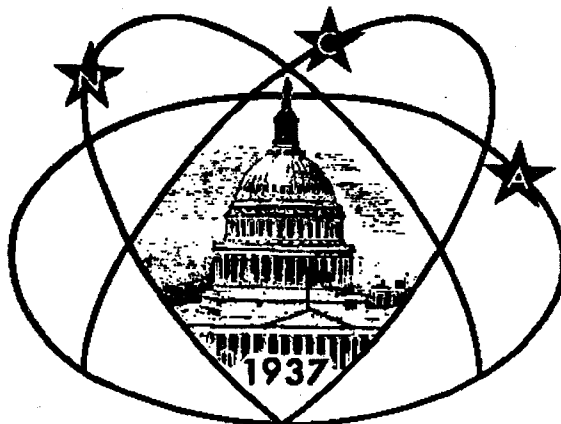




Star



Dust

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Steve Dick to Talk on SETI HRMS Project

By Nancy Byrd

The next meeting of National Capital Astronomers, on February 6, 1993 at 7:30 PM, will be held at the National Institutes of Health (in the Bunim Room on floor 9 of the Clinical Center, Building 10). At this colloquium, Dr. Steven J. Dick of the U.S. Naval Observatory will offer NCA an overview of the history and expected future directions of SETI (Search for Extraterrestrial Intelligence).

There have been few topics which have so captured the imaginations of people as the possibility of communicating with intelligent beings from other worlds. Such contact would be likely to have a profound effect on the course of human history. But to date, such communication is the stuff of science fiction. Maybe extraterrestrial civilizations are so few that the chances of contact with them are impossibly remote. On the other hand, the stuff of life as we know it (including heavy metals) has probably been abundant in the universe for at least nine billion years. So there has been time for intelligent life to evolve, but how probable an event this is remains unknown. If you believe Shklovskii and Sagan's back-of-the-envelope calculations, you expect intelligent life to be common in the universe. But if they are out there, why haven't they contacted us? Perhaps we are the victims of a cosmic snub, or ... maybe they have tried, and we weren't listening, or maybe it's our turn to speak, and they are listening. There is a growing consensus among the scientific community that we must search for evidence of extraterrestrial intelligence and attempt to make contact with any such beings out there, and now there is funding for that effort.

On October 12, 1992, NASA began its SETI efforts with radio telescopes at Arecibo, Puerto Rico and the DSN in California. Now known as the High Resolution Microwave Survey (HRMS), this program already has a 25 year history. An important part of the HRMS project will be the maintenance and publication of the history of this SETI effort. Dr. Dick will concentrate in his talk on the HRMS history project, which, aside from its administrative and technical aspects, will analyze the NASA effort in the context of the history of exploration and the search for our place in the universe.

Dr. Dick is currently serving as astronomer and historian at the U. S. Naval Observatory, where he is writing the history of the U. S. Naval Observatory. He is also official historian for NASA's High Resolution Microwave Survey (HRMS), SETI program. Dr. Dick also has served as astronomer at the USNO Southern Hemisphere Station in New Zealand. Other positions in his remarkably varied and successful career include various editorial positions, and authorship of numerous scientific articles and the book, *Plurality of Worlds: The Origins of Extraterrestrial Life Debate from Democritus to Kant* (Cambridge University Press, 1982; paperback edition, 1984; French translation *La Pluralite des mondes*, 1989).

Dr. Dick received his B.S. in astrophysics in 1971 and his M. A. and Ph. D. in the history and philosophy of science at Indiana University.

February Calendar

The Public is Welcome!

Saturday, February 6, 9:30 AM - George Carruthers (Naval Research Laboratory), "Astronomy from Space." At Smithsonian Institution, National Air and Space Museum (NASM), Albert Einstein Planetarium. For info, call NASM: 202/357-2700.

Saturday, February 6, 5:30 PM - Dinner with the speaker at Frascati's Restaurant in Bethesda before the monthly meeting. Reservations are for 5:30 Sharp!

Saturday, February 6, 7:30 PM - Dr. Steve Dick (U.S. Naval Observatory): "Search for Extraterrestrial Intelligence (SETI), history and current directions." Meeting will be held in the Bunim Room at the National Institutes of Health. For directions refer to map and description on inside back page.

February 9-23 - Moonless time for conducting The International Dark-Sky Association (IDA) North American Star-Watch program. For details, see Star Dust, 1993 January issue, page 2. NCA Points of Contact: Walter Nissen (Phone: 301/585-5711) and Daniel Costanzo (703/841-4765).

Wednesday, February 10, 7:30 PM - LeRoy Doggett (U.S. Naval Observatory), "Astronomy in the Time of Columbus." At NASM, Albert Einstein Planetarium.

Tuesday, February 23, 7:30 PM - Frederick Gregory (NASA), "Astronaut Frederick Gregory." At NASM, Samuel P. Langley Theater.

Friday, February 5, 12, 19, 26, 8:30 PM - NCA 14-inch telescope open nights with Bob Bolster, 6007 Ridgeview Drive, south of Alexandria off Franconia Road between Telegraph Road and Rose Hill Drive. Call Bob for details and more dates at (703) 960-9126. Although receding from the Earth, Mars will be worth observing and is well placed.

Next Month:

Saturday, March 6, 7:30 PM - Dr. James Crowley: "Imaging Spectrometer Studies of the Earth and Beyond."

Saturday, March 6, 9:30 AM - Judith Lean (Naval Research Laboratory), "Do Changes in Solar Radiation Affect the Earth's Climate?" At Smithsonian Institution, National Air and Space Museum (NASM), Albert Einstein Planetarium (Judith spoke at NCA's 1992 November and 1991 February Colloquia).

Measuring the Universe

By John Graham

One of the principal scientific objectives of the Hubble Space Telescope is to measure distances to the nearest galaxies with an accuracy greater than previously possible. This is a key step in fixing the distance scale for the universe at large, in determining the expansion rate, and in understanding its past and future evolution. While we now know distances within the solar system very accurately through such techniques as radar and laser ranging, on the universal scale, galaxy-to-galaxy distances are still uncertain by a factor of two, leading to corresponding uncertainties in its age.

Distance determination in astronomy is necessarily carried out by reaching out to more remote objects after adopting distances for those closer to the sun. The basic distances come from trigonometrical parallaxes of nearby stars which are determined by using the earth's orbit as a baseline and measuring the angular displacement against the background of more distant stars. The angles involved are very small and the method can only be used for stars in the solar neighborhood with distances less than 60 or 70 light years. Observations made with the HIPPARCOS satellite promise to extend this limit several fold.

Using these basic data, we can move out by comparing the apparent brightness of stars at known distances with similar objects in star clusters which contain as well rarer objects with higher intrinsic luminosities. These in turn can be used to probe further out into the Milky Way and in turn to galaxies outside our own. This work has required many years of diligent and careful work over the last century or so. Errors unfortunately accumulate as we get further away and there is an ongoing effort to increase the precision of stellar distances with the application of new instruments and new technology.

At large distances, the concept of a "standard candle" becomes important. The idea is to identify an object whose intrinsic brightness is known and whose distance can be estimated from its apparent brightness. Good standard candles have the following characteristics. 1) They are luminous and easily identified. 2) The physical basis for the known brightness is well understood. 3) The measurable quantities are objective, well defined, and easy to determine. 4) There is a demonstrably low dispersion. Cepheid variable stars, of which the bright star delta Cepheii is the type

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OBSERVER'S HANDBOOK

By Jeff Norman

Copies of the "Observer's Handbook" for 1993, published by the Royal Astronomical Society of Canada, will be on sale at the February 6, 1993 NCA monthly meeting and at all subsequent meetings until they are sold out. The price is \$10. If you would like a copy and cannot attend the meeting, please call Jeff Norman evenings or weekends at (202) 966-0739 to make other arrangements.

NCA Meets With Virginia Power About Light Pollution Issues

By Daniel Costanzo

On 1993 January 11, NCA members Victor Slabinski, Daniel Costanzo, Robert Bolster, and Nancy Byrd met about light pollution issues with Virginia Power officials John Marsh, III and Daniel Desmond at the Atlantis Restaurant in Alexandria, Virginia. NCA, representing both itself and The International Dark-Sky Association (IDA), discussed a letter Victor wrote last August expressing concerns and making recommendations about Virginia Power's proposed outdoor lighting service to multiple family dwellings and businesses.

Thanks to Victor's mentioning it at the January NCA meeting held two days earlier, what was going to be a meeting hastily arranged by two utilities officials with one private citizen, became four NCA members (and all Virginia Power customers) meeting the two Virginia Power officials. It turned out to be an educational experience for both organizations, though NCA did most of the educating.

This meeting showed that there is much work to do regarding light pollution abatement, most of it involving educating and fostering awareness across the full spectrum of society. But many lessons were learned to assist NCA and IDA in reaching that goal. And the Virginia Power officials were cordial throughout. NCA can say that there now are two less members of the power industry who are ignorant about light pollution.

This meeting is a major achievement in NCA's recognized service to science and society. For only an organization like NCA could hold such a meeting in a way maintaining professionalism, dignity, and integrity. But this meeting would never have occurred if Victor had not taken precious time from his very busy life and profession to respond to a public notice unexpectedly appearing in his monthly electric bill. For that effort, we are forever in Victor's debt.

I urge all NCA members to assist us and IDA in whatever way they can in this noble cause. Participating in the Star-Watch program is one easy way to start (for details, see *Star Dust*, 1993 January issue, page 2). Joining IDA is another. To join IDA, or for more information and data sheets, write to: David Crawford (Executive Director), IDA, 3545 North Stewart Avenue, Tucson, Arizona 85716. IDA is a very fine non-profit organization that's well worth supporting. NCA has supported IDA since its inception. For if we don't speak for the (dark) sky, no one else ever will.

Passing

Michael LoGuirato, member of NCA for 35 years, died at his home on December 10, 1992. He was the father of June LoGuirato, who for many years, reported monthly to NCA on the status of nearby minor planets. Please accept our sympathies, June.

Excerpts from The IAU Circulars

By R.N. Bolster

1. December 27 - Bezar and Marten, Observatoire de Paris-Meudon and Paubert, Institut de Radio Astronomie Millimetrique, detected CH₃CN in the atmosphere of Titan using the IRAM 30-m radio telescope at Pico Veleta. They also detected HC₃N previously seen last May.
2. December - Astrometry of object 1992 QB₁ has continued, and Marsden's latest orbit has a perihelion distance of 40 AU, low eccentricity (0.01) and a period of 296 years.
3. January 2 - Jean Mueller discovered a comet (1993a) of 16th magnitude in Ursa Major on a photograph taken with the 1.2-m Oschin Schmidt telescope at Palomar. Preliminary orbital elements indicate that the comet will reach perihelion exactly one year later at a distance of 1.7 AU.

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example, are particularly good ones. These are stars in an advanced evolutionary stage in which the outer layers of the stellar atmosphere become temporarily unstable causing the star to pulsate. Cepheid pulsation occurs because of modulating opacity in the helium ionization zone which acts as a valve-like mechanism, alternately trapping and releasing energy and forcing the outer layers of the star into motion. One observes, and it is easy to understand theoretically, a relation between the pulsation period and the average intrinsic brightness of the star. The calibration of the period-luminosity relation is carried out using cepheids which have been found in star clusters of the Milky Way and in the most nearby star systems, the Magellanic Clouds and the Andromeda galaxy.

I would like to report tonight on the progress that a group of us have been making in studying cepheids in more distant galaxies using the Hubble Space Telescope. This is a project which has been long in the planning stage, and indeed I talked to National Capital Astronomers about it in 1988. Our original intention was to push out to distances of the order of 60 million light years, but this hope has been frustrated by the well known error in the shape of the Telescope's 94-inch mirror. The incorrect figure of the mirror introduces spherical aberration into the light distribution of each of the images. The effect is well determined and if our variable stars were not surrounded by many faint non-variable stars it would be possible to take it fully into account. But this background is not known and we are consequently restricted to more nearby galaxies where the cepheids can be more easily disentangled from the surround star field. It turns out that we can do very well! During the first year of operation of the Space Telescope, we were able to obtain observations of two fields in the spiral galaxy Messier 81 on 12 occasions. During the previous three decades, the Mount

Palomar 200-inch telescope had spent many nights searching for cepheids in this galaxy. The grand total found was two. In the short time we have had with the Space Telescope, we have found 37 good candidates and have been able to assign periods to 27 of these. Our job is made easier by the fact that we optimize the intervals between successive observations for finding variable stars of the cepheid type (we know it is not going to be cloudy out there!) and we can depend on the image quality being the same from exposure to exposure. We detected some variable stars by the time-honored method of "blinking" between images taken at different epochs but with modern computational techniques it is possible to measure the brightness of every star on every image and then to ask the computer for a list of those stars which appear to be varying in brightness. To calibrate our Space Telescope observations, brightness measurements of stars in each field have been made with the largest ground-based telescopes. We are planning more observations with the Space Telescope during 1993 to refine the periods of our newly discovered variable stars and to determine good light curves and values of the average brightness. We do not yet have a new distance for Messier 81. We expect it to be around ten million light years but we are waiting for all the data to come in before the determination of a final value.

Next year, we are planning to look for cepheids in the somewhat more remote galaxy Messier 101. In this giant open spiral, we will be able to check whether the period - absolute brightness relation changes at all with the known chemical abundance variations across the galaxy. Late this year, a repair mission to the Hubble Space Telescope is planned when correcting optics as well as a new wide-field camera will be installed. Then we hope to pursue our original aim of determining distances out beyond the Virgo cluster of galaxies and with the new data put a firm distance scale, accurate at the ten percent level, onto the observable universe.

National Capital Astronomers, Inc.

is a non-profit, public-service corporation for advancement of the astronomical sciences and is the astronomy affiliate of the Washington Academy of Sciences. For information, call NCA: (301) 320-3621.

SERVICES AND ACTIVITIES:

A **Forum** for dissemination of the status and results of current work by scientists at the horizons of their fields is provided through the monthly NCA Meeting. (See monthly *Stardust* for time and location.) All interested persons are welcome; there is no charge.

Expeditions frequently go to many parts of the world to acquire observational data from occultations and eclipses which contribute significantly to refinement of orbital parameters, the coordinate system, navigation tables and timekeeping. Other results of this work under continuing study include the discovery of apparent satellites of some asteroids, discovery of apparent small variations in the solar radius, and profiles of asteroids.

Discussion Groups provide opportunities for participants to exchange information, ideas, and questions on preselected topics, moderated by a 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.

The **NCA Public Information Service** answers many astronomy-related questions, provides predictions of the

paths and times of eclipses and occultations, schedules of expeditions and resulting data, assistance in developing programs, and locating references.

Astronomical Telescope & Binocular - Public Seminar, for Selection, Use, and Care, held annually in November, offers the public guidance for those contemplating the acquisition of a first telescope, and dispels the many common misconceptions which often leads to disappointment.

Working Groups support areas such as computer science and software, photographic materials and techniques, instrumentation, and others.

Telescope-Making Classes teach the student to grind and polish, by hand, the precise optical surface that becomes the heart of a fine astronomical telescope.

NCA Travel offers occasional tours, local and world-wide, to observatories, laboratories, and other points of interest. NCA sponsored tours for comet Halley to many parts of the southern hemisphere.

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

Public Programs are offered jointly with the National Park Service, the Smithsonian Institution, the U.S. Naval Observatory, and others.

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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:

Leith Holloway 10500 Rockville Pike Apt. M-10, Rockville, MD 20852.

The following information is optional. Please indicate briefly any special interests, skills, vocation, education, experience, or other qualifications which you might contribute to NCA.

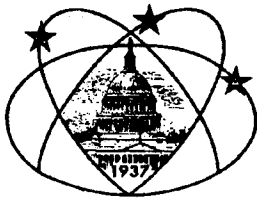
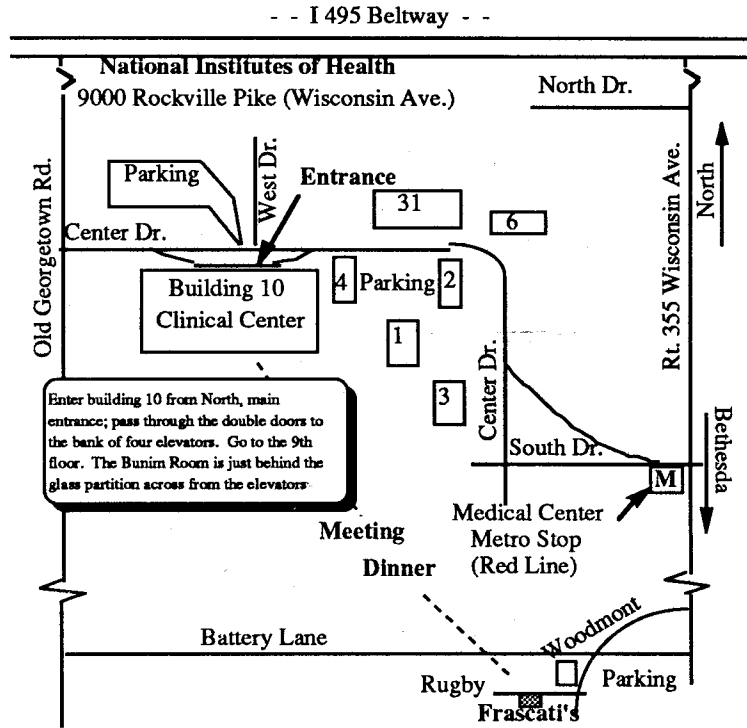
Thank you, and welcome!

Getting to the NCA Monthly Meeting

•Subway 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, 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).

•To Frascati's: Proceed down Wisconsin Avenue toward Bethesda. Bear right onto Woodmont (or the next right onto Battery Lane), follow Woodmont across Battery, take a right onto Rugby and park. The restaurant will not guarantee seats after 5:30.

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