



## SHAPIRO: HIGH-ENERGY NEUTRINOS FROM PULSARS AND QUASARS



DR. SHAPIRO

Dr. Maurice M. Shapiro, Chief Scientist of the Laboratory for Cosmic-Ray Physics, Naval Research Laboratory, will address the June 6 meeting of National Capital Astronomers. He will discuss high-energy neutrinos generated within pulsars and quasars.

A new branch of astronomy is being developed, based on these elusive particles which have no mass and little or no electrical charge. With their great penetrating power, neutrinos can bring information from their sources deep inside stars and galaxies — regions otherwise inaccessible.

Ultra-high-energy neutrinos are offspring of short-lived particles, mesons and muons, which are, in turn, the products of cosmic-ray nuclear collisions. It is believed that supernova remnants, including pulsars, and extremely

active galaxies with compact cores are cosmic-ray sources. High-energy neutrinos distinctively indicate the presence of high-energy nuclei. Hence, this new astronomy promises deeper understanding of cosmic-ray production.

A large underwater observatory is under design for DUMAND (Deep Underwater Muon and Neutrino Detector). This international consortium includes scientists of various complementary disciplines. The observatory, also to be an ultra-high-energy physics laboratory, is planned for the deep water near the Hawaiian Islands.

Maurice M. Shapiro is a member of the steering committee of the DUMAND Consortium. He has been Chief Scientist of the Laboratory for Cosmic-Ray Physics since 1949, and for 12 years was simultaneously Superintendent of the Nucleonics Division. He is a former chairman of the Division of Cosmic Physics of the American Physical Society, and a Fellow of the Society and of the American Association for the Advancement of Science. He is a past president of the Philosophical Society of Washington and a member of the International Astronomical Union. He is listed in *Who's Who in America*, *Who's Who in the World*, and *World Who's Who in Science*. His many pioneering contributions have been recognized internationally by medals and other awards. Dr. Shapiro received the Ph.D. in physics from the University of Chicago.

**JUNE CALENDAR** — *The public is welcome.*

Tuesday, June 2, 9, 16, 23, 30, 7:30 PM — Telescope-making classes at Chevy Chase Community Center, Connecticut Avenue and McKinley Street, NW. Information: Jerry Schnall, 362-8872.

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

Friday, June 5, 12, 19, 26, 9:30 PM — Use the NCA 16-inch telescope with Bob Bolster, 6007 Ridgeview Drive, south of Alexandria off Franconia Road

CALENDAR continued on page 38.

CALENDAR — *continued*

between Telegraph Road and Rose Hill Drive. Call Bob at 960-9126.

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

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

Saturday, June 20, 9:00 PM — *Exploring the Sky*, presented jointly by NCA and the National Park Service. Glover Road south of Military Road, NW, near Rock Creek Nature Center. Planetarium if cloudy. See page 39.

## MAY LECTURE

Dr. G. E. Brueckner, Head of the Solar Physics Branch of the U.S. Naval Research Laboratory, told the National Capital Astronomers May 2 meeting of new evidence regarding the forces that drive the solar wind.

Coronal spikes have been observed in the C IV emission lines at 1548 and 1550 Å with an instrument which was pointed at a coronal hole during a rocket flight. Thin (about 2 s) thread-like structures originating from the tops of macrospicules reach altitudes up to 30,000 km above the limb. Sometimes the structures are bent and show rapid change of their inclination angle, indicating loop-like formations. Densities at  $10^5$  K are approximately  $10^{10}$  cm<sup>-3</sup>. Although the spikes are observed at transition-zone temperatures, they are coronal because of their altitude range. The velocities are superthermal in the corona. Therefore the spikes can be the source of coronal-temperature plasma via strong shock waves or thermalization in closed magnetic fields.

In open-field configurations they may be the source of a momentum-driven solar wind which is accelerated close to the solar surface. The acceleration of the spikes may be caused by magnetic-field reconnection. Their kinetic energy flux is about  $10^9$  ergs cm<sup>-2</sup> sec<sup>-1</sup>. This means that only  $5 \times 10^{-4}$  of the solar surface in a coronal hole would need to be covered by the spikes to account for the energy in a high-speed solar wind stream. It is obvious that similar processes can account for high-speed stellar winds.

Dr. Brueckner kindly provided this review.

## NCA INVITED TO SPSE DINNER MEETING

Members of National Capital Astronomers are invited to hear Senator Howard Baker address the June 9 dinner meeting of the Society of Photographic Scientists and Engineers. Senator Baker's topic will be "My Photographic record." This will *not* be a political talk.

A talented photographer, the Senator has been processing his own since the age of twelve. He agrees that politics is his hobby; photography is his first love.

The meeting will be held at the Twin-Bridges Marriott on June 9. Cash bar at 6:00 PM, dinner at 7:00 PM. Reservations at \$15.00 each, payable to SPSE Washington Chapter, should be sent to Joseph Kitrosser, 5726 Larpin Lane, Alexandria, VA 22310.

## NCA WELCOMES NEW MEMBERS

Alan R. Boldt Family  
12129 Westwood Hills Drive  
Herndon, VA 22071

Frederick B. Hendricks, M.D.  
2209 39th Street, NW  
Washington, DC 20007

Sam Roberts  
2003 Hopewood Drive  
Falls Church, VA 22043

Sally and Chuck Rosenberg  
2425 Tunlaw Road, NW  
Washington, DC 20007

## NCA ELECTS OFFICERS

At the May meeting, NCA elected the following officers for fiscal 1982

President	Daniel G. Lewis
Vice President	Mark M. Trueblood
Secretary	Nancy L. Hueper
Treasurer	Ruth S. Freitag
Sergeant at Arms	Geoffrey R. Chester
Trustee (4-year term)	Mary Ellen Simon

## OCCULTATION EXPEDITIONS PLANNED

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

UT Date	Time	Place	Vis Mag	Pcnt Sunlit	Cusp Angle	Min Aper
LUNAR: 06-26-81	10:08	Elko, VA	7.0	36	4N	5 cm
ASTEROIDAL:			Star Mag	Decr	Asteroid	
06-05-81	04:19	Quebec or ne USA	7.0	3.0	(129) Antigone	5

## TREASURER'S REPORT

Income		Expenses	
Dues	\$3379.24	Sky & Telescope	\$1640.25
Other	100.00	Star Dust - printing	359.21
Total	3479.24	- postage	409.49
		Administrative	936.82
Balance 1 July 1980	2371.77	Total	3375.77
Inc. over exp.	103.47		
Bal. 30 April 1981	2475.24		

Daniel G. Lewis, Treasurer

## SUMMER PARK PROGRAMS SCHEDULED

The public summer program, *Exploring the Sky*, presented jointly by NCA and the National Park Service, has been scheduled for 1981 as follows: June 20, 9:00 PM; July 11, 9:00 PM; August 8, 9:00 PM; September 19, 8:30 PM; October 24, 7:30 PM.

All programs are held on Glover Road just south of Military Road, NW, near Rock Creek Nature Center, where the planetarium is used if cloudy. For further information, call Bob McCracken, 229-8321.

## LEAGUE TO CONVENE

The 1981 convention of the Astronomical League will be held at Kutztown State College, Kutztown, PA, August 10-16, hosted by the Lehigh Valley society.

Bus trips, guest speakers, planetarium shows, exhibits, workshops, and paper sessions will be featured. Economical dormitory accommodations will be provided.

Guest speakers will be Dr. George O. Abell, UCLA; Dr. William E. Brunk, NASA; Dr. Frank D. Drake, Cornell; Dr. Owen Gingerich, Harvard; Dr. George F. Reed, Westchester State; and Dr. Harry L. Shipman, Delaware University.

Early registration is recommended; dormitory accommodations are limited. Contact Neil Lerner, Treasurer, AstroCon-81, PO Box 133, Mansfield, PA 16933. Telephone (717) 662-3629.

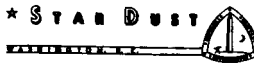
EXCERPTS FROM THE IAU CIRCULARS

1. March 30 — E. Bowell, Lowell Observatory, discovered a 17th-magnitude minor planet near Jupiter. It appears to be of the Griqua type (2:1 Jupiter liblator).
2. April 3 — J. H. Elias, Cerro Tololo Interamerican Observatory, discovered a 15th-magnitude comet (1981c) in Chamaeleon.
3. April 23 — J. Merlin, Le Creusot, France, and C. Y. Shao, Center for Astrophysics, observed another outburst by Comet Schwassmann-Wachmann-1 to 11th magnitude.
4. April 26 — S. J. Bus, California Institute of Technology, discovered a 16th-magnitude comet (1981d) in Libra using the 46-cm Schmidt telescope at Palomar.
5. April 26 — The occultation of BD -19deg4222 by Uranus was successfully observed with the 0.8-m and 1.0-m reflectors at the Kavalur, India, Observatory, and with the 1.0-m reflector at the Uttar Pradesh State Observatory at Naini Tal. Occultations by the epsilon ring were also timed.
6. May 7 — D. Pascu and P. K. Seidelmann, U. S. Naval Observatory, observed an unidentified satellite of Jupiter with a CCD camera on the 1.5-m astrometric reflector at Flagstaff. The 16th-magnitude object, designated 1981 J 1, may be identical with 1979 J 2.

FOR SALE

Accessories for Celestron-8: Counterweight, \$8:00; telextender, \$10.00; T-adapter, \$10.00; 6-mm Clave Plossl ocular, \$45.00; Astro-Physics 2-inch guidescope with mounting rings and 5x Barlow, efl 3 m, \$85.00. Bill Phillips, 116 North Fairfax Street, Falls Church, VA 22046, (703) 536-6993.

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