☆ STAR DUST

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STROBEL TO PRESENT VOYAGER SPECTRAL IO PLASMA STUDY

DR. STROBEL

Dr. Darrell L. Strobel, Naval Research Laboratory, will present results from Voyager ultraviolet spectrometry of the Io plasma torus at the January 3 meeting of National Capital Astronomers.

The ultraviolet spectrometers on Voyagers 1 and 2 yielded spectra of Jupiter and the Io plasma torus between 500 and 1,700 Å. Strong EUV emissions at 685 and 833 Å were observed from S III, S IV, O II, and O III. Power dissipation exceeding 2×10^{12} W was measured.

Dr. Strobel will discuss properties of the plasma torus that can be inferred from the EUV spectroscopy. He will contrast the Voyager results with the earlier Pioneer results and speculate on the influence of the plasma torus on Jupiter's upper atmosphere.

Dr. Strobel, a supervisory research physicist, is Head of the Atmospheric Dynamics Section of the Plasma Physics Division, where he has been active in atmospheric dynamics, ionospheric physics, and planetary atmospheric research for the past seven years.

Before joining Naval Research Laboratory, Dr. Strobel was engaged in planetary atmospheric physics at Kitt Peak National Observatory.

Dr. Strobel received his B. S. in physics from North Dakota State University in 1964, and his A. M., 1965, and Ph. D., 1969, from Harvard University. He is a member of the American Geophysical Union, American Meteorological Society, American Astronomical Society, and the American Association for the Advancement of Science. Dr. Strobel serves as Associate Editor of *Icarus*.

JANUARY CALENDAR — *The public is welcome.*

Friday, January 2, 9, 16, 23, 30, 7:30 PM — Telescope-making classes at American University, McKinley Hall basement. Information: Jerry Schnall, 362-8872.

Friday, January 2, 9, 16, 23, 30, 8:00 PM — Observing with the NCA 14-inch telescope 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, January 3, 6:15 PM — Dinner with the speaker at the Thai Room II, 527 13th Street, NW. Reservations unnecessary.

Saturday, January 3, 8:15 PM — NCA monthly meeting at the Department of Commerce Auditorium, 14th and E Streets, NW. Dr. Strobel will speak.

Tuesday, January 6, 13, 20, 27, 7:30 PM — Telescope-making classes at the Chevy Chase Community Center, Connecticut Avenue and McKinley Street, NW. Information: Jerry Schnall, 362-8872.

DECEMBER LECTURE

Dr. Andrew G. Michalitsianos, of NASA's Laboratory for Astronomy and Astrophysics, Goddard Space Flight Center, discussed the results of current studies of symbiotic stars at the December 6 meeting of National Capital Astronomers.

Symbiotic stars are a class of intimately associated binaries which exhibit a composite spectrum. Typically, a continuum indicating the relatively cool (2,500-3,500K) surface temperature of an ordinary M-type red giant is overlain with very narrow emission lines indicating an extremely hot but subluminous source. Variability is usually small, on the order of 1 magnitude, and rather erratic. Those with Mira-type primaries show normal light cycles of about 1 year.

Previous infrared observations in the 1-10μ range have shown two types: One having a typical M-continuum, the other indicating a thermal dust jacket of silicon oxides. A single-star model has been proposed in which an M-giant is in the process of ejecting its envelope, exposing portions of its hot core, from which ultraviolet irradiation ionizes the envelope to excite the observed emission lines. Michalitsianos does not see observational support for this single-star model.

In 1935, Paul Merrill observed in the visual spectrum a large, 2-arcmin nebula surrounding R Aql, whose continuum showed superimposed forbidden lines (spectral lines which cannot be excited by atomic collisions at usual gas densities, but which can be photon excited at extremely low densities). He suggested that the hot component may be a subdwarf O or B star.

Recent observations by the International Ultraviolet Explorer (IUE) satellite modify his interpretation. Although an extended nebula is observed in the visual and infrared, only a very small envelope surrounding the M star is shown in the ultraviolet range from 1,200 to 3,200 Å. Identified lines include C III, C IV, Si III, He II, N V, and others. These ionization levels indicate an extremely hot source, but one without an observed continuum in the visual or infrared. Appearance of the forbidden lines with the others indicates a stacked structure, a hierarchy of emission, probably a complicated stratification of the nebula. An O or B star would be too luminous, dominating the visual as well as the UV spectrum.

The ultraviolet spectrum is attributed instead to a very compact nebula having a radius on the order of that of the primary itself — about 10^{12} to 10^{13} cm, and about the size of the binary orbit. A very hot (15,000-200,000K) but subluminous white dwarf is indicated as the ionizing source.

The nebula originates from the Mira-type variable primary; such stars are known to expel stellar winds of about 10^{-7} solar masses per year. Their radiation pressure is comparable with their gravitation. Expansion cycles of the primary may engulf the dwarf companion; viscous decay of the orbit may cause major perturbations, possibly nova outbursts. It is speculated that eventual complete orbital decay and entry of the companion into the primary core may even trigger a supernova eruption.

The foregoing example (R Aql) illustrates the value of the IUE for investigating symbiotic stars. Because the red primary continuum does not contribute to the UV spectrum, the IUE can selectively examine the very hot but subluminous secondary which is the ionizing source. A joint project of NASA and the European Space Agency (ESA), the IUE is an ultraviolet spectrometer in synchronous orbit. It offers the observer the convenience of real-time operation from 1,200 to 3,200 Å in either of two modes. The low-resolution, low-dispersion mode, at 6 Å per mm, is useful for very faint objects or to shorten exposures. Brighter sources can be examined with the high-resolution 0.1-Å per mm mode to reveal fine structure. IUE has yielded about 14,000 new UV spectra so far.

Michalitsianos listed several other examples of these objects, compared their similarities and differences, and pointed out some engaging questions and apparent anomalies. It is interesting that these objects can be studied to

OCCULTATION EXPEDITIONS PLANNED

Dr. David Dunham is organizing observers for the following grazing lunar occultations in January. For further information call Dave at 585-0989, or Richard Taibi, 449-7170.

UT Date	UT Time	Place	Vis Mag	Pcnt Sunlit	Cusp Angle	Min Aper
01-12-81	02:01	Whitakers, NC	7.1	34	4S	5 cm
01-15-81	00:07	Bowie, MD, Alex, VA	6.2	68	7S	5 cm
01-26-81	11:46	Fredericksburg, VA	7.5	66	8S	8 cm
02-06-81	23:01	Milton, DE	7.3	5	9S	8 cm

NCA WELCOMES NEW MEMBERS

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3040 Idaho Avenue
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1904 Abbotsford Drive
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Thomas S. Shorebird
PO Box 2289
Washington, DC 20013

Sterling T. W. Smith
330 Broadwood Drive
Rockville, MD 20851

RITTERS PRESENT TELESCOPE

Mrs. Helen V. Ritter and Mr. William L. Ritter, wife and son of the late William Howell Ritter, have presented to National Capital Astronomers Mr. Howell Ritter's telescope and his collection of works on astronomy.

Mr. Ritter made the 6-inch Newtonian telescope many years ago in the NCA telescope-making class.

National Capital Astronomers is grateful to the Ritters for this thoughtful gift, which will find renewed usefulness among the NCA membership.

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determine the effects of scattering and absorption by the interstellar medium, which, in turn, must be deconvolved from the spectrum to study the nature of the source.

Subdwarfs of symbiotic stars occupy an area on the Hertzsprung-Russell diagram below the main sequence, characteristic of central stars of planetary nebulae.

RX Pup has peculiar properties. It is an optical, IR, and radio object. Like R Aql, it has an eruptive history. It displays an inverse P Cyg profile in N IV. The C IV lines at 1,648 and 1,550 Å show reversed amplitudes. A P Cyg profile, normally associated with a very hot stellar wind, is a characteristic line distortion usually indicating a violent mass expulsion.

RW Hyd has a continuum indicating a temperature of about 100,000 K, and is positioned much higher on the H-R diagram than the dwarf of R Aql; Much higher excitation levels result. HEAO-B observations, however, detect no X-rays. It has no recorded eruptive history.

TV Gem has a very strong UV continuum which decreases with decreasing wavelength.

Since August 1980, CH Cyg has erupted and increased in brightness about 2 magnitudes.

In cases of mass-transferring systems, absorption in the plane of accretion disks may account for the absence of observable X-rays, if emitted. Evolution of accretion disks is a subject of current investigation. rhm

EXCERPTS FROM THE IAU CIRCULARS

1. November 29 — Minoru Honda, Kurashiki, Japan, discovered a nova of 10th magnitude in Cygnus.

2. December 5 — Miklos Lovas, Konkoly Observatory, discovered a probable comet of 17th magnitude in Lynx.

3. December — Collins and Newsome, Ohio State University, reported that an analysis of the radial-velocity data from SS433 showed that the 165-day period is decreasing by 0.011 days per day. This indicates a lifetime of only a few decades for the unusual radial-velocity oscillations of this object.

NAVAL OBSERVATORY COLLOQUIA SCHEDULED

On Thursday, January 8, Dr. Gernot Winkler, Head of the Time Service Division of the Observatory will discuss time service in the 1980's.

On Thursday, January 22, Dr. Robert Murphy, NASA, will survey the status and future of planetary exploration.

The colloquia are held in Building 52, Room 300, at 3:00 PM. Enter the 34th-Street gate on Massachusetts Avenue, NW, where the guard will require identification and provide directions. For further information call 254-4540.

FOR SALE

Telescope parts: F/8, 10-inch Cave mirror, made about 1962, needs aluminizing. Wooden cell, diagonal flat and holder, tube, ocular focusing mount, 4 eyepieces, finder. Allen Cordon, H: 765-0648, O: 632-7558.

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