

## HERMAN TO RELATE OLD NAVAL OBSERVATORY HISTORY



JAN HERMAN

Mr. Jan K. Herman, Historian of the U. S. Naval Medical Command, will recount the history of the old Naval Observatory at 23rd and E Streets, NW, at the 5 March meeting of NCA. The site is now occupied by the headquarters of the Naval Medical Command.

From 1844 to 1893 the Observatory occupied the hilltop site in Foggy Bottom. During those 49 years it became one of the Nation's leading scientific institutions and one of the finest astronomical laboratories in the world. It was here that Matthew Fontaine Maury, its first Superintendent, gained international recognition as the father of oceanography. Here, the Observatory's timepieces, set by celestial observations, marked standard time for America's railroads and many of its cities.

Early on an August morning in 1877, one of its astronomers, Asaph Hall, using the largest telescope in the world at the time, discovered the two satellites of Mars.

Mr. Herman's talk will cover some of the highlights of the old Observatory's history, including Maury's controversial tenure as Superintendent. He will also discuss the old Observatory's key role in the development of American science.

Jan K. Herman was born in Tallahassee, Florida. He has a B. A. and M. A. in history from the University of New Hampshire, and was a Ford Foundation Fellow. He moved to Washington in 1968 while in military service, worked as an editor in the Department of State, and has been editor of *U.S. Navy Medicine*, the publication of the Navy Medical Department, since 1979.

### MARCH CALENDAR — *The public is welcome.*

Friday, March 4, 11, 18, 25, 7:30 pm — Telescope-making classes at American University, McKinley Hall basement. Information: Jerry Schnall, 362-8872.

Friday, March 4, 18, 8:00 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, March 5, 6:15 pm — Dinner with the speaker at the Thai Room II, 527 13th Street, NW. Reservations unnecessary.

Saturday, March 5, 8:15 pm — NCA monthly meeting at the Department of Commerce Auditorium, 14th and E Streets, NW. Jan Herman speaks.

Tuesday, March 1, 8, 15, 22, 29, 7:30 pm — Telescope-making classes at Chevy Chase Community Center, Connecticut Avenue and McKinley Street, NW. Information: Jerry Schnall, 362-8872.

Saturday, March 19, 8:00 pm — NCA discussion group at the Department of Commerce, Conference Room D: The NCA nova-search program.

Saturday, March 26, 8:00 pm — Meeting of the NCA working group on software, Department of Commerce Conference Room D. All interested are welcome.

## FEBRUARY LECTURE

Dr. Robert S. Harrington, Chief of the Equatorial Branch, U. S. Naval Observatory, addressed the February meeting of National Capital Astronomers on modern methods of stellar parallax measurement and the substantially higher accuracies they yield. He described the techniques, limitations, the use of the Naval Observatory's 1.55-m astrometric reflector, the significance of more accurate parallaxes, and some of the uses to which they are put.

As the Earth orbits the Sun, a star's apparent position oscillates; it is the path of the Earth as seen from the star. The parallax is one half of the observed motion. The nearest star to the Sun,  $\alpha$  Centauri, has a parallax of 0.7 seconds; distances to only the closest stars can be measured by parallax.

For this discussion Harrington set the radius of the parallax neighborhood at about 33 light years (ly). Within this distance are found no O or B giants, nine A and F stars, all brighter than  $M=3.55$ , 25 G stars, 23 visible, 223 K and M stars, and 17 invisible degenerate stars. There are no giants, no evolved giants, no Cepheids, no RR Lyrids within the neighborhood. These are the types used to calibrate the entire universe, and there is none close enough to measure accurately! All the intrinsically brighter stars are much farther away.

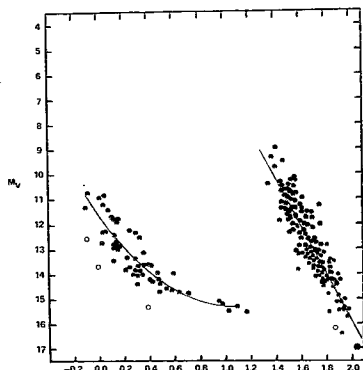
Bessel first successfully measured heliocentric stellar parallaxes in 1838 using a transit instrument. Since then long-focus refractors have been used mainly. Amplitudes on the photographic plates are about .05 mm. Some of the errors are atmospheric dispersion of the image into a vertical spectrum, telescopic distortion, emulsion creep in processing, imperfect measuring instruments, and personal measuring error. Twenty years ago some parallaxes were known within 2 percent, more usually 10 percent. Systematic errors (signal:noise ratio = 1:1) were never below .02 second — corresponding to a distance of 180 ly.

Since then better computers and impersonal measuring instruments have greatly improved accuracy. At the Naval Observatory, Strand led a complete system development of better parallax measurement featuring the 1.55-m astrometric reflector. This instrument has a .9-m flat secondary (rather than a conic section) which eliminates distortion. Errors are now routinely as small as .004 seconds with no detectable systematic error. At least one star's parallax is known to .002 second, ten times better than the previous figure. In consequence, parallaxes can be measured at tentimes the older distances, covering a thousand times the volume of space; distances to thousands of stars can now be measured within 2 percent, some far more accurately.

Further implications: The same measurements yield both parallax and proper motion; the same improvement applies. We deduce the kinematics of the galaxy from stars' motions, but "we have chosen all the wrong stars," those unusual types formerly all that were accessible to parallax measurement. We can now also measure radial motion from changing proper motion. Spectroscopic methods are still superior, but they can be contaminated with Einstein wavelength shift.

Double-star mass measurements are also improved by a factor of 10. Mass error is about three times parallax error, and is the major error in the mass: luminosity relationship, the other important astrometric calibrator. The search for stellar planets and dark companion stars is vastly extended.

Barnard's star has the largest known proper motion. Van de Kamp detected



The  $M_v$ -vs- $B-V$  plot for the 265 stars with published Naval Observatory parallaxes and photometry meeting the accuracy criteria specified in the text. The solid curves are least-squares regression lines, based only on the data indicated by solid circles, for the degenerate and dwarf sequences.

## OCCULTATION EXPEDITIONS PLANNED

Dr. David Dunham is organizing observers for the following grazing lunar occultations in March. For information call Dave at 585-0989.

UT	Place	Vis	Pcnt	Cusp	Min	
Date	Time	Mag	Sunlit	Angle	Aper	
03-16-83	23:16	Seaside Heights, NJ	6.6	5	14S	10 cm
03-19-83	01:24	Thornburg, VA	8.4	18	4S	13 cm
03-21-83	02:49	Bay View, MD	4.7	38	1N	5 cm
03-21-83	03:25	Gum Tree, MD	8.4	39	2N	15 cm
03-21-83	04:55	Palmer Springs, VA	6.0	39	2N	10 cm
03-21-83	18:26	Newburgh, NY	8.0	49	6S	13 cm
03-23-83	00:07	Doswell, VA	7.0	60	5S	8 cm
03-24-83	00:25	Silver Spring, MD	8.7	73	4N	20 cm
03-26-83	00:23	Henderson, NC	6.3	90	6S	5 cm

## NCA SOFTWARE WORKING GROUP TO MEET

All members interested in astronomical software are invited to attend a planning meeting of the NCA software working group at 8:00 pm on 26 March at the Department of Commerce. Information: Bob Bolster, 960-9126.

## TREXLER ORGANIZING GALACTIC CLUSTER VALIDATION GROUP

As a part of the NCA project to investigate decataloged objects, James Trexler is organizing a working group on galactic cluster validation. Those having an interest in participating call Jim at 839-3490.

## DISCUSSION GROUP ON NCA NOVA SEARCH 19 MARCH

Come to the Department of Commerce (Conference Room D) on Saturday, 19 March at 8:00 pm to discuss and plan the future of the NCA nova-search program. Information: Bob McCracken, 229-8321.

that it has an apparent companion of about Jupiter's mass; Harrington does not now believe it is real. However, van Biesbroeck's star does seem to have a companion of about three times Jupiter's mass. This is a new, previously unpublished discovery.

The Naval Observatory also measures brightnesses and color indices. The accompanying color-luminosity diagram shows faint, nearby stars to much improved precision; it lies well below the usual color-luminosity diagram. The vertical branch spread is about three times that for a straight line; there must be two, or intrinsic spread. The white-dwarf branch behaves similarly, and we find few stars in the gap between. There are anomalies: a red degenerate and a carbon dwarf; carbon stars "should be" giants! Van Biesbroeck's star is by far the intrinsically faintest, reddest known; its mass, only 0.03 that of the Sun, is one-half that necessary for hydrogen ignition: an exciting mystery!

We see further possibilities. We are convinced that we can measure to .001 second. Are van Biesbroeck's star and similar ones anomalies or is there a gradation down into the planetary range? So we seek stellar companions. We seek more faint stars — but how to identify them? These measurements will demand improved second-order astrophysical theory. There are good astrophysical data on only one star — the Sun — and only one close, similar G2 star is unfortunately below the southern horizon of the astrometric reflector.

A major distance calibrator,  $\delta$  Cephei, is now within our reach. No RR Lyrae parallaxes are now known.

The astrometric reflector has one odd problem: Because long exposures are necessary to integrate seeing, there are no otherwise suitable photographic plates slow enough to permit astrometry of stars brighter than 12th magnitude. The Observatory is developing occulting disks to cope with this problem.

Harrington expects great progress in the 80's!

John B. Lohman

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## EXCERPTS FROM THE IAU CIRCULARS

1. January 2 — Ake, Computer Sciences Corporation, and Simon, University of Hawaii, reported that observations of epsilon Aurigae with the IUE fine-error sensor since 1982 April indicate that eclipse totality occurred near 1982 December 5. The change in brightness was about 1 magnitude, increasing with decreasing wavelength.

2. January 10 — Haarala, Korhonen, Sillanpaa, and Salonen, Turku University Observatory, observed an outburst of BL-Lac object OJ278 in Cancer.

3. January 18 — W. Liller, Vina del Mar, Chile, discovered a nova of 7th magnitude in Musca. The discovery was made photographically using PROBLI-COM.

4. January 29 — Birkle, Neckel, and Sarcander; Max Planck Institut fur Astronomie, Heidelberg, and Centro Astronomico Hispano-Aleman, discovered a supernova of 13th magnitude in NGC 1265 in Perseus with the 2.2-m telescope working at a wavelength of 1 micrometer.

## U.S. NAVAL OBSERVATORY COLLOQUIA SCHEDULED

On Thursday, 10 March, Alice K. Babcock, USNO, will speak on "Modeling the Rotational Acceleration of the Earth." On Wednesday, 30 March, Donald K. Yeomans, Jet Propulsion Laboratory, will speak on "Comet Halley, 1404 B.C. to 1986 A.D." Both will be held at 3:00 pm in Building 52, Room 300. Coffee and tea will be served at 2:50 pm.

NCA members are welcome; enter at 34th Street and Massachusetts Avenue, NW., where the guard will require identification and provide directions. For further information, call 653-1513.

## NEIGHBORHOOD ASTRONOMERS MEETING SET

The fourth annual Washington Neighborhood Astronomers Meeting will be held on Tuesday, 15 March, at the University of Maryland. After registration at 8:30 am, papers will begin at 9:00, followed by a reception at 5:00 pm. For information call Dr. M. R. Kundu, 454-3001, as soon as possible.

★ S T A R D U S T

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