★ STAR DUST

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THOMPSON TO PRESENT GAMMA-RAY OBSERVATIONS

DR. THOMPSON

Dr. David J. Thompson, of the Gamma-Ray and Nuclear Emulsions Branch, Goddard Space Flight Center, will address the January 6 meeting of National Capital Astronomers on gamma-ray astronomy.

This study of the highest energy electromagnetic radiation is concerned with galactic structure, pulsars, and quasars. The present picture of the gamma-ray sky is derived largely from SAS-2 and COS-B satellite observations. Galactic sources predominate; several of the strongest gamma-ray sources are pulsars. Some gamma-ray sources have not been observed at other wavelengths, hence, have not been identified with previously known objects. Extragalactic objects observed include a radio galaxy, a Seyfert galaxy, and a quasar. The isotropic background is also observed in the gamma spectrum.

The Gamma-Ray Observatory (GRO), planned by NASA to be launched by the Space Shuttle, will be the next major step in high-energy astronomy.

David J. Thompson received his B. A. in physics from Johns Hopkins University in 1967 and his Ph. D. in physics from the University of Maryland in 1973. He was a co-investigator on the Second Small Astronomy Satellite (SAS-2) high-energy gamma-ray telescope, and is presently a co-investigator on the high-energy telescope which NASA has selected for study for the GRO.

JANUARY CALENDAR — *The public is welcome.*

Friday, January 5, 12, 19, 26, 7:30 PM — Telescope-making classes at American University, McKinley Hall basement. Information: Jerry Schnall, 362-8872.

Saturday, January 6, 6:15 PM — Dinner with the speaker at the Thai Room II, 527 13th Street, NW. Reservations unnecessary.

Saturday, January 6, 8:15 PM — NCA monthly meeting at the Department of Commerce Auditorium, 14th and E Streets, NW. Dr. Thompson will speak.

Monday, January 8, 15, 22, 29, 7:30 PM — Telescope-making classes at the Chevy Chase Community Center, Connecticut Avenue and McKinley Street, NW. Information: Jerry Schnall, 362-8872.

OTHER EVENTS OF INTEREST

Saturday, January 6, 9:00 AM — Smithsonian lecture on Jupiter at the National Air and Space Museum. Tickets not required, but please arrive by 8:45 AM to assure admittance. NASM staff speaker.

Wednesday, January 24, 8:00 PM — Smithsonian lecture on the chemistry of the galaxy, at the National Air and Space Museum, by Benjamin F. Peery, Jr., professor of astronomy at Howard University.

Wednesday, January 31, 8:00 PM — Second Annual Wernher von Braun Memorial Lecture at the National Air and Space Museum, by Rocco A. Petrone, President of National Center for Resource Recovery, Inc., and past Director of Apollo Launch Operations.

DECEMBER LECTURE

John Scott, associated with the University of Maryland Astronomy Program, spoke at the National Capital Astronomers December 5 meeting. His topic was super luminal sources, high-energy radio sources apparently expanding at velocities greater than light.

Four, and possibly five more of these radio sources have been discovered by using very long baseline interferometers (VLBIs). 3C120 is one. They exhibit a two-lobe structure, with the two lobes apparently separating at from several to 100 times the speed of light.

These super luminal sources range from tens to millions of parsecs in size, yet all exhibit double structure. They are mostly found in the nuclei of quasars, probably the result of internal explosions that are the most energetic events in the universe — 10^{58} ergs, compared with the 10^{33} ergs of a large solar flare. It requires one million years for an ordinary galaxy to emit this quantity.

The apparent greater-than-c velocities of the lobes of super luminal sources are easier to explain than why these sources are double. Three major models have been suggested:

1. Compact object model — The super-energetic sources are caused by massive black holes. This idea is largely discredited.
2. Beam model — The internal explosions are the result of interaction between beams of particles from a black hole at the center of a galaxy, and the source.
3. Dr. Scott favors the model in which the two radio lobes are analogous to blobs of matter composed of collisionless gas thrown off from supernovae. The explosion gives off relativistic particles and synchrotron radiation.

The problem with this plasmoid model is that matter is thrown off in all directions, not in two distinct lobes. The matter takes the form of blobs in a balance between the internal pressure of expansion and the supersonic ram pressure from the Mach-10 velocity. These blobs are then focused into a wing-like form by density gradients in the surrounding medium that change on a scale comparable in size to the blobs themselves.

The quasar nuclei are rotating rapidly, resulting in a disk-like structure. The disk is most dense at the center, and least dense at the top and bottom outer surfaces. This density gradient will focus the matter from an internal explosion in the form of wings, into a form which the VLBI sees as a double source.

This mechanism works only when the matter blobs of an explosion and the scale of the density gradient of the medium are comparable. Hence, supernovae do not produce double radio sources.

The illusion that the two radio lobes of a super luminal source are traveling faster than the velocity of light, has been explained in recent years by several authors. These sources are thought from redshifts to be so distant that they are traveling at an appreciable fraction of the speed of light; the wave fronts from the lobes arrive at two times very close together; the velocity of separation, d/2, seems to be as much as 10 to 100 c! It's a geometric effect of a source appearing to keep up with its own signal. Although a quasar explosion emits matter in all directions, an observer preferentially sees that matter coming toward him from a source moving at almost c.

Remote clusters of galaxies offer a test of the plasmoid model. There, density gradients in the medium are comparable in size to the clusters. Explosions material should then focus into a C-shaped radio lobe, open away cluster center, pointing down-gradient. This is found observationally and helps astronomers to locate faint, remote clusters of galaxies. Several quasars are associated on the sky with some of these, and apparently astrophysically. They offer another line of evidence that the quasar cosmic redshifts are correct indicators of their great distances. One cluster of galaxies is seven billion light years distant. wrw

OCCULTATION BY MELPOMENE DISCLOSES MORE POSSIBLE SATELLITES

The December 11 occultation of SAO 114159 by the asteroid (18) Melpomene swept a 130-km path, neatly centered on the Washington, DC area, across the United States. The path is cross-hatched on the accompanying map.

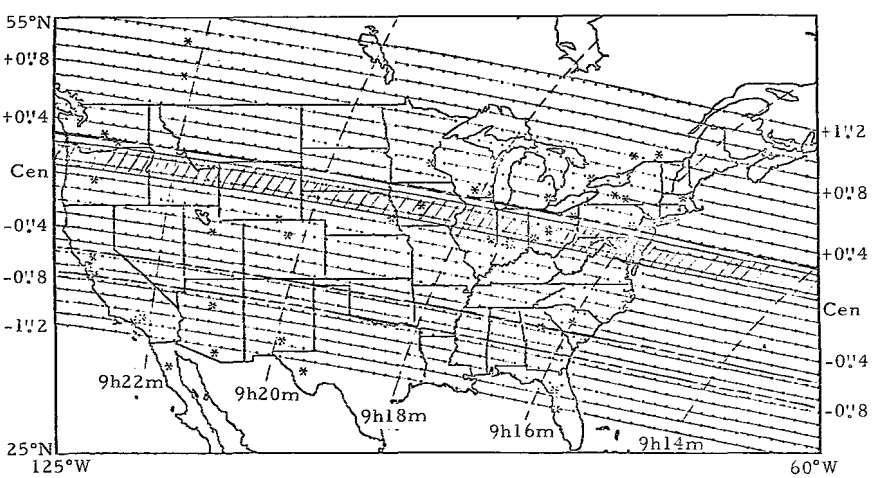
Dr. David Dunham, president of the International Occultation Timing Association, organized approximately a dozen observers in a dense pattern across the path in the local area to define the limits. Photoelectric observations were made at NASA, Greenbelt, Maryland, at the University of Maryland, and the U.S. Naval Observatory, Washington. Local visual and photoelectric observations indicate the diameter of Melpomene to be about 130 km, somewhat smaller than the previously estimated 150 km. These observations also disclose the star SAO 114159 to be a close binary.

Several secondary events were reported, indicating possible satellites of the asteroid. From Temple University, Ambler, Pennsylvania, H. Poss reports a 2-second event, which corresponds to a 20-km object (if central), 4.5 minutes before the Melpomene occultation. A 5.77-second occultation (60 km), 5.5 minutes early, was reported by R. Williamon from Fernbank Science Center, Atlanta, Georgia. Two one-half-second events one second apart, 6.8 minutes early, were seen at Mountain View, California by R. Nolthenius. These could indicate two 10-km objects in contact.

While none of the reported secondary events was confirmed by other observers, the photometric records showed stellar duplicity in agreement, thus confirming an occultation by some object, most probably an asteroidal satellite; time scales deny most other possible interpretations.

The paths of the reported secondary events are indicated by the three dashed lines on the map. Their timings are given relative to the primary occultation, which occurred 4.7 minutes earlier than the predicted times shown on the map.

Other observations reported from across the continent are indicated by asterisks.



NASA TERMINATES SKYLAB RECOVERY/DEORBIT EFFORTS

Citing deterioration of on-board Skylab systems, accelerated decay of the orbit, and Space Shuttle program delays, NASA has discontinued plans to either boost Skylab into a higher orbit or drive it into a remote ocean area.

Skylab is presently in a 426-km-high orbit and was earlier positioned in a low-drag attitude to delay reentry until an early Space Shuttle mission might either recover or deorbit it. Reentry is expected between mid 1979 and mid 1980; the recovery mission would be difficult to accommodate with Space Shuttle before April 1980. Further efforts have been deemed impractical.

EXCERPTS FROM THE IAU CIRCULARS

1. November 4 — N. L. Cohen, Cornell University, discovered a possible water maser in the direction of RT Serpentis.

2. November 24 — Ward, Blades, and Griffiths discovered a 13th-magnitude supernova in IC 5201. Observations with the 190-cm reflector at Mount Stromlo show it to be of type II, with H_α and H_β emission showing expansion of 20, 000 km per second.

3. December 1 — J. McGraw, University of Texas, found recurrent nova WZ Sagittae to be in outburst again. Its brightness varied from magnitude 8.0 to 7.6 with the 82-minute orbital period, with up to 10 percent flickering on a time scale of 30 seconds to 10 minutes.

4. December 11 — D. W. Dunham, Silver Spring, Maryland, reported several successful observations in the Washington-Baltimore area of the occultation of SAO 114159 by (18) Melpomene. R. M. Williamon, Fernbank Science Center, Atlanta, reported observing an occultation apparently by a satellite of the asteroid.

This listing courtesy R. N. Bolster.

FIRST CLASS MAIL

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