★ STAR DUST

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CLARK TO DISCUSS VLBI OF QUASARS

DR. CLARK

At the April 2 meeting of National Capital Astronomers, Dr. Thomas A. Clark, of Goddard Space Flight Center's Infrared and Radio Astronomy Branch, will discuss the present state of Very Long Baseline Interferometry (VLBI) of quasars with 10^{-3} arcsec resolution. He will describe and model the phenomenon of rapid changes observed in the nuclei of some quasars, in which apparent velocities exceeding c are displayed.

Dr. Clark will discuss applications of VLBI of quasars in geodesy, such as measurement of motion of the poles, rotational variation, and tectonic motion.

The work represents the collective efforts of a team at NASA-Goddard, the University of Maryland, MIT, the Haystack Observatory, and SAO. Dr. Clark is the project scientist for the NASA-sponsored portion of the program.

Thomas A. Clark received his Ph. D. in astro-geophysics from the University of Colorado in 1967. Prior to coming to Goddard, he was with NASA at Marshall Space Flight Center, Huntsville, Alabama, and NBS-CRPL at Boulder, Colorado. He is also adjoint Professor in the Astronomy Program, University of Maryland.

Dr. Clark is a member of the American Astronomical Society, International Astronomical Union, URSI, and other leading societies.

APRIL CALENDAR — *The public is welcome.*

Friday, April 1, 8, 15, 22, 29, 8:00 PM — Telescope-making classes at American University, McKinley Hall basement. Information: Jerry Schnall, 362-8872.

Saturday, April 2, 6:15 PM — Dinner with the Speaker at Bassin's Restaurant, 14th Street and Pennsylvania, NW. Reservations unnecessary.

Saturday, April 2, 8:15 PM — NCA monthly meeting at the Department of Commerce Auditorium, 14th and E Streets, NW. Dr. Thomas Clark will speak.

Monday, April 4, 11, 18, 25, 7:30 PM — Telescope-making classes at Chevy Chase Community Center, Connecticut Avenue and McKinley Street, NW. Information: Jerry Schnall, 362-8872.

Saturday, April 16, 4:00 PM — NCA Spring picnic at Manassas Battlefield Park. See page 30 for details.

MARCH LECTURE

Dr. Joseph F. Dolan, a National Academy of Sciences Senior Research Associate at Goddard Space Flight Center, addressed the March 5 meeting of National Capital Astronomers on recent discoveries in high-energy (20 keV - 3 MeV) X-ray astronomy. Dr. Dolan's talk was the third of a series on the low-, intermediate-, and high-energy segments of the X-ray spectrum.

Orientation of the spin axis of the Orbiting Solar Observatory (OSO-8), is such that the solar instruments scan the Sun on each revolution of the satellite,

March lecture — *continued*

once every 10 seconds. The high-energy X-ray detector of present interest is one of those which do *not* scan the Sun; its 5° field is centered 5° from the aft spin axis, where it scans a 5- to 15-degree annulus. Thus constrained, the various instruments cannot observe the same object simultaneously. An ecliptic object can be tracked for about 14 days of the annual rotation.

The detector is a CsI crystal scintillation counter whose spectral response is defined from about 20 keV by soft X-ray shielding to about 3 MeV by circuitry. A similar, fully shielded detector yields instrumentation background, and an internal source of ionizing radiation is provided for calibration. Quantum efficiency is approximately 90 percent.

Most of the X-ray sources are galactic, therefore concentrated near the galactic plane. Their average intensity is about 10^{38} ergs per second. They are generally associated with previously known optical or radio sources.

The first three known celestial sources, the Crab Nebula, Sco XR-1, and Cyg XR-1, were discovered in 1962 by rocket flight. The Crab Nebula is always one of the strongest sources at any wavelength; the spectrum displays the same slope from the optical range to 500 keV. About 10 percent of the emission of the Crab Nebula is contributed by the pulsar within it, which also displays a similar pulse characteristic from radio to X-ray wavelengths.

The strongest source, Cyg XR-1, is identified with the invisible companion of a 9th-magnitude supergiant. In 1975 this variable source showed an intensity decrease of 1 magnitude in 36 hours. Recent high-energy data combined with previous data taken in the lower-energy spectrum show variability of opposite sense in the high- and low-energy ranges; the spectrum pivots at about 7 keV.

The familiar model applies: a 20-30 solar-mass supergiant filling its Roche lobe spills through the L_1 onto the accretion disk of a 6-12 solar-mass secondary. Optically undetectable, the secondary cannot be a main-sequence star and exceeds the mass limit for a neutron star. A black hole is suggested, whose accretion disk contains a source of electrons at relativistic thermal velocities. Such a model predicts the observed spectral pivoting.

An extragalactic source, Cen A was previously known as a peculiar radio galaxy which also displays differential spectral intensity variation. Recent high-energy X-ray observations suggest a small, powerful source of relativistic electrons yielding X-rays by inverse Compton scattering.

The infrared-radio Cyg X-3, a galactic source, has a 0.2-day sinusoidal periodicity over its spectrum which is not presently explained. It may not be a binary.

Vela XR-1 is a binary whose secondary is an eclipsing neutron star; the eclipse is in phase over the spectrum.

X Persei, sixth visual magnitude, is the 20-30-solar-mass secondary of a binary system having a period in excess of 500 days. The 40-solar-mass primary may be a black hole.

The galaxy 3U1555+27 at about 5×10^7 ly must also have a small central source to account for its energy spectrum, extrapolation of which can be detected to X-rays.

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NCA SPRING PICNIC TO BE HELD AT MANASSAS BATTLEFIELD PARK

On Saturday, April 16, from 4:00 PM, members will have another opportunity to get acquainted, exchange questions and answers, and enjoy a dark rural sky. Bring your picnic dinner, telescopes, and guests.

Go west on I-66 approximately 17 miles from the Beltway to Route 234, right on 234 1.7 miles to the site on the left. Follow the dirt road to the picnic tables. Picnic will be held regardless of weather short of rain at the time.

NOMINATING COMMITTEE REPORTS

The Nominating Committee, Robert McCracken, Chairman, Mabel Sterns, and Mr. and Mrs. Richard Byrd, offers the following candidates for offices for fiscal 1978:

President	James H. Trexler
Vice President	Daniel G. Lewis
Secretary	William R. Winkler (incumbent)
Treasurer	Robert M. Lynn (incumbent)
Trustee	Benson Jay Simon (retiring President)
Sergeant at Arms	Richard J. Byrd (incumbent)

Additional nominations may be made by written petition of ten full members in good standing, submitted to the trustees prior to the May 7 election.

OCCULTATION EXPEDITIONS PLANNED

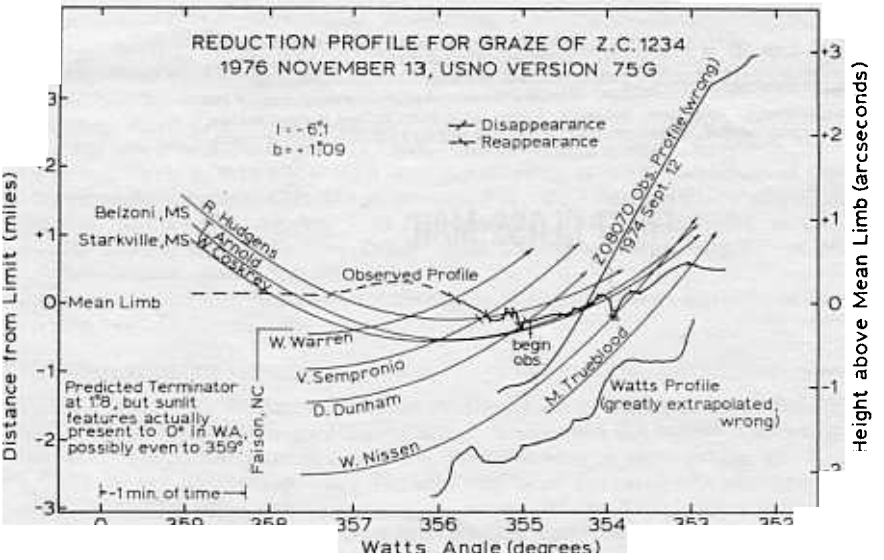
Dr. David Dunham is organizing observers for the following grazing lunar occultations in April. For further information, call Dave at 585-0989.

Raymond Finkleman plotted the graze paths.

April	UT	Place	Vis Mag	Pcnt Sunlit	Cusp Angle	Min Aper
4	04:13	Henderson, NC	8.9	80	*	6"
8	05:20	25 mi W Phila, PA	6.3	77	6S	2"
27	01:04	40 mi NW Phila, PA	7.8	54	8N	2"
29	03:53	Sterling Park, VA	8.6	75	6N	8"

*During umbral lunar eclipse.

Successful results of the November 13 expedition south of Goldsboro, NC were reported in *Star Dust*, December 1976. The resulting profile herewith also shows some of the corrections to previous data made possible by these observations.



EXCERPTS FROM THE IAU CIRCULARS

1. February 17 — M. Lovas, Budapest, Hungary, discovered a 15th-magnitude comet (1977c) in Leo Minor.

2. February 26 — J. A. Graham, Cerro Tololo International Observatory, discovered a 13th-magnitude nova in the Large Magellanic Cloud on a plate taken by Rojas.

3. March 5 — D. Dunham, Computer Sciences Corporation, reported that the occultation of Gamma Ceti by (6) Hebe was observed from Mexico. The duration of the occultation was 2.5 seconds at Mexico City and 5 seconds at a location 90 km north of there.

4. March 10 — The occultation of SAO 158687 by Uranus was observed by J. L. Elliot, E. Dunham, and D. Mink from the Kuiper Airborne Observatory over the Indian Ocean; by R. L. Millis, P. Birch, and D. Trout at the Perth Observatory; and by Bhattacharyya and Kuppuswamy at Kavalur, India. Secondary occultations during intervals of 8 to 9 minutes, both before and after the planetary occultation, indicate that Uranus is surrounded by a ring or satellite belt 40,000 to 50,000 km in radius. The satellites observed were from 100 km to much smaller in size.

This listing courtesy R. N. Bolster.

GINGERICH TO SPEAK AT SMITHSONIAN

On April 27, Dr. Owen Gingerich, Professor of Astronomy, Harvard University, will speak on Changing Views of Space, the third lecture of the current series on astronomy offered by the National Air and Space Museum.

These public lectures are free, but reservations are required. For further information and tickets, call 381-4193.

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