



Bell to Describe BIMA Millimeter-wave Interferometer



DR. BELL

Dr. Roger A. Bell, Director, Astronomy Program, University of Maryland, will present The December 5 National Capital Astronomers colloquium at the National Air and Space Museum. He will describe the current work to extend the Hat Creek, California millimeter-wave interferometer.

The University of Maryland, College Park, is joining forces with the University of California, Berkeley, and the University of Illinois, Urbana-Champaign, to extend the present Hat Creek array from three telescopes to six, making it the largest millimeter-wave interferometer in the world. The Berkeley-Illinois-Maryland Array (BIMA) will operate in the one- to three-millimeter spectral region, where the emission of many molecules is beyond the range of most radiotelescopes. The array is expected to make important contributions to knowledge of stellar evolution.

Dr. Bell will describe the arrangements to make the new facility operational, and will discuss some of the science to be done with the new array.

Born in Great Britain, Roger A. Bell received the B.Sc. from the University of Melbourne in 1957, and his Ph.D. from the Australian National University in 1961. He served as a lecturer at the University of Adelaide, South Australia, before coming to the University of Maryland as an assistant professor in 1963, where he became the Director of the Astronomy Program in 1986. Dr. Bell received the Ph.D. (honoris causa) from the Uppsala University in 1982, Received A.N.U. Scholarship while at King's College, University of London in 1959-60, was Visiting Fellow, Australian National University, University in 1963, Principal Research Fellow, Royal Greenwich Observatory in 1969-70, and J. Clarence Karcher Lecturer, University of Oklahoma in 1977. He has received National Science Foundation and National Air and Space Administration research grants totaling well over \$1 million and 160 hours of Cray computer time valued at more than \$300,000.

Dr. Bell is a member of the American Astronomical Society, the American Association of University Professors, the International Astronomical Union, and is a Fellow of the Royal Astronomical Society. He has published extensively in the field.

NOVEMBER CALENDAR — *The public is welcome.*

Tuesday, December 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.

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

Friday, December 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, December 5, 5:45 pm — Dinner with the speaker at the Smithsonian 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, December 5, 7:30 pm — NCA monthly lecture in the Einstein Planetarium of the National Air and Space Museum, Seventh Street and Independence Avenue, SW. Enter Independence Avenue side. Dr. Bell will speak.

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

A gift NCA membership will last all year!

NOVEMBER COLLOQUIUM

Dr. Michael Rich, Department of Terrestrial Magnetism, Carnegie Institution, addressed National Capital Astronomers on November 7 at the National Air and Space Museum. He presented new data from his studies of metal abundances of stars in the central galactic bulge.

The stars populating the central region of the galaxy closely resemble most of those observed in distant galaxies, particularly the oldest ellipticals in which there is little or no current star formation. For several decades astrophysical studies have mainly targeted stars within the kiloparsec-sized neighborhood of the Sun; the galactic center was examined only in its integrated light. Thus, little was learned of stars in the center of the galaxy.

In the 1950's Baade found windows in the intervening obscuration through which he photographed portions of the galactic center to 20th magnitude with the 100-inch telescope on Mount Wilson. Using RR-Lyrae-type variable stars which he discovered there to measure distances, he found a substantial peak in their distance distributions at the center of the galaxy, which showed that there is a central galactic bulge.

In early studies, the integrated light of the bulge was thought to be chiefly that of dwarfs. Rich has found M-giants to be prevalent in the stellar population of the bulge. Study of these metal-rich stars is thus important to an understanding of the evolution of the galaxy.

In its wide range of metal abundances, the stellar population of the bulge is unique in the galaxy, having late-type, metal-rich stars alongside the RR-Lyre metal-poor stars. It is, however, similar to the populations of the distant elliptical galaxies, which makes it possible to study such a population at close range.

An unexpected finding was that the central bulge apparently contains some young stars. Giants in the globular clusters are about 15 billion years old; some of the giants in the bulge are 2 magnitudes brighter than those at the tip of the giant branch of the globular cluster population. These bright bulge stars seem to be only 5 billion years old. There is only a partial theoretical explanation of how these metal-rich stars might have become so bright.

In the cool M-giants, the broad molecular absorption bands of titanium oxide, etc., cutting up their spectra make it difficult to determine abundances, but these stars are known to be metal-rich because of their evolution.

Because M stars evolve through the hotter, brighter K class, Rich is both avoiding the troublesome molecular bands and gaining an approximately 4-magnitude advantage (particularly important in spectroscopy) by studying the hotter, brighter, metal-rich K-giants in the central bulge. He is deriving both their metal abundances and kinematic properties.

To develop the relationship between abundances and temperature, thus between K- and M-giants, Rich measured line widths of 45 previously well-observed standard stars from globulars, the local disk, etc., determined temperatures from iron and magnesium spectra, and developed a least-squares fit of line widths to the temperature equation.

Rich measured 34 line features in the spectra of each of about 200 stars. From these data he has found not only the large unexpected population of late-type metal-rich stars in the central galactic bulge, but also the wide range of metal abundances among the stars of that region. From the abundance distribution among the metal-poor stars, he has also for the first time developed a sufficient statistical sample to fit the simple model of chemical galactic evolution. This indicates that the central bulge has an evolutionary history very similar to that of the distant elliptical galaxies, and is a step forward in understanding the evolution of our galaxy.

Robert H. McCracken

NCA WELCOMES NEW MEMBERS

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A GIFT MEMBERSHIP IN NATIONAL CAPITAL ASTRONOMERS WILL LAST ALL YEAR! CALL (301) 320-3621 (Bethesda, MD).

OCCULTATION EXPEDITIONS PLANNED

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

Date	Time	Place	Vis Mag	Pcnt Sunlit	Cusp Angle	Min Aper
12-12-87	08:11	Sykesville, MD	8.7	60	14S	20 cm
12-27-87	01:08	Mechanicsville, MD	8.2	45	16S	8 cm
12-29-87	01:03	Somerset, PA	5.6	67	17S	5 cm

AIR AND SPACE MUSEUM OFFERS PROGRAMS, TELESCOPIC SKY VIEWING

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

Saturday, December 7, 9:30 am -- Dr. David Dvorkin, Curator of Astronomical History and NCA member, will present a program on supernovae in the Einstein Planetarium.

Following the program, weather permitting, NCA Trustee and NASM Docent Stanley Cawelti will offer safe telescopic viewing of the Sun.

Thursday, December 10, 8:00 pm -- Dr. Carl Sagan, Cornell University, will speak on the Mariner II mission to Venus, in the Langley Theater. Following the lecture, weather permitting, NCA Trustee and NASM Docent Stanley Cawelti will offer a telescopic tour of the nighttime sky.

Friday, December 11, 2:00 to 4:00 pm -- Symposium on the 1962 Venus mission, the first to another planet. Einstein Planetarium.

Saturday, December 12, 9:30 am -- Dr. Joseph Royce, Geoscience Program, NASA, will speak in the Einstein Planetarium, on the history of Mars exploration. Following the lecture, weather permitting, NCA Trustee and NASM Docent Stanley Cawelti will offer safe telescopic viewing of the Sun.

ASTRONOMY AND PERSONAL COMPUTERS

Generating charts of star fields, for use as finder charts and for comparing with observations, requires a knowledge of both astronomy and computer graphics hardware. First, the right ascensions and declinations of the stars to be plotted have to be converted from the mean positions given in the star catalogs to the apparent positions at the time of observation. Accurate conversion to apparent place includes applying the corrections from precession, nutation, annual and diurnal aberration, proper motion, refraction, orbital motion (for double stars), paralax, and polar motion, although for finder charts the precession corrections alone are sufficient. These are discussed in many books on astronomy and the *Astronomical Almanac*. Meeus's *Astronomical Formulae for Calculators* gives formulae and examples. Trueblood (NCA) and Genet's *Microcomputer control of telescopes* has a nice discussion as well as example programs.

The next step is to convert the apparent positions to the plot coordinates. Right ascension and declination are coordinates on a sphere, like latitude and longitude, and must be projected to a flat surface to be plotted. Map makers' projections can be used, especially if large areas of the sky are to be plotted. For smaller areas, standard coordinates or plate coordinates can be computed by considering the area to be plotted as projected onto a plane tangent to the celestial sphere at the center of the plot. Formulae for computing standard coordinates are given in textbooks on positional astronomy, such as Smart's *Spherical Astronomy* or McNally's *Positional Astronomy*. The standard coordinates must closely approximate what is seen through a telescope. With information on focal length, f-ratio, and corrections for lens errors and field curvature, the plots can match photographs made of star fields.

The final computations are those needed to convert the plot coordinates to commands or units the specific graphics device uses. Since virtually every plotter, dot matrix printer, and graphics display device differs from every other, software must be developed for every device used. There are general purpose plotting software packages available for some combinations of computers, printers, and/or screens. Many languages, such as BASIC or C, are sold with plotting capabilities. Any program that allows plotting of points on an X-Y graph can be used, although not all allow labels on the stars or an indication of magnitudes. Examples of plots or documentation specific to plotting may not be easy to find. This final step is the easiest to discuss but potentially the most difficult to implement.

Joan B. Dunham

EXCERPTS FROM THE IAU CIRCULARS

1. October -- A University of Manchester team discovered a pulsar with an 11-millisecond period in globular cluster M4. The object was detected by computer analysis of data from the 76-m Lovell radiotelescope.

2. October 18 -- C. and E. Shoemaker and H. Holt discovered a comet (1987z) of 14th magnitude in Pisces with the 46-cm Palomar Schmidt telescope.

3. October 18 -- Jean Mueller discovered a comet (1987a1) of 17th magnitude in Pisces with the 1.22-m Palomar Schmidt telescope.

4. October 18 -- Robert H. McNaught, Siding Spring Observatory, discovered a comet (1987b1) of 9th magnitude in Lupus on a patrol photograph taken with an 85-mm lens.

Robert N. Bolster
At press time, comets through 1987f1 have been discovered, the latter on November 22.7.

NCA DUES INCREASE NECESSARY SOON

The coming increases in postage and publication costs make it necessary to increase NCA dues effective 1 March 1988. The new schedule will be published in an early edition.

FOR SALE

Unitron 4-inch refractor, altazimuth mount, unihex (ocular turret), Barlow lwns, seven oculars. Excellent condition. \$1200.00. Daniel G. Kaplan, H: (301) 946-7585 (Silver Spring) ; O: (020) 628-6050 (DC).

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