☆ STAR DUST

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# CENTRAL PLANETARY STARS TO BE DESCRIBED

DR. SALLY HEAP

Dr. Sally Heap of the Laboratory for Optical Astronomy at Goddard Space Flight Center will speak to National Capital Astronomers about the physical properties of the central stars of planetary nebulae at the NCA February 5 meeting.

These central stars are very old and have masses approximately that of the sun. During the past fifty thousand years, they sloughed off their outer atmospheres, producing planetary nebulae. The remaining central stars are among the hottest stars in the Milky Way; they are "in their last moments of glory" before becoming invisible. The physical nature of central stars and the means by which their properties are determined will be discussed by Dr. Heap.

Sally Heap is a native of the Washington, D. C. area. She graduated from the Madiera School and holds three astronomy degrees: B. S. (Wellesley) and M. A. and Ph. D. (UCLA). During the summers of 1962 and 1964, Dr. Heap was an assistant in the Astrometry and Astrophysics Division of the U. S. Naval Observatory in Washington.

## FEBRUARY CALENDAR

Thursday, February 3, 17, 8:30 PM — Neighborhood Astronomy on the observing deck of the new Chevy Chase Community Center, Connecticut Avenue and McKinley Street, NW. Information: Rene Lamadrid, 585-5569.

Friday, February 4, 11, 18, 25, 7:30 PM — Telescope-making classes at American University, McKinley Hall basement. Information: Jerry Schnall, 362-8872.

Saturday, February 5, 6:15 PM — Dinner with the speaker at Bassin's Restaurant, 14th Street and Pennsylvania Avenue, NW. No reservations needed.

Saturday, February 5, 8:15 PM — NCA monthly meeting at the Department of Commerce Auditorium, 14th and E Streets, NW. Dr. Sally Heap will discuss the central stars of planetary nebulae.

Saturday, February 12, 2:00 PM — Meeting for all NCA Juniors at Chevy Chase (Maryland) Library, 8001 Connecticut Avenue. Results from the January 30 lunar eclipse will be discussed. Information: Jean Radoane, 434-0443.

Saturday, February 19, 8:00 PM —Discussion group meets at the Department of Commerce, 14th Street and Pennsylvania Avenue, NW, room 2062. Bob Bolster will show slides of his recent trip to Kitt Peak National Observatory and its optical shops.

Jerry Schnall will begin telescope-making classes at the new Chevy Chase Community Center on Monday, March 6, 7:30 PM, and every Monday evening Thereafter. The Friday evening classes at American University will continue.

## FILM NIGHT PLANNED

We expect that one of our spring meetings will feature several professionally produced films on astronomical topics. At the February meeting, members may vote on which films, chosen from a selected list, they would most like to see.

## NCA JANUARY LECTURE

Dr. David S. Leckrone, from the Laboratory for Optical Astronomy at Goddard Space Flight Center, spoke to NCA about the helium to hydrogen ratio in the Universe at its January 8 meeting.

Many disciplines have contributed to our present knowledge of He/H. This ratio plays a major role in planetary, galactic, and extragalactic astrophysics. By 1957, the nucleosynthesis theory of the formation of the Universe was well developed; it predicted that within an hour of the formation of the galactic nucleus, the He/H ratio would be .09. To study hot young stars, the very difficult theory of stellar evolution, and observed He/H ratios are used to model a spectral profile which is compared with that observed. Where the two diverge, differences in height and properties of the observed and predicted stellar chromospheres are present.

It is interesting that optical and radio measures of He/H in galaxies yield about .106 and .08-.09, respectively, but satellite measures of solar cosmic rays give quite different values. It is believed that the sun's brightness has changed by .4 magnitude in its lifetime.

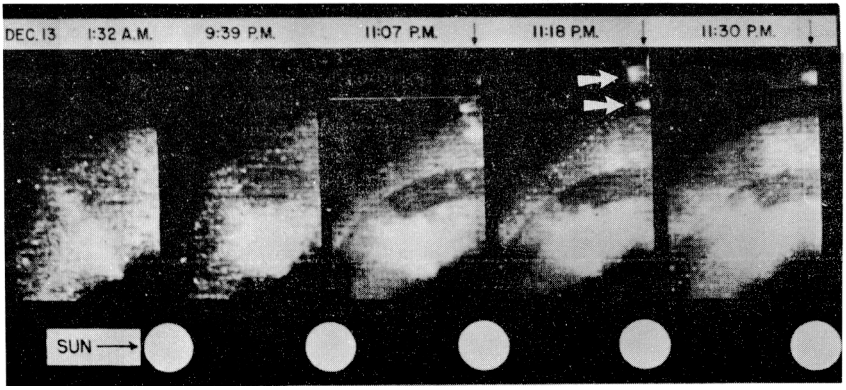
David Leckrone outlined an unusual method of studying intergalactic gas clouds, if they exist, by observing red-shifted ultraviolet spectral lines of quasars from a giant orbiting space telescope. He also noted that the close correspondence between the big-bang theory predictions of He/H and the observed ratio is a blow to steady-state cosmology.

## NOTES ON CURRENT RESEARCH

*Moonquakes* — A group of geologists from Columbia, MIT, University of Hawaii, and General Dynamics summarize data from the Apollo 12-14 lunar seismometers in an August 1971 paper recently published in *Science*, page 687. More than 100 events believed to be moonquakes have been recorded since 1969, nearly all at times of lunar apogee and perigee. Thus, tidal forces probably play a major role. Although the events have occurred in at least 10 different zones, 80 percent of the energy comes from a zone apparently 600 km south-southwest of the Apollo 12-14 line and deep inside the moon. The zones are less than 10 km in diameter and fixed in location. The origin of the internal strains being released by tidal triggering is unknown.

*The integral galaxy* – Richer and Sharpless of the University of Rochester and Olsen of the University of British Columbia discuss a 12-million parsec distant galaxy shaped like an integral sign, in January 1 *Astrophysical Journal*, page 13. This galaxy was thought likely to be a barred spiral viewed edge-on, for no nucleus was clearly visible, and the observed shape would fit such a galaxy. These astronomers, however, were able to locate the population II old red stars of the nucleus using near infrared photography and then showed, from 50Å bandpass observations in Hα light that the radial distribution of singly-ionized hydrogen was quite different in the integral-sign galaxy from that of appropriate barred galaxies. Thus, the integral-sign galaxy is an unusual galaxy.

Observations were made with the 24-inch University of Rochester reflector, using a Carnegie image converter for photography on 103a-D plates.




## PICTURES OF THE MONTH

The photographs above and on page 24 show two radically different views of sunlight, obtained from an American spacecraft.

Above — Eruption in the farside solar corona. A Naval Research Laboratory white-light coronagraph on an Orbiting Solar Observatory photographed this eruption on the solar hemisphere facing away from the earth, December 13, 1971.

The solar photosphere position is shown in each frame (lower right corner) with the dark occulting disc above and the white outer corona extending out more than nine solar radii. The coronal eruption (11:07, 11:18, 11:30 PM) reaches more than 12 solar radii into space.

Page 24 — Alfred Worden photographed the zodiacal light while orbiting over the far side of the moon in the Apollo 15 command module on August 1, 1971. The sun, hidden behind the moon in the shadow umbras of both earth and moon, illuminates interplanetary dust in the plane of the earth-moon orbit about the sun. (Top left) 15-sec. exposure, 25° from sun. (Top right) 60-sec. exposure. (Bottom left) 10-sec. exposure, 15° from sun. (Bottom right) 30-sec. exposure. Pictures photographed with 55-mm f/1.2 lens on Eastman 2485 film. Because of the earth's upper atmosphere airglow, zodiacal light is seen far better from space.

These NASA photographs courtesy of Dick Horwitz.

*Overheard* — in the dark at the Juniors' star party, near Jerry Hudson's 10-inch catadioptric (Wright-Schmidt) camera:

"What kind of a telescope did he say that is?"

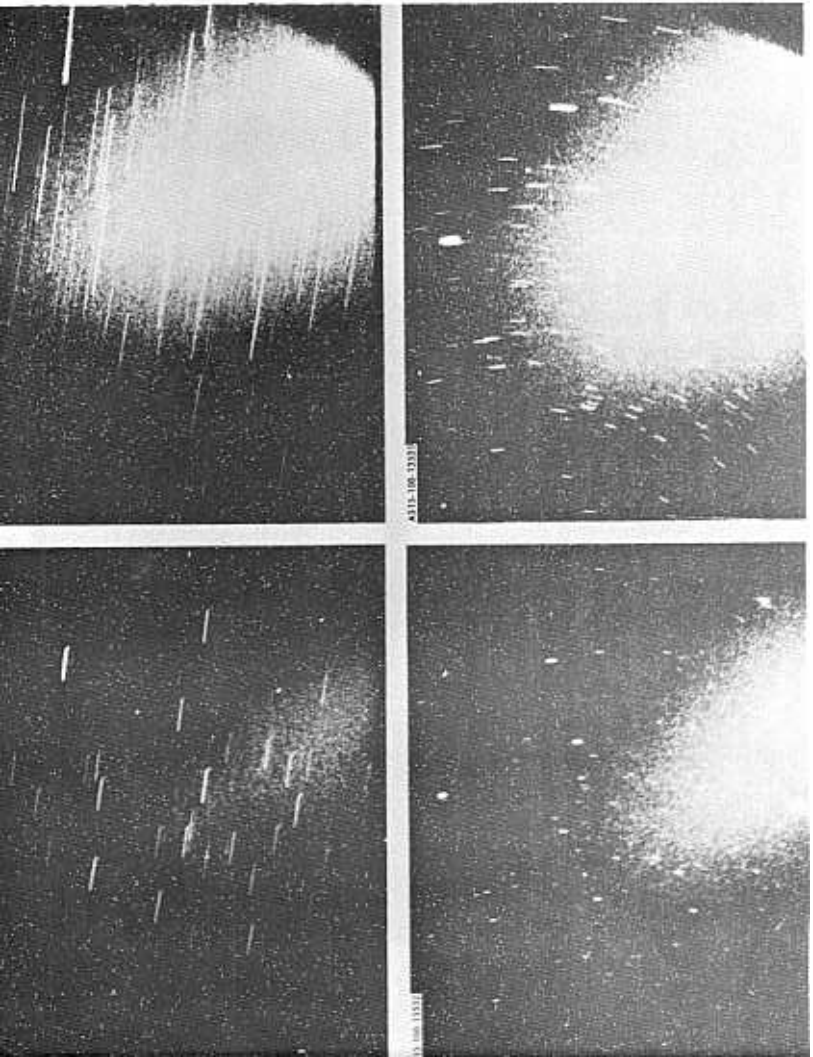
"Uh...cata...*catastrophic*, I think!"

## IMPORTANT EQUATIONS IN ASTROPHYSICS — VIII

The degree to which a chemical element in a stellar interior is ionized is given by the *Saha equation:*

$$N(r-1)\,\frac{N_e}{N(r)} = 2\,\frac{g(r-1)}{g(r)}\,\frac{(2\pi m_e kT)^{3/2}}{h^3}\,e^{-\chi(r)/kT}$$

where $N$ is the number of ions of the element per unit volume; $(r)$ denotes a function of distance from star center; $g$ is a statistical weight; $N_e$ and $m_e$ are the number per unit volume and mass of the free electrons present, respectively; $k$ is Boltzmann's constant; $T$ is temperature; $h$ is Planck's constant; and $\chi$ is the energy required for ionization.



* STAR DUST

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