★ STAR DUST

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BECKER TO DESCRIBE 2-20-KEV SATELLITE WORK

DR. BECKER

Dr. Robert H. Becker will address the February 6 meeting of National Capital Astronomers on the 2-20keV (4-0.4Å) experiment on the Orbiting Solar Observatory 8 (OSO-8) satellite. He will describe the detectors and interpret some of the observations made in this intermediate energy range.

Dr. Becker's presentation will be the second of three covering the low-, intermediate-, and high-energy wavelengths shortward of the ultraviolet, respectively.

The three proportional counters, two filled with xenon and one with argon, are equipped to track discrete sources for up to 10 days — long enough to encompass the periods of many variable sources.

Noteworthy contributions from OSO-8 to be discussed include the discovery of X-ray line emission from supernova remnants, clusters of galaxies, and X-ray binary systems; the discovery of X-ray absorption edges in the spectra of X-ray binary systems; and the discovery of six X-ray burst sources.

Born in Newark, New Jersey, Robert H. Becker received his B.A. from Lehigh University, and his M.S. and Ph.D. from the University of Maryland, the latter in 1975. His thesis was a study of radio emission from supernova remnants using interferometer data from the National Radio Astronomy Observatory at Green Bank, West Virginia. He is a National Research Council Research Associate with the High-Energy Astrophysics Division of Goddard Space Flight Center.

Dr. Becker is presently involved in the development of a new solid-state detector to be flown on the High-Energy Astronomy Observatory-B (HEAO-B) satellite to be launched in the Spring of 1978.

FEBRUARY CALENDAR — *The public is welcome.*

Friday, February 4, 11, 18, 25, 8:00 PM — Telescope-making classes at American University, McKinley Hall basement. Information: Jerry Schnall, 362-8872.

Saturday, February 5, 6:15 PM — Dinner with the speaker at Bassin's Restaurant, 14th Street and Pennsylvania Avenue, NW. Reservations unnecessary.

Saturday, February 5, 8:15 PM — NCA monthly meeting at the Department of Commerce Auditorium, 14th and E Streets, NW. Dr. Becker will speak.

Monday, February 7, 14, 21, 28, 8:00 PM — Telescope-making classes at the Chevy Chase Community Center, Connecticut Avenue and McKinley Street, NW. Information: Jerry Schnall, 362-8872.

Wednesday, March 2 — Dr. Frank D. Drake will deliver the first of a series of Smithsonian lectures on the exploration of space. Held in the Spacearium of the National Air and Space Museum, the lectures are free, but tickets are necessary. Call 381-4056 for information.

JANUARY LECTURE

Dr. R. G. Cruddace, U. S. Naval Research Laboratory, addressed the January 8 meeting of National Capital Astronomers on the results of recent soft X-ray observations from rockets.

A key to understanding the relatively intense, diffuse, soft-X-ray background radiation may be provided by the North Polar Spur of the galaxy, first delineated by radio astronomy. The feature may be the remains of an unusually powerful supernova of a few times 10^5 years ago, fairly close to the Sun.

The shape of the background spectrum from soft X-ray to gamma is not simple. Above about 1keV (≈ 10Å) it is quite isotropic, which suggests a cosmological origin. From 0.25keV (≈ 44Å) to 1keV the radiation is significantly above an extrapolation of the high-energy spectrum, and is not isotropic. Sources appear patchy, and the flux generally increases with galactic lattitude.

Such a spatial distribution might be produced by galactic absorption of radiation from intergalactic gas at about 10^6K. If this is indeed the source, integration of the density of such gas yields a mass sufficient to close the universe gravitationally — viz., to preclude infinite expansion!

Observational tests seeking soft X-ray shadows of other galaxies have yielded uniformly negative results; a very large number of very weak galactic sources apparently account for the background.

Of the several discrete sources found, the first to be identified with a known galactic radio feature is the North Polar Spur (NPS). A trace through the synchrotron radiation of these sources is a projection of a circle on the galactic coordinates — apparently the expanding shell of a very old supernova remnant.

Most of the radiation would be expected to be generated within the compression region behind such an intense spherical shock wave. A corroborative Wisconsin University rocket experiment mapped the 0.25keV flux just *inside* the radio NPS. Recent NRL results mapped the soft X-ray peaks closer to the continuum shell than the hard X-ray sources, which are closer to the original center, corresponding to the expected velocity, density, and temperature gradients in such a structure.

Measurements by Mathison and Ford of the polarization by interstellar dust of starlight transiting the compression region show expected orientations. Measurements independent of X-rays detect strong UV absorption of starlight by O VI and O VII heated by the shockwave to about 10^6K.

All of the foregoing observations characterize the very old supernova remnant: an expanding shock wave followed by a cool, dense shell of dust and gas surrounding a sphere of very hot gas at about 10^6K.

As the slowly cooling gases reach about 10^6K, recombinations occur that result in more rapid cooling. The cooling rate avalanches as the ionization descends through successive energy levels. Soon the rapidly decreasing radiation fades into the background; the remnant is no longer detectable.

The NPS has apparently entered this phase; it cannot have progressed much further. On the basis of this model the age of the NPS is calculated to be from 1 to 3×10^5 years old; the original energy between 6×10^{51} and 1×10^{53} ergs — an unusually powerful supernova exceeding the average energy by 1 to 3 orders and the usual age by 2 to 5 times.

Four other such loops, apparently similar objects, have been found in galactic radio maps. Another weak, soft-X-ray source has been discovered in which optical filaments are found.

From the known supernova incidence rate — one or two each century — the five near the Sun are the number to be expected for their ages. The whole galaxy, then, must be filled with very old supernova remnants lost in, but contributing to, the radiation background.

Some old supernova remnants may be detectable to an age of perhaps 3×10^5

NCA OBSERVERS REPORT θ^1 ORIONIS-A ECLIPSE RESULTS

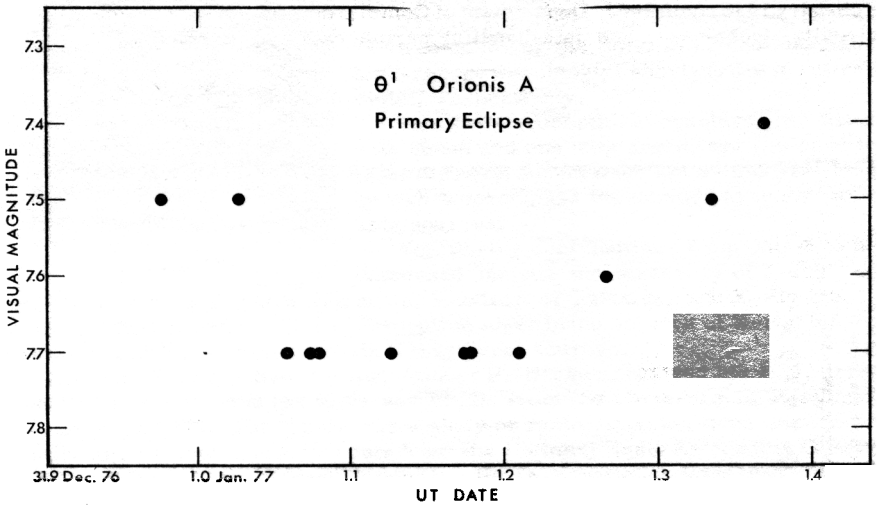
The Special AAVSO Activities Section of NCA, led by Daniel Costanzo, observed the primary eclipse of θ^1 Orionis A on December 31. The variability of this Algol-type star was only recently discovered; its parameters have not been well determined.

Three observers acquired 31 data points: Costanzo (6-in refl), 12; R.N. Bolster (6.4-in Mak), 14; W.R. Winkler (8-in refl), 5. George Kelly's reduction by Pogson's method yields a minimum of magnitude 7.7, which occurred at January 1.11 UT. According to the method, the means of all observations within each 0.05-day interval are plotted.

Shown here is a direct plot of single-observer data.

The light curve is still poorly known; the American Association of Variable Star Observers requests nightly observations in order to detect a secondary eclipse. Another primary eclipse is predicted to occur on March 6-7, 1977.

More information on the project may be obtained from Costanzo, 841-0989.



Reduction of single-observer (Costanzo) data

OCCULTATION EXPEDITIONS PLANNED

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

+ = waxing, − = waning phase, cusp angle measured + if on dark side from north or south cusp. Raymond Finkleman plotted the graze paths.

February	EST	Place	Vis Mag	Pcnt Sunlit	Cusp Angle	Min Aper	Notes
20	6:30P	Harrisburg, PA	8.9	8	5N	8"	Sun altitude -7°
20	7:13P	Harrisburg, PA	7.1	8	6N	2"	Near prev event
23	9:37P	Springfield, VA	7.8	31	8N	2"	Also nearby MD
25	9:24P	Golansville, VA	3.9	49	-9S	2"	N. of Charltsvl

years, but no older. To account for the general background, the remnants must radiate, although weakly, for about 10^6 years, when they come to equilibrium and the radiation ceases. The model indicates that one-third to one-half of interstellar space is filled with these remnants. rm

EXCERPTS FROM THE IAU CIRCULARS

1. October 16 — R. D. Eberst, Royal Observatory, Edinburg, and I. Coulson, University of Edinburg, found a possible comet trail on a photograph taken with the 122-cm Schmidt telescope at Siding Spring. The 17th-magnitude object in aquarius has not been observed since its discovery.

2. December 15 — Ney, Stoddard, and Hubbard, University of Minnesota, found that the infrared emission from Nova Vulpeculae 1976 had changed considerably since November 28, becoming brighter at longer wavelengths. This is indicative of the condensation of a dust shell, but no silicate absorption or emission features were seen in the spectrum.

4. January 7 — J. G. Hosty, Huddersfield, U.K., discovered a nova of 7th magnitude in Sagitta. The position of the nova is 19h37.1m, 18°02'.

DISCUSSION GROUP TO MEET ON PHOTOMETRY

A discussion of photoelectric photometry will be held at 8:00 PM on Saturday, February 19 in room 2062, Department of Commerce. Detector characteristics, circuits, techniques, and data-handling peripherals will be considered.

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