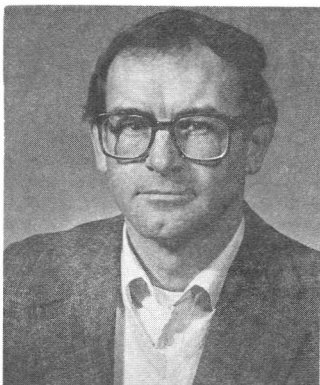




Kurfess to Discuss Recent Gamma-Ray Physics Advances



DR. KURFESS

Dr. James Kurfess, Head of the Gamma- and Cosmic-Ray Astrophysics Branch of the Naval Research Laboratory, will speak at the March meeting of National Capital Astronomers. He will discuss recent advances in gamma-ray astrophysics.

Low-energy gamma rays, from about 0.1 to 10 MeV, may provide unique information about the high-energy nuclear reactions which occur in many astronomical sites, including solar flares, novae, supernovae, compact objects such as neutron stars and black holes, and the very energetic phenomena occurring in the nuclei of active galaxies. Recent gamma-ray satellite observations have begun to reveal these processes and increase understanding of particle acceleration, interactions, and energy production occurring in these sites.

Dr. Kurfess will review briefly the state of gamma-ray astrophysics, discuss several recent results obtained by the Solar Maximum Mission, and describe the capabilities of the Gamma Ray Observatory, the Nation's next major thrust in high-energy astrophysics, to be launched in 1990.

James Kurfess received his Ph.D. in nuclear physics from Case Institute of Technology in 1967. Prior to coming to the Naval Research Laboratory in 1969, he was a Research Associate in the Space Science Department at Rice University. He is the Principal Investigator for the Oriented Scintillation Spectrometer Experiment on NASA's Gamma-Ray Observatory Mission, and a Co-investigator on the Solar Maximum Mission gamma-ray experiment.

FEBRUARY CALENDAR -- *The public is welcome.*

Monday, March 2, 9, 16, 23, 30, 7:30 pm -- Telescope-making classes at Chevy Chase Community Center, Connecticut Avenue and McKinley Street, NW. Information: Jerry Schnall, 362-8872.

Friday, March 6, 13, 20, 27, 7:30 pm -- Telescope-making classes at American University, McKinley Hall basement. Information: Jerry Schnall, 362-8872.

Friday, March 6, 20, 8:00 pm -- NCA 14-inch 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 7, 6:00 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, March 7, 8:15 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. Kurfess will speak.

Saturday, March 21, 8:00 pm -- Discussion group on observational instruments and measurements. 4250 Connecticut Avenue, NW, Suite 510, alongside the Red Line Metrorail UDC exit. Use the plaza entrance. See page 27.

For other organizations' events of interest see inside.

FEBRUARY LECTURE

The February 7 National Capital Astronomers lecture at the National Air and Space Museum was given by Dr. Frederick Bruhweiler, Professor of Physics at Catholic University. He spoke on relatively recent apparent changes in the spectrum of the brightest star in the sky, Sirius, and offered a plausible reconciliation of the historical observational record with recent advances in knowledge of stellar evolution.

Many ancient writings refer to Sirius as being red, rather than the blue-white that it is today. Their widespread, often independent prevalence seems to warrant investigation, although no fully satisfactory scientific explanation is known for such a dramatic change in so short a time. Dr. Bruhweiler reviewed some of these sources, Babylonian, Latin, Greek, and others, discussed some of the problems encountered in evaluating their credibility and accuracy of translation, and offered a plausible explanation for the apparent change.

Arabian references from about 1000 AD call Sirius blue-white. Third-century BC Greek writings refer to the color as "like copper." It was also referred to as "highly colored," translated as purple, which as late as 750 AD meant red, not the color we now call purple. In the second century AD the astronomer Ptolemy listed six red stars including Sirius. Another Greek astronomer about 130 BC referred to Sirius as red.

Sirius is a binary with an orbital period of about 50 years. The primary (A) component is an approximately normal, main-sequence star of spectral class A, of two to three solar masses. Its intrinsic luminosity is about 100 times that of the Sun. The secondary (B) is a degenerate white dwarf, one of most massive known and very dense, with a surface temperature of about 27000 K.

Bruhweiler discussed and dismissed a number of proposed explanations and conjectures. Misidentification of the star in so many writings is very unlikely, he concludes. References to the position in the sky, rising times and the seasons tend to strengthen the identification.

Another explanatory effort invokes Stellar evolution. When both components were formed about 0.5 billion years ago, the more massive B component was at a higher luminosity on the zero-age main sequence than Sirius A. More massive stars burn fuel much more quickly; B would become a red giant, then a white dwarf. In the process, it would eject its outer envelope as a planetary nebula. Sirius B is now cooling. Sirius A, burning at a much lower rate, has barely evolved off the main sequence. The problems with this model are that white dwarf cooling time is between 10 million and 100 million years, not 2000 years. Further, had the event been so recent, the planetary nebula should be visible, but none is seen. Data from the International Ultraviolet Explorer show none. This sets a limit of three orders less mass than would be expected of such a nebula. There is, however, an absorption feature from normal interstellar gas.

Interstellar dust reddens objects by scattering blue, but this model would require three magnitudes of dimming; Sirius would have been only about magnitude 1.6, not nearly as spectacular as writings indicate. No such dust cloud has been found. It would be very large, and would redden other nearby stars. Sirius is in a very clear region of the sky.

A circumstellar protoplanet ring passing in front of Sirius has been suggested. The particles would be too large to scatter blue and produce reddening; an unlikely model.

Bruhweiler offered a plausible explanation in terms of recent advances in knowledge of stellar evolution. White dwarfs were previously thought to be cooling with no nuclear burning. Now there is evidence for some residual burning of hydrogen to helium. According to the current view, white dwarfs seem to be differentiated, or layered. In the very intense gravitational field the heavier elements sink to the core, leaving the lighter elements in the outer layers. The carbon-oxygen core is surrounded by a helium layer which separates the carbon from an outer layer of pure hydrogen.

Both helium and hydrogen layers are quite thin; the unsharp boundary allows some diffusion both ways across the helium barrier. A sufficient overlap at precisely the correct temperature, about 30,000 K, will result in an explosive thermonuclear runaway. This C-N-cycle burning could last a few hundred years, reach a luminosity of 100 times that of Sirius A, with an appearance very like that of a red giant!

This model is plausible, based on developments of the last 5 years. These ideas have been tested on white dwarfs with convincing results. There is now much accepted evidence for hydrogen burning in their outer layers. Hot white dwarfs have more hydrogen, cooler ones, mostly helium atmospheres.

Bruhweiler's hope is, if possible, to use the historical record of Sirius to probe the final stages of stellar evolution.

Robert H. McCracken

PHILOSOPHICAL SOCIETY TO HEAR SHAPIRO ON COSMIC RAYS

Dr. Maurice M. Shapiro, University of Maryland, will speak at 8:15 pm on Friday, March 20, on the source of cosmic-ray energy. The Philosophical Society lectures are held in the John Wesley Powell Auditorium of the Cosmos Club, Florida and Massachusetts Avenues, NW, two short blocks west of the Dupont Circle Metrorail station. For further information call Thomas Lettlen, (301) 926-9004 evenings.

OCCULTATION EXPEDITIONS PLANNED

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

Date	UT Time	Place	Vis Mag	Pent Sunlit	Cusp Angle	Min Aper
Grazing Lunar:						
03-06-87	04:25	Cranford, NJ	6.8	37	6N	5 cm
03-06-87	04:43	San Onofre, CA	3.0	37	3N	1 cm
03-06-87	05:19	Pueblo, CO	3.8	37	6N	5 cm
03-09-87	07:59	Seville, OH	5.0	67	6N	5 CM

NCA WELCOMES NEW MEMBERS

Henry B. Bruns 300 Great Falls Road Rockville, MD 20850	Hillard Harvey Family 219 Audreys Court Vienna, VA 22130
David B. Hack, CRS/SPR U.S. Library of Congress Washington, DC 20540	Charles E. Schotthoffer, Jr. 4817 Oxbow Road Rockville, MD 20852

DISCUSSION GROUP ON OBSERVING, INSTRUMENTATION, MEASUREMENTS

The NCA discussion groups are intended to be tutorial -- at any level you choose -- to help members understand and better appreciate the lectures, solve research problems, or find new interests in astronomy.

Only four things can be measured about a radiant-energy (light, etc.) source: position, brightness, spectrum, and polarization, and, of course, variations of these with time. Even an elementary knowledge of how and why these measurements are made and what they tell us, will increase ones depth of enjoyment and provide a foundation for further learning.

Come learn and enjoy! Saturday, March 21, 8:00 pm, Suite 510, 4250 Connecticut Avenue, NW, adjacent to the UDC Metrorail station. Use the plaza entrance.

AIR AND SPACE MUSEUM OFFERS QUASAR TALK, TELESCOPIC SKY VIEWING

On Wednesday, March 18, at 7:30 pm, in the Albert Einstein Planetarium of the National Air and Space Museum, Dr. Bruce Margon, Chairman of the Astronomy Department, University of Washington, will discuss quasars and offer some possible explanations for their existence.

Following the talk, weather permitting, NCA President and NASM Docent Stanley Cawelti will offer telescopic sky viewing on the east deck.

WASHINGTON AREA ASTRONOMERS SYMPOSIUM MARCH 19

On Thursday, March 19, the twelfth Washington Area Astronomers Meeting will be held in the Art-Sociology Lecture Hall at the University of Maryland. Following the 8:30 am registration, papers will be presented from 9:00 am to 3:15 pm, with a coffee break at 10:30 and lunch at 12:30. The poster session and reception will begin at 3:30 pm. Preregistration is \$5.00, \$8.00 at the meeting. For further information call (301) 454-4021.

ASTRONOMY AND PERSONAL COMPUTERS

Often, the major difficulty we face in developing a computer system for astronomy is in getting started. Instead of being intimidated by the problems we see, we should remember that small computers, even hand calculators, can compute almost anything the big ones do. It just takes longer, and may take more effort, perhaps much more effort, on our part. The following are some suggestions on how to begin.

Write notes on your ideas for the system, using a text editor if you have one. Record your ideas as you think of them; you can arrange them in logical order later. How much trouble you put into planning the system depends on how you like to work. Some people get faster results when they carefully define everything before programming, others work better when they write their programs as they define them.

Break the system into pieces that can be done separately. Look to see how other people have solved the same type of problem. You may discover relatively inexpensive programs you can use or modify for your own purposes.

Consider making a prototype to test your ideas. You could do some computations by hand or do the computations with a spreadsheet program. If you suspect the program needs to be in machine code to be fast enough, write the prototype in BASIC, or another language, not in machine code. Then you might determine that only a few subroutines must be in machine code, not the whole program.

Determine how you will test your system before you write it. If you write the system in pieces, test the pieces before you try to test the whole system. If you use someone else's software, test that too.

Joan B. Dunham

EXCERPTS FROM THE IAU CIRCULARS

1. January -- Jennifer Wiseman, Lowell Observatory, discovered a comet of 14th magnitude in Cancer on plates taken by Brian Skiff at the Anderson Mesa Station on December 28. The orbital elements by Marsden show that Comet Wiseman-Skiff (1987b) has a period of 6.53 years, and passed close to Jupiter in 1984.

2. January 19 -- N. Nishikawa, K. Takamizawa, A. Tago, and S. MitsUma, of Minamata, Saku, Tsuyama, and Honjo, Japan, independently discovered a comet of 9th magnitude in Pisces. The parabolic orbital elements by Nakano show that comet 1987c, named for the first three discoverers, will reach perihelion on March 18, but is already receding from the Earth.

3. January 24 -- M. Tarasako, Hamamatsu, Japan, discovered a comet of 8th magnitude in Sculptor with 15-cm binoculars. The orbital elements by Green show that comet 1987d reached perihelion on December 25 at a distance of 0.38 AU. 4. January 25 -- M. Honda and M. Sugano, Tokyo, discovered a nova of 8th magnitude in Herules at 18h 41m 72s, +15° 16' 16".

Robert N. Bolster

SUPERNOVA 1987A IN LARGE MAGELLANIC CLOUD

On February 23, Ian Shelton and Oscar Duhalde, Las Campanas Observatory, Chile, announced the discovery of a 4.5-magnitude supernova at 5 hours 35.4 minutes, -69 degrees 16 minutes, in the Large Magellanic Cloud. Supernova 1987A, at a distance of 50 to 60 parsecs (about 160 to 180 lightyears), is the closest confirmed supernova since 1604. Pre-discovery plates have shown the star at 6th visual magnitude on the day before discovery, and as a class B supergiant star on March 21, probably the first supernova precursor star ever recorded. Fluctuations of a few tenths magnitude have been noted. Apparently a type II supernova, it will probably brighten to between 3rd to 1st magnitude. If type I, it may reach visual magnitude -1. The hydrogen-beta line is blue shifted (approaching) 16,100 km per second.

OBSERVER'S HANDBOOKS STILL AVAILABLE

Treasurer Ruth Freitag still has a few **Observer's Handbooks** available. At \$7.00 this handy little jewel is one of the best bargains in astronomy. A wealth of information and data are included, much of it condensed from the *Astronomical Almanac*. Get your copy while they last. See Ruth at the March meeting, or call her at (703) 521-7831 evenings.

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★ S T A R D U S T

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