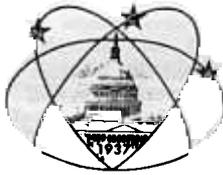


S T A R

National Capital Astronomers, Inc.



D U S T

Washington, DC (301) 320-3621

Volume XLVI Number 2

OCTOBER 1988

ISSN 0898-7548

Graham Scrutinizes Extragalactic Distance Scale



DR. GRAHAM

Dr. John Graham of the Department of Terrestrial Magnetism, Carnegie Institute of Washington, will speak at the October 1 National Capital Astronomers colloquium in the National Air and Space Museum. He will describe an experiment that he and associates have proposed for the Space Telescope, to resolve the discrepancy in the Hubble constant, upon which the cosmic distance scale is based.

Distances in astronomy are notoriously hard to measure. Uncertainties increase as we look farther out into space. Yet, at the limit, our knowledge of the expansion, age, and early evolution of the universe depends entirely on the accuracy of these distances that we can measure to remote, extragalactic star systems. New instruments and techniques, some currently available like new electronic detectors, some still ahead like the Hubble Space Telescope, will help us tie down these distances more precisely than has been possible to date. Graham will discuss the various "standard

candle" objects that are used to establish distances and their applicability over various distance ranges, as well as what we can learn with an improved, more accurate distance scale in our hands.

Born in Sydney, Australia, John Graham received his Ph.D. from the Australian National University. Subsequently, he was associated with the London Observatory in South Africa and Holland in 1964 and 1965, the Kitt Peak National Observatory at Tucson, Arizona from 1966 to 1968, the Inter-American Observatory at Cerro Tololo, Chile from 1969 to 1985, when he came to the Carnegie Institution. He is a past Vice President of the American Astronomical Society, and is a member of National Capital Astronomers.

OCTOBER CALENDAR -- The public is welcome.

- Saturday, October 1, 5:45 pm -- Dinner with the speaker at the Smithson Restaurant, 6th and C Streets, SW., inside the Holiday Inn. Reservations unnecessary. Use the 7th Street and Maryland Avenue exit of the L'Enfant Plaza Metrorail station.
- Saturday, October 1, 7:30 pm -- NCA monthly colloquium in the Einstein Planetarium of the National Air and Space Museum, Seventh Street and Independence Avenue, SW. Enter Independence Avenue side. Dr. Graham will speak.
- Tuesday, October 4, 11, 18, 25, 7:30 pm -- Telescope-making classes at Chevy Chase Community Center, Connecticut Avenue and McKinley Street, NW. Information: Jerry Schnall, 362-8872.
- Friday, October 7, 14, 21, 28, 7:30 pm -- Telescope-making classes at American University, McKinley Hall basement. Information: Jerry Schnall, 362-8872.
- Friday, October 7, 21, 28, 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 at 960-9126.
- Saturday, October 8, after 4:00pm -- NCA visit to Hopewell Observatory. See page 9.
- Saturday, October 15, 7:00 pm -- *Exploring the Sky*, another free, public Mars Special with telescopes -- Bring the family. Presented jointly by NCA and the National Park Service, Glover Road south of Military Road, NW, near Rock Creek Nature Center. Planetarium if cloudy. Information: John Lohman, 820-4194.

For other organizations' events of interest see elsewhere in this issue.

SEPTEMBER COLLOQUIUM

Dr. Richard Berendzen, President of American University, addressed the joint meeting of National Capital Astronomers and the Washington Academy of Sciences (of which NCA is the astronomical affiliate) at the National Air and Space Museum on September 10. Speaking to a full house on the occasion of the close approach of Mars, he interpreted what he calls The Astronomical Perspective -- a view through space and time, back to the beginning of the cosmos.

Along the way, he pursued some of the fundamental quests of humanity common to all ages. All have shared the desire to understand order and structure in the cosmos. On the Salisbury plains of England, a prehistoric people built the megalithic Stonehenge. While their reasons seem to have been partly religious, it is also a prehistoric astronomical analog computer with which they could predict motions of stars and planets they believed to govern their lives. In doing so, they made the common assumption that the Universe was built for us to enjoy, that we are at the center of it all, a view held for centuries, and, by some, even today.

In the 17th century, Isaac Newton, perhaps more than any other, challenged that view. Berendzen showed a portrait of Newton made from real life. It strongly resembles Bob Hope with a curly wig! When he was 23, Newton withdrew from Cambridge, where he was a student, to avoid the great plague, and went into isolation for about 18 months in his uncle's farmyard. There he invented the calculus and most of mechanical physics, stated his law of gravity, declared it to apply throughout the universe, and shifted us from the center of the cosmos to a little planet in orbit around the Sun.

Newton gave us the theory; now more observational data were needed. These came from many places. The United States started to dominate observational astronomy in the early 20th century. At first, the vast sums of money necessary to build large observatories for serious photographic exploration came mainly from private sources, individuals such as Andrew Carnegie. Institutional and government funding followed, to build the sophisticated observatories of today.

Berendzen reviewed the history of Mars observation. Because of its bloody-looking red color, ancients named Mars for their god of war. During the 1877 Mars opposition, Asaph Hall at the U.S. Naval Observatory discovered the two Martian moons, Deimos and Phobos. (He used the 26-inch Clark refractor, then the world's largest, which can now be seen -- and used -- during the Observatory's weekly Monday night public tours. -- ed.)

Also during that opposition of Mars, Giovanni Schiaparelli thought he saw long, straight lines, and called them "canali," meaning channels. This was misinterpreted by British and American press as "canals," which implies artifacts. The polar caps expand and shrink seasonally, while markings in the equatorial regions seem to darken, suggesting plant life. Could the canals be to support agriculture? We now know that they were imaginary.

Percival Lowell built Lowell Observatory near Flagstaff, AZ, expressly to search for life on Mars. Lowell thought he saw these long, straight lines, or ditches. The Suez and Panama Canals had just been completed. Public awareness and Fascination grew. Marconi, in the late teens, reported reception of a strange radio signal, and conjectured that it came from Mars. August 1924, brought another close opposition. By international agreement, every radio station in the United States and most of the world were silent for 5 minutes each hour around the clock during the opposition, while everyone who had a radio listened for Mars. Station WOR in New Jersey picked up a signal, undoubtedly transmitted as a hoax, reportedly from Mars. In the early 1930's a British clergyman on BBC fictitiously reported that the British countryside was being invaded. This story with the New Jersey radio hoax, prompted radio producer Orson Wells to capitalize on the public concern. He produced his classic "War of the Worlds," in which Martians were supposedly invading the Earth, landing in New Jersey. "Martians have a 'thing' about New Jersey," Berendzen said. "Only Martians would!" (Ed. note: A recording of the original radio program, "War of the Worlds," will be presented on 30 October at the National Air and Space Museum. See page 9.)

What about the "canals?" There in fact are strange, magnificent configurations there, but not the canals. There are canyons that would span the United States from coast to coast, and, mountains wider than Arizona and three times the height of Mount Everest, the highest mountain on the Earth -- truly

colossal features for a small planet whose diameter is only half that of the Earth.

What about the possibility of Martian life? In 1976 the two United States Mars Viking probes, orbiters and landers, showed strange markings. Are there artifacts of intelligence on Mars? The answer is "yes! -- for we have been there!" But no trace of Martian life was found. There are also places on Earth, Berendzen says, where the Viking probes could land and find no trace of life.

The Soviets have now made Mars their top astronomical priority, and plan mobile landers to explore the planet. One recent Soviet probe has been unfortunately lost on the way to Mars. Perhaps someday The United States, the Soviet Union, and other nations will cooperate in the exploration of Mars.

Moving beyond Mars, Berendzen described Saturn's ring system, seen as "ears" by Galileo in 1609, as the largest, flattest thing we know, and showed close-up photos by United States probes. He pointed out that the planet would float in water, and that the equatorial colors probably are from the same hydrocarbons as in the Earth's early atmosphere, in which we evolved. The study of Saturn, Jupiter, and the other planets today, is like a time tube back to our own genesis.

Berendzen then turned to the Sun: the star that governs it all. He pointed out solar activity on slides, discussed interrelations with the Earth, and Spoke of the necessity of studying solar energy production mechanisms. To understand the Earth, and ourselves, we must study the stars and other cosmic objects. It is in the nuclear reactions within the stars that atomic nuclei (of which we, and all matter, are made) are synthesized. The massive stars then explode as supernovae, scattering the material into space. The clouds of gases from such stars mingle, and, where there is sufficient mass, gravitationally collapse to form new stars in which the elements are recycled to form the heavier elements. Berendzen interpreted stellar evolution for the uninitiated by an artist's representation with a flow chart. He described the history and future of the Sun, the more massive stars, supernovae, and Black holes.

Are we alone? We must first understand our own genesis, our own evolution. Could it have occurred elsewhere? How could we communicate without something in common? We have the universe in common. Berendzen showed and discussed that controversial spacecraft plaque that was designed to communicate with any cosmic creatures who might intercept it. He described the "language" of the plaque, based on the common universe. NASA tested it on a number of American scientists. Not one of them could interpret it! Perhaps the cosmic creatures will be more intelligent. Might we someday become UFO's elsewhere?

We could now communicate throughout the galaxy with the giant Arecibo radiotelescope. If signals exist, can receive them. How would positive discovery of intelligent life be accepted? Would it challenge our beliefs?

In the quest to find ourselves in the cosmic context, Astronomers not only look out, but now can -- and do -- look down from space, at the Earth. We see a fragile, delicate planet. It is our very special, delicate home. We must cherish and protect it. We must realize that all peoples have much more that brings us together than separates us.

We are privileged to live in a special epoch in which we can see galaxies 15 billion lightyears away -- galaxies that must have been formed only one or two billion years after the formation of the universe. The most distant galaxy ever found was recently discovered; its spectrum indicates it to be older than expected. It suggests that science is not a codified body of knowledge, but is evolving, dynamic. We have much more to learn.

Present indications are that about 18 billion years ago the universe was formed in a colossal explosion that we call the "big bang." If so, theory predicts a 3-Kelvin remnant which has been sought and discovered. A Nobel prize was awarded for the discovery.

The Sun is a very ordinary star in the edge of a very ordinary galaxy. "We are but specks in space, our lives but ticks in time, but with our 1500 to 1800 gram brains, the most complex computers ever known, and with education, we can piece together the mosaic, peer back to the beginning of the universe, study the solar system, wonder about life on Mars, explore the planets, leave our own solar system, even wonder about the end of time. This," Berendzen says, "is what I call The Astronomical Perspective. and no planet brings it into focus more than the occurrence of the close approach of that most interesting of planets, Mars."

Robert H. McCracken

OCCULTATION EXPEDITIONS PLANNED

Dr. David Dunham is organizing observers for the following occultations. For further information call (301) 495-9062 (Silver Spring, MD).

UT Date	Time	Place	Vis Mag	Pent Sunlit	Cusp Angle	Min Aper
Grazing Lunar:						
10-15-88	23:03	Beltsville, MD,	8.5	24	13S	25 cm
10-20-88	02:54	Germantown, MD	8.2	67	16S	15 cm
10-16-88	08:19	Duncannon, PA	4.6	98	13S	10 cm
10-27-88	01:33	Jones Mills, PA	3.0	95	-1S	5 cm
Asteroidal:						
			Star Mag	Delta Mag	Name	
10-02-8805:32*		James Bay, Canada	12.5	0.11	(6) Hebe	30 cm
09-30-88 01:02*		Panama	6.1	6.0	(579) Sidonia	3 cm

† Photometric. * Appulses to be observed for possible satellites or path changes.

NCA/NCP "EXPLORING THE SKY" TO FEATURE MARS AGAIN FOR PUBLIC

On Saturday, September 24, at 7:30 pm, National Capital Astronomers and the National Park Service will present another free, public, telescopic viewing of Mars on Glover Road just south of Military Road, NW, in the large field near the Rock Creek Nature Center (about a mile east of Connecticut Avenue).

Bring the family! This will be another opportunity for all ages to see Mars near its close approach, weather permitting, with a variety of telescopes. See the South Polar ice cap and some of the darker, greenish areas on the red planet, that for many years led early observers to believe that there was plant life on Mars. Possibly witness one of the occasional violent Martian dust storms, but in that case other interesting features may be obscured.

In case of unsuitable weather, a program will be held in the Nature Center Planetarium.

Dr. John Lohman has also prepared interesting, descriptive, free handouts to help you learn and enjoy!

U.S. NAVAL OBSERVATORY TOURS IN OCTOBER

The Monday night public tours of the Naval Observatory will begin at 8:30 pm (EDT) on October 5, 19, 26. **NOTE CHANGE:** Passes will be issued to the first 100 persons in line, not at the main gate as previously, but at the gate across from the British Embassy, at Massachusetts Avenue and the southeast side of Observatory Circle. Parking is not allowed on the grounds for the tours except for the handicapped; ample parking is available near the gate. **NOTE FURTHER** that this change does not apply to those NCA members who are registered to use the NCA Clark refractor in Observatory Building 25. Sign-in remains at the main gate.

Visitors will see various observatory facilities and, weather permitting, appropriately selected celestial objects, with the historic 26-inch Clark refractor with which the satellites of Mars were discovered more than a century ago.

For details, call the taped Observatory message: (202) 653-1543.

NASA GODDARD SCIENTIFIC COLLOQUIUM SCHEDULED

Friday, October 7, 3:30 pm, in Building 3 Auditorium: "Laboratory Simulation of Jovian Atmospheric Chemistry," James Ferris, Rensselaer Polytechnic Institute.

Coffee and tea will be served from 3:00. Enter the main gate and obtain a visitors pass from the guard. Call Jaylee Mead, 286-8543, for further information.

NCA INVITED TO HOPEWELL CORPORATION OBSERVATORY

NCA members, families, and guests are again invited to explore the autumn night sky at Hopewell Observatory on Saturday evening, October 8. Come early (any time after 4:00 pm) and bring your prepared picnic dinner if you wish (...and stay as long as you like, of course!) Coffee, tea, cocoa, and soft drinks will be provided by the Hopewell Corporation. The night probably will be chilly so dress warmly; the observatory is not heated (the operations building is, however).

From the Beltway, go west on I-66, 25 miles to the Haymarket exit at U.S. 15. Left on 15, 0.25 mile to traffic light, right on Route 55, 0.75 mile to County Road 681. Right on 681, 3.2 miles to end, left on County Road 601 (gravel) 1.2 miles to County Road 629, Right on 629, 0.9 mile to narrow paved road on right (Directly across from easier-to-see entrance gate with stone facing on left). Turn right, go 0.3 mile to top of ridge, go around microwave station and continue on dirt road through woods a few hundred feet to the observatory.

Carpooling is recommended. Further information? Call NCA: 320-3621.

AIR AND SPACE MUSEUM OFFERS PROGRAMS

The following free, public programs will be held in the the National Air and Space Museum during September:

Saturday, October 1, 9:30 am -- NCA trustee, past president, and NASM Docent Stanley Cawelti will present the Monthly Sky Lecture, "A Light-hearted Look at the Angry Red Planet," in the Einstein Planetarium. Following the program, weather permitting, Stan will offer safe telescopic viewing of the Sun.

Sunday, October 30, 8:00 pm -- At the same time and date as the original program, a recording of Orson Wells' *War of the Worlds*, made at the time of the broadcast, will be presented in the Einstein Planetarium. Following the program, weather permitting, Stanley Cawelti will offer telescopic viewing of Mars.

NCA WELCOMES NEW MEMBERS

Jerry and Barbara Colgate
6588 Medinah Lane
Alexandria, VA 22312

Lawrence W. Fagg
Catholic University
Washington, DC 20064

John and Marjorie Kuehn Family
14303 Merton Court
Rockville, MD 20853

Delee F. Miner
5918 Mayflower Court
Alexandria, VA 22312

Sharon Romm
4636 Que Street, NW
Washington, DC 20007

Carolyn B. Tilley
10041004 Elm Avenue
Takoma Park, MD 20912

UNIVERSITY OF MARYLAND OPEN HOUSE SCHEDULED

The Astronomy Program, University of Maryland, holds open house on the 5th and 20th of each month at the University's Observatory on Metzert Road in College Park. Talks and slide shows are presented, followed by telescopic sky viewing, weather permitting.

Wednesday, October 5, 9:00 pm -- "Galaxies," Dr. John Trasco.

Thursday, October 20, 9:00 pm -- "Stellar Evolution," Dr. David Zipoy.

The public is invited; there is no charge, and no reservations are necessary for individuals. Groups larger than ten should call (301) 454-3001 at least 5 days prior to the program.

ASTRONOMY AND PERSONAL COMPUTERS by Joan B. Dunham

Backing up Hard Disks -- How often should a hard disk be backed up? We know some very cautious people who back up virtually every week, if not every day. We owned our hard-disk-equipped computer more than two years before we backed it up once. We follow a policy of software on the hard disk, data on floppies, so that, if the hard disk should fail, we have everything on floppies -- somewhere. We admit that we could find ourselves digging among stacks of floppies, trying to remember what we had where, but, so far, we have had no trouble. We felt comfortable with this non-backup procedure, since our experience with PC's has been that, once past the initial start-up failures, disk failures are not that common. Also, we really do have copies of everything on our hard disk somewhere. (For very large data sets, that may be on a mainframe data set.)

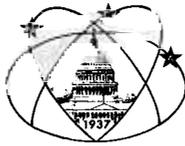
We backed up the hard disk before we moved the computer to our new house. Since we didn't make a practice of frequent backup, we did not purchase any of the backup packages, but used the MS DOS backup. This requires that the process start with formatted floppies. We were not sure how many we needed, so we formatted 50 floppies (we needed 38). The whole process took most of an afternoon and evening, during which we packed up the office. Fortunately, the computer works just fine after moving, at least as well as it did before moving, so we did not have to investigate the MS DOS restore.

How frequently hard-disk backups should be performed depends on who uses them, how they are used, and what plans there are for recovery should the hard disk fail. Our plans are, basically, to use other computers which either do not have hard disks, or have hard disks that we do not control until repairs are complete. This could mean that we spend some time after the hard disk repairs are complete trying to remember how the software was configured. We are assuming that disk failures are so infrequent that the time spent would be less than the time taken doing the backups.

Debuggers -- The larger and more complex a piece of software, the more likely it is to have bugs, errors which interfere with the planned use of the software and which must be corrected before the program can be used. The best way to handle errors would be not to make them in the first place, but, in the real world, that is an unreasonable expectation. Programmers who never make mistakes are programmers who never try anything new. Some mistakes can be found by careful reading of the code, by thinking through the logic, and by adding intermediate output, dumping variables as the computation proceeds. When the program is large and complex, this manual procedure may be too slow to be practical. Debuggers are software packages designed to help find programming errors. BASIC interpreters have the trace capability, a relatively simple debugger which shows the line numbers as execution proceeds. A more sophisticated debugger will stop at preset points in the computations and display the variables, or will step through the program, displaying the variables as the computations proceed. Some have the capability to show trails of subroutine entries, or to stop when specific conditions are met (a variable changing to a negative number, for example), and displaying the contents of registers, or requested variables.

Debuggers can be purchased as stand-alone packages, as part of a program development system, or as an integral part of a computer. When purchasing a debugger separately from the language, especially when sold by different vendors, it is important to be sure that they are compatible. How much should be invested in a debugger depends on how much is invested in the programming. If your livelihood, or your professional reputation, depends on your programming skills, you probably already have them. For those rest of us who do not have so much depending on our software skills, it is a matter for some discussion and consideration. In addition to considerations of whether or not we can afford to pay for a debugger, we need to consider how much we would really use it. If we use a package infrequently, it may take more time to understand how to use it each time we try than to search out a bug manually, and we may regret our purchase.

Most of my experience with debuggers has been with relatively unsophisticated debug options of some FORTRAN compilers, and with the BASIC trace statement. I have been considering upgrading a C compiler I bought to the new version, which has internal debugging packages available. However, these would not work with the FORTRAN compiler we have, so we could find ourselves with two separate, incompatible debug capabilities.



National Capital Astronomers, Inc.

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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 colloquia held at the National Air and Space Museum of the Smithsonian Institution. 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 *Sky & Telescope* magazine and the *NCA Star Dust*.

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.

The **Telescope Selection, Use, and Care Seminar**, 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 lead 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 and other astronomical items.

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

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The following information is optional. If you would like to participate actively in NCA affairs, please indicate briefly any special interest, talent, skills, vocation, education, experience, or other qualifications which you might contribute. Thank you, and welcome!

NOTE: If you already subscribe to *Sky & Telescope*, please attach a recent mailing label, or indicate expiration date: _____. An adjustment will be made. Make check payable to National Capital Astronomers, Inc., and send with this form to: Patricia B. Trueblood, Secretary, 10912 Broad Green Terrace, Potomac, MD 20854.

EXCERPTS FROM THE IAU CIRCULARS Robert N. Bolster

1. August O.C. St. Cyr, NASA Goddard Space Flight Center, discovered another Sun-grazing comet (1988 D) in June 27 data from the Solar Maximum Mission coronagraph. Marsden calculated the perihelion distance to be 0.0053 AU.

2. August 18 -- M. Lovas, Konkoly Observatory, discovered a supernova of 15th magnitude in MCG 9-23-9.

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Published eleven times yearly by NATIONAL CAPITAL ASTRONOMERS, INC., a non-profit, public-service corporation for advancement of astronomy and related sciences through lectures, expeditions, discussion groups, conferences, tours, classes, public programs, and

publications. NCA is an affiliate of the Washington Academy of Sciences. President, Walter I. Nissen. Star Dust deadline 15th of preceding month. Information: (301) 320-3621. Material for publication: Robert H. McCracken, Editor, 5120 Newport Avenue, Bethesda, MD 20816.

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