



## BRANDT TO DETAIL U. S. PLANS FOR COMET HALLEY



DR. BRANDT

Dr. John C. Brandt, Chief of NASA Goddard Laboratory for Astronomy and Solar Physics, will speak at the November meeting of National Capital Astronomers. He will discuss the U.S. effort in the international plans for the 1985-86 observation of Comet Halley.

Comet Giacobini-Zinner will also appear in late 1985. The plans include a fly-through of the tail of Giacobini-Zinner on September 11 by the ISEE-3 spacecraft. Photographs and ultraviolet spectra will be taken near perihelion in January - March 1986 by the repaired Solar Maximum Mission. The ASTRO-1 package of ultraviolet instruments and wide-field cameras will be flown in March 1986. This will coincide with the *in-situ* investigation of Comet Halley by the European Space Agency, Japan, and the Soviet Union.

The International Halley Watch (IHW) is the coordinating agency for extensive ground-based observations of Comet Halley. Networks of ground-based observatories should provide nearly continuous coverage of the comet. The IHW will also coordinate observations by amateurs who volunteer to make a dedicated effort during the period according to instructions which will be provided, particularly those on islands in the South Pacific Ocean, the South Atlantic Ocean, and the Indian Ocean.

Dr. John C. Brandt received the A. B. in mathematics from the Washington University at St. Louis in 1956, the Ph. D. in astronomy and astrophysics from the University of Chicago in 1960, and the M. B. A. from Loyola College in 1983. He is the author of 12 books on astronomy and is a member of the American Astronomical Society, the International Astronomical Union, and is a Fellow of the American Association for the Advancement of Science.

### NOVEMBER CALENDAR — *The public is welcome.*

- Tuesday, November 1, 8, 25, 22, 29, 7:30 pm — Telescope-making classes at Chevy Chase Community Center, Connecticut Avenue and McKinley Street, NW. Information: Jerry Schnall, 362-8872.
- Friday, November 4, 18, 25, 7:30 pm — Telescope-making classes at American University, McKinley Hall basement. Information: Jerry Schnall, 362-8872.
- Friday, November 11, 25, 8:00 pm — NCA 14-inch telescope 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, November 5, 6:15 pm — Dinner with the speaker at the Thai Room II, 527 13th Street, NW. Reservations unnecessary.
- Saturday, November 5, 8:15 pm — NCA monthly meeting at the Department of Commerce Auditorium, 14th and E Streets, NW. Dr. Brandt will speak.
- Saturday, November 19, 8:00 pm — Special free public advisory program: How to Select, Use, and Maintain a Telescope. U.S. Department of Commerce Auditorium, 14th and E Streets, NW. See page 11.

## OCTOBER LECTURE

Dr. Andrew S. Wilson, Associate Professor of Astronomy, University of Maryland, addressed the October meeting of National Capital Astronomers on active galaxies having explosive nuclei and radio jets. In order to show differences and similarities between normal and active galaxies, he first reviewed the well-known characteristics of the usual, or normal, galaxies.

A normal spiral galaxy such as M31 has a flat disk 500-700 light years (ly) thick and perhaps 100,000 ly across. In a face view a pinwheel structure is seen; the galaxy evidently and actually rotates. A spiral galaxy contains much gas and dust, and stars of a wide range of ages; new stars are being formed of the gas and dust. Brightness is highest in the central region, the nucleus. Thirty to 40 percent of spiral galaxies contain a bar from which the spiral arms begin. Gravity holds the galaxy together.

A small minority of spiral galaxies have a small bright center which may emit as much energy as the rest of the galaxy. These are Seyfert galaxies, described as a class by him in 1943. Ordinary galaxies radiate throughout chiefly like masses of stars; Seyfert galaxies' bright nuclei show strong emission lines from excited atoms. The lines are greatly broadened, which implies rapid gas motion — around 1,000 to 10,000 km/s, to be compared with velocities of 50 to 100 km/s in normal galaxies.

Elliptical galaxies are spherical-to-football shaped, with little detailed structure. They contain mostly very old stars and no gas. They cannot form new stars. Occasionally there are unusual features, for example, a jet was seen streaming from M87's center long ago.

Radio astronomy developed rapidly in the 1950's and '60's. When arrays of radiotelescopes produced resolutions comparable with those of optical telescopes, strange radio patterns were found to be associated with elliptical galaxies. These patterns, pairs of radio sources, far to opposite sides of the central galaxy, contain gas and strong magnetic fields, and some dust which may help form them. Radiating trails link them with the central galaxy, which itself is a radio source. While the powerful jets are almost always associated with active elliptical galaxies (which thus need not be so placid as they seem!) some Seyfert galaxies show weaker jets. The mechanism is known to be synchrotron radiation.

Variants are seen in which the jets bend back in parallel streams. The cause seems to be interaction with intergalactic gas in relative motion with respect to the galaxy. The parallel jets are slowed, then finally quenched.

The bright jets clearly originate within the galaxy and show their direction even there. The length shows that the direction is maintained over many millions of years. There are occasional weak examples in which the jets do not escape the galaxy.

Theory is weak and explains active-galaxy phenomena poorly. It must account for enormous power — around  $10^{11}$  to  $10^{12}$  times that of the Sun at radio frequencies. Sometimes there is strong X-ray emission: In the extreme examples, quasars, X-ray radiation can reach  $10^{12}$  to  $10^{13}$  that of the Sun. X-ray intensity varies over minutes to hours, indicating a source no larger than the solar system (changes cannot occur in less time than light takes to cross the source). Strong infrared radiation, broad emission lines, high-velocity gas, and radio jets must be accounted for.

There seems to be only one good candidate cause: a black hole of  $10^{22}$  to  $10^{13}$  solar masses. Qualitatively such an object seems able to do what is needed; details are not understood. No viable alternatives are known, and all that mass in so small a region would seem to generate a black hole in any case! When the Space Telescope is available, its data will help greatly. (Ed. note: However, it is already heavily oversubscribed.)

A rotating black hole should generate a thin accretion disk about its rotation

## OCCULTATION EXPEDITIONS PLANNED

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

UT	Place	Vis	Pcnt	Cusp	Min	
Date	Time	Mag	Sunlit	Angle	Aper	
11-27-83	09:26	Andover, NJ	5.7	50	5S	5 cm
11-28-83	08:44	Conowingo Dam, MD	8.7	39	3S	10 cm
11-30-83	10:26	Conowingo Dam, MD	8.7	18	7S	10 cm
ASTEROIDAL:		Star Mag	Delta Mag	Duratn	Name	
11-05-83	05:38	Midatl states	8.9	5	6s (683)	Lanzia 10 cm
11-17-83	07:15	Miss by 2!1S	7.9	Appulse	{173} Ino	5 cm
11-20-83	05:31	Miss by 2!0N	9.1	Appulse	(199) Byblis	8 cm

## TREXLER TO LEAD CLUSTER-VALIDATION TRAINING EXPEDITION

James Trexler will lead an expedition to the Shenandoah Mountain Pine Tree Meadow site on 4, 5, and 6 November. The target will be the Gamma Cassiopeia group of eleven clusters, one of which, RNGC 358, has been deleted as "non-existent." If you are interested in joining this on-going program call Jim at (H) 839-3490 or (O) 767-3305.

## PUBLIC TELESCOPE-ADVICE PROGRAM IN NOVEMBER

Telescopes make excellent gifts — if bought wisely. Popular misconceptions and misleading advertisement frequently lead to disappointment and discouragement. National Capital Astronomers will offer a free public briefing including advice, discussion, and hands-on demonstrations of various types, sizes, and makes of telescopes. NCA does not officially endorse any make, but owners of various types will be available for discussion. A demonstration of our telescope-making activity will also be featured.

The program will be held in the U.S. Department of Commerce Auditorium, 14th and E Streets, NW, on Saturday, February 19, at 8:00 pm.

## FREITAG'S COMET HALLEY STORY PUBLISHED

Ruth S. Freitag, a Senior Science Specialist of the Library of Congress and NCA Treasurer, has compiled an extensive bibliography on Halley's Comet. In the process, she has encountered many imaginative promotional applications of the comet motif that indicate popular attitudes and beliefs regarding comets. Writing in the Summer 1983 *Quarterly Journal of the Library of Congress*, she presents numerous amusing examples of advertisements gleaned from worldwide publications of the 1910 era.

axis. Along the axis in both directions, the paths of least resistance, jets could escape. In our own galaxy a collapsed star, SS433, emits similar (smaller) jets at relativistic speeds. It is close enough to be studied in detail. Some electromagnetic process produces the jets.

The question period brought out some clarification and detail. The jets show quasi-periodic bright areas which may be analogous to those seen in rocket exhaust. There seem to be relativistic velocities near the source. A possible contributor to the behavior is the Penrose process, in which part of the matter approaching a black hole is absorbed and part ejected with increased energy.

The velocities observed are Doppler-caused in the case of broad emission lines, but not in the case of the bent-back trails. (Relativistic Doppler effect does distort the apparent directions and distances, as in SS433, and observed apparent superluminal velocities are caused by relativistic Doppler effect.)

John B. Lohman

## EXCERPTS FROM THE IAU CIRCULARS

1. July 27 — J. Davies and S. Green, University of Leicester and Rutherford-Appleton Laboratory, detected a possible comet with the IRAS spacecraft. The object was seen again on September 1 and confirmed on the 11th by Gilmore. Comet IRAS (1983 o) was then in Centaurus and of 16th magnitude.

2. September 7 — Carolyn Shoemaker, Palomar Mountain Observatory, discovered a 16th-magnitude comet (1983p) in Pegasus on exposures made with the 46-cm Schmidt telescope.

3. September — Charles T. Kowal, California Institute of Technology, discovered a comet of 16th magnitude on 6 plates taken with the 1.2-m Schmidt telescope at Palomar in May. The object had also been discovered in that month by Z. Vavrova, Klet Observatory, who presumed it to be a minor planet. The orbit of Comet Kowal-Vavrova (1983t) is indeterminate.

4. September 11 — D. W. Dunham, Computer Sciences Corporation, reported that numerous timings of the occultation of 14 Piscium by (51) Nemausa had been obtained by observers in Southern Virginia and in North Carolina. The longest chord, 13.5 s, corresponds to 160 km.

5. October 1 — J. Hough and W. Sparks, U. K. Infrared Telescope Unit, Hilo, discovered a supernova of 13th magnitude in NGC 1265. R. N. Bolster

## DISCOUNTS ON SKY PUBLICATIONS FOR NCA MEMBERS

Our membership survey indicates that several members are unfamiliar with the NCA publications discount program.

NCA members may order most SKY publications at discounts through our treasurer, Ruth Freitag, 1300 Army-Navy Drive #806, Arlington, VA 22202, (703) 521-7831. A list of publications and prices will be available for your examination at the November meeting. A copy may be obtained by mail upon request to Stanley G. Cawelti, 11621 Chapel Road, Clifton, VA 22024, accompanied by a self-addressed stamped long envelope.

Some publications not on our list may be obtained at discounts through the Astronomical League. Consult the League *Reflector* for that arrangement.

FOR SALE — Four-foot aluminum tube approximately 18 inches in diameter with 0.375-inch wall. Saddle mount attached. Price negotiable. Mark Trueblood, (301) 983-9442.

*STAR DUST* may be reproduced with proper credit to National Capital Astronomers.

★ S T A R D U S T

WASHINGTON, D. C.



Published eleven times yearly by NATIONAL CAPITAL ASTRONOMERS, INC., a non-profit, public-service corporation promoting astronomy and related sciences through lectures, expeditions, discussion groups, tours, classes, public programs, and publications. President and Editor, Robert H. McCracken. Deadline 15th of preceding month. Information: (301) 320-3621. Material for publication: *STAR DUST*: 5120 Newport Avenue, Bethesda, MD 20816.

FIRST CLASS