00

Last May Alisa and I spent a wonderful weekend in a cabin at a dark-sky site in West Virginia when one of our friends, Walter Baine, let me take a look at *Secrets of the Night Sky* by Bob Berman. I was immediately attracted to the outstanding illustrations. Walter offered, "Why don't you borrow it? I haven't read it in the last month," to which I replied, "I've got so many good books on my reading list I don't need another book to feel more guilt about not being able to read to them all."

After breakfast the next morning I decided to sleep in while Alisa went for a hike. Later that morning I picked up *Secrets of the Night Sky* and I found myself reading every word in four very engaging chapters. Then I explored the appendices on "Buying a Telescope" and "Selecting Binoculars." That afternoon I heard myself asking Walter, "May I take you up on your offer, again?" *Secrets of the Night Sky* had moved to the top of my reading list.

Bob Berman has the rare ability to break down complex topics into clear, concise, and humorous bite sized chapters. In fact, the book's Contents resemble a menu with such entrees as "Moonstruck", "Two Dog Night", and "Eclipsing It All." Each entre comes with heaping servings of colorful metaphors and very vivid descriptions that the beginner can grasp and the more experienced astronomer can appreciate. For "dessert", Berman often rewards the reader with wonderful digressions like this description of the gravity of a black dwarf star:

"Think of it: sitting around a campfire on a star. An appealing image, except that the gravity would be so strong you'd never be able to lift a marshmallow to the fire. For that matter you also couldn't stand, sit, or even breath. Not that breathing would be easy in any event, since there'd be no atmosphere. And without air, how much heat could that campfire give off? The whole idea is losing its charm. Cancel the trip."

While Berman emphasizes objects that are visible to the naked eye, he touches upon such challenging topics as the formation of galaxies, the age and fate of the known universe, as well as time dilation experienced near the speed of light as predicted by Einstein's theory of relativity. I was particularly engrossed with his fine summary chapter on observing artificial satellites. The weekend following our West Virginia trip Alisa and I attended the monthly sky watching activity at Sky Meadows State Park, another dark-sky site near Paris, Virginia. We learned that more than 30 satellites would pass over the sky during the course of that evening. Reading Berman's chapter, "Satellite Season," helped me to understand that bright points of light moving steadily from the southern to the northern horizon are typically military satellites. Communications satellites are usually in fixed or geosynchronous orbits, some 35,700 kilometers (22,300 miles) up, invisible to the naked eye. Spy satellites are placed in low Earth orbits, about 400 to 960 kilometers (250 to 600 miles) up, because they need to be close enough to see what's on the ground! What a concept!! Berman also reveals how you too can easily recognized space junk like spent rocket boosters orbiting our planet.

If you don't appreciate books that are easy to read, challenging, and fun, then avoid *Secrets of the Night Sky*. If you don't want to take a chance on being disappointed at buying an inexpensive priced hard cover book, then take a real risk and buy a copy of the science magazine, *Discover*. Bob Berman authors the "Night Watchman," a monthly column on astronomy featuring his wacky and informative style. And if you aren't willing to take any risks at all, I might be convinced to loan you one of my back issues of *Discover* (as long as you promise to give it back). Of course, if you never read *Secrets of the Night Sky*, I'm quite content to keep the secret of "The Lost Subaru" all to myself.

Web Exploration

by Alisa Joaquin

Gary and I finally hooked up with the World Wide Web (WWW) a few months ago. Our connection is through NETCOM®. We use a simple browser called NetCruiser. While on the web, I started my explorations by going to their HOMEPORT page. Listed were the usual topics that included News, Sports, Travel, Government, Computing, Art & Entertainment, Science, etc. Under SCIENCE, I discovered a whole list of topics from Astronomy to Zoology. Under Astronomy I found another list that led me to specific topics such as the 1994 Eclipse to Images of Stars and Galaxies to the Astro Web. This topic really got my interest.

The Astro Web is a home page for a whole host of information. Within this page you can access the WWW Virtual Library which is part of this database. A group called the Astro Web Consortium maintains the database. It is a collaboration involving 9 individuals and 7 institutions. The database is updated daily.

Among the subjects found in the Astro Web are Data, Publications, People, Organizations, Software, Astronomical Imagery, Education, History, and Miscellaneous. You can even search the Master Database. There is so much information out there, it can be overwhelming. I haven't even mentioned what is under each subject. That may be something for another time. With the WWW, you certainly won't run out of material. Good searching!

A Final Note:

Starting this month, the following box below will be appearing periodically throughout the year within the newsletter. It's a good message and one we all should be following. Thank you.

Don't throw this newsletter away. If your finished with it, pass it on to someone else to read. If not, then recycle it. It's right for the environment.

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. 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. They also serve locally by assisting with 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 Programs 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 about space technology, astronomy, and related sciences.

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 dark-sky sites in Maryland, Virginia, and West Virginia.

YES! I'D LIKE TO JOIN THE NATIONAL CAPITAL ASTRONOMERS

Enclosed is my payment for the following membership category:

[ ] Regular
- [ ] *Sky & Telescope* and *Star Dust*. ($48 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.
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- [ ] Star Dust only ($10 per year)

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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 $24 when it expires.

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

NCA c/o Jeffrey B. Norman, 5410 Connecticut Avenue, NW, Apt. #717, Washington, D.C. 20015-2837.

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!**

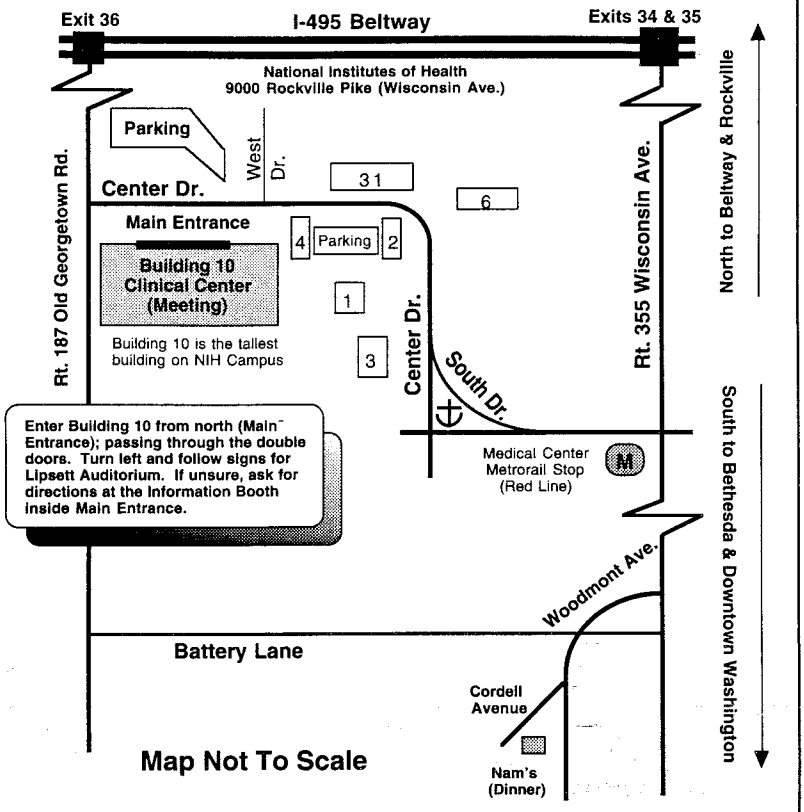
_____

_____

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. Continue uphill to Building 10 (walking time about 10 minutes), the tallest 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).

The Jade Palace - Take Wisconsin Avenue towards Bethesda and and bear right onto Woodmont Avenue. Follow Woodmont to Cordell Avenue. Take a right onto Cordell Avenue and look for the resturant on your left (address 4928 Cordell Avenue). Parking may be found on the side streets, or in local parking garages. Cars may be ticketed, even on weekends. Seats are not guaranteed after 5:30 so come early. Ordering will begin at that time.



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