

# ★ STAR DUST

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## DR. UNDERHILL TO SPEAK ON SUPERGIANT STARS



Dr. Anne B. Underhill of Goddard Spaceflight Center, NASA, will speak to NCA about current research on supergiant stars, at the April meeting. Supergiant stars are very luminous stars; they are found in all spectral classes. Compared to main sequence stars in the same spectral class, supergiants have very extensive atmospheres and most are known to be losing mass. The spectral characteristics of these stars will be surveyed and the implications that spectra give about processes occurring in the outer layers of supergiants will be discussed. Particular attention will be given to B-types.

Dr. Anne Underhill was born in British Columbia, and earned her master's degree at the University of British Columbia. She received her Ph.D. in astrophysics from the University of Chicago, where, as Canadian Federation of University Women traveling scholar, she studied under Struve, Greenstein, and Chandrasekhar. Dr. Underhill did postdoctoral work at Copenhagen Observatory, was an astrophysicist at Dominion Astrophysical Observatory, and for eight years was Professor of astrophysics at the University of Utrecht, Holland. Since September 1970, our speaker has been Chief of the Laboratory for Optical Astronomy at Goddard.

### NCA APRIL CALENDAR

- April 3, Saturday, 6:15 P.M.--Dinner with the speaker at Bassin's, 14th and Pa. Ave. NW. No reservations required.
- April 3, Saturday, 8:15 P.M.--April meeting of NCA at Department of Commerce Auditorium, 14th and E St. NW. Dr. Underhill will speak. Nominees for 1971-72 will be introduced.
- April 17, Saturday, 2:00 P.M.--MD.-D.C. Juniors meet at Chevy Chase Library, Conn. Ave., and then go to Bob Bolster's to see his observatory and stay on for a star party. Bring a small bag lunch. Call Jean Radoane for information at 434-0443.
- April 17, Saturday, 8:15 P.M.--Discussion Group at Department of Commerce, room 2062. "Observing the sun in Monochro-

NCA APRIL CALENDAR (continued)

matic light--history, spectroheliographs, monochromators and problems.

April 23, Friday, 8:00 P.M.--Observing at the NCA 5-inch refractor on the grounds of the U.S. Naval Observatory. Call Larry White at 461-9681 if interested.

April 24, Saturday, evening--NCA Juniors star party at the Quakers' Friends Home, Sandy Spring, Md. Leo Scott is host. Call Jean Radoane at 434-0443, for details.

April 2, 9, 16, 23, 30, 7:30 P.M.--Telescope making classes at American University. Call Jerry Schnall at 362-8872 for information.

At about 10:30 P.M. on April 18, a Barium-ion cloud is due to be released at an altitude of five earth radii (30,000 km) over Wallops Is. Va. If skies are not clear at all of a special network of observatories, however, the cloud release will be postponed to successive nights through April 28. This data is tentative; Bob Wright will have the latest information at our April meeting. We hope to use the NCA alert system to increase observation of this space shot. This is a joint Max Planck Institute-NASA project.

1971-72 OFFICERS NOMINATED

This year's nominating committee consists of Chairman Jerome Schnall, Mabel Sterns, James Krebs, Darrel Freund, Sr., and James Sharpe. They have chosen the following people for office, beginning July 1, 1971:

President, William Winkler	Treasurer, Charles Shepard
Vice-President, John Eisele	Trustee, Worth Crowley
Secretary, Estelle Finkel	Sgt.-At-Arms, Larry Torrence

Jim Sharpe completes his 4-year term as trustee in July.

As provided by the NCA Constitution, members may nominate others to office by presenting to a present officer or trustee a petition signed by at least ten members. This must be done by election time at the May 1 meeting of NCA.

The president thanks the nominating committee for their fine efforts, and those who have accepted the responsibilities of running for office.

NEW MEMBERS

David G. Hassler 8809 Patricia Court College Park, Md. 20740 935-6527	Thomas L. Gibson R.F.D. 1, Box 42 Boyce, Va. 22620 703-837-1290	Walter Forrar, Jr. 5321 Neville Court Alexandria, Va. 22310 971-9387
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Paul R. Burnett, 2401 32nd St., SE., Washington, D.C. 20020  
582-1399

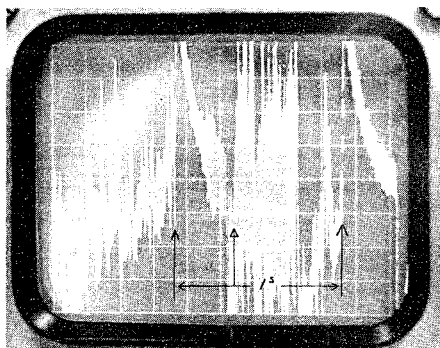
Dick York, 8755 Antonia St., Manassas, Va. 22110

Robert Stewart, 6008 Craig St., Springfield, Va. 22105  
569-1966 (Junior)

Jeffrey E. Jones, 8300 Wickham Rd., Springfield, Va. 22152  
451-6456 (Junior)

Patricia Brown, 5909 Gloster Rd., Washington, D.C. 20016  
229-0366 (Junior)

#### CRATER-SHADOW TIMING AT THE FEBRUARY 10 TOTAL LUNAR ECLIPSE



Middle arrow is time mark pulse.

pulse could be located to the nearest 0.1 sec. in time. From the oscilloscope screen Bill measured crater ingress and egress from the earth's shadow on the moon. Data came from a 6-inch refl.

A number of NCA members made crater-shadow timings at the February total lunar eclipse. These can be used to determine the earth's shadow size. Probably the most comprehensive measurements were those of Bill Pala at McLean, Va. To reduce observer timing error, Bill fed 90-meter CHU time signals and his time marker pulses through a voltage divider, a variable passband filter, a variable frequency amplifier, and into one channel of an oscilloscope. Its manually triggered sweep was used to place oscillations on the time and marker pulse patterns so that the marker

#### IMPORTANT EQUATIONS IN ASTROPHYSICS--I

The Thermal Energy of a Star, U:

$$U = \int_0^R \left[ \frac{3KT(r)}{2m} \right] 4\pi \rho(r)r^2 dr$$

R is stellar radius,  $\pi = 3.14\dots$ ,  $\rho$  is density, K is a physical gas constant, T is temperature, dr is an increment of distance outward from stellar center, and m is mean mass per particle of stellar matter. Quantities followed by (r) are measured at a given distance r from stellar center. The integral sign means that the total thermal energy of a star is obtained by solving this equation over the entire cross-section area of the star.

#### NOTE ON CURRENT RESEARCH

A. G. W. Cameron of Yeshiva University indicates, in a February issue of "Science News", that he believes the unseen companion to binary Epsilon Aurigae is a "Black Hole" in the Milky Way Galaxy--that is, a collapsed star whose gravitational field is so strong that it entirely traps its own light. The light curve of Epsilon, Cameron says, can be interpreted as indicating

a companion swarm of particles around a Black Hole.

**OUR MARCH SPEAKER**

Dr. Maurice Shapiro of the Naval Research Laboratory discussed the birth and death of cosmic rays at the NCA March 6th meeting. Near the earth, the total cosmic ray energy density and that of starlight are each equivalent to one electron volt (ev) per cubic centimeter. Galactic cosmic rays vary between  $10^9$  and  $10^{20}$  ev in energy; many begin their lives as hydrogen nuclei in supernovae and end their lives as secondary particle streams in the earth's atmosphere.

Instrumentation used in NRL cosmic ray experiments was a part of Dr. Shapiro's lecture. He and a colleague permitted NCA members to examine the back-up cosmic ray instrument package to the one flown on Gemini 11. The speaker also noted that photographic emulsions flown on high-altitude balloon cosmic ray flights are 100 times as thick as those of ordinary camera film.

**TREASURER'S REPORT**

March 20, 1971

**Income**

Bal. Fwd.	\$263.57
Dues	17.00
Handbooks	15.00
Time Tables	1.00
	<u>33.00</u>

**Outgo**

Sky Pub. Co.	\$15.15
Speak. Din.	10.31
Office Sup.	10.72
	<u>36.19</u>

**Total**

296.57

**Bal. Fwd.**

260.39

On Hand-checking account

1049.98

Remember the Astronomical League's Mid-East Regional Convention, May 28, 29, 30, at Princeton N.J. Bob Wright has the details.

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