☆ STAR DUST

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SOLAR FIELD LINE RECONECTIONS STUDIED

DR. BRUECKNER

As reduction progresses, the voluminous data from the Skylab solar observations in the extreme ultraviolet and X-ray spectra continue to yield new knowledge of the Sun. We have seen how previously unknown features — the coronal holes, bright points, macrospicules — all seem to delineate the complex solar magnetic field structure.

At the November 1 meeting of the National Capital Astronomers, Dr. G. E. Brueckner, head of the Solar Spectroscopy Section of the U. S. Naval Research Laboratory, will discuss the reconnection of magnetic field lines in the solar corona. The observations indicate that all the coronal material is confined to magnetic fields which can develop open or closed structures over periods of hours, days, or months. In rare cases, reconnections of field lines between separate active regions have been observed.

Solar flares are very close to the surface, and are associated with newly emerging magnetic flux. Reconnection of field lines seems to provide the energy for flares, but the observations are not conclusive.

Dr. G. E. Brueckner received his Ph. D. from the University of Gottingen, Germany, in 1961, where he subsequently engaged in high-resolution solar spectroscopy and the construction of large solar spectrographs. In 1968 he joined the U. S. Naval Research Laboratory, where he became head of the Solar Spectroscopy Section in 1971. Until 1973 he participated in the design, construction, and testing of the two NRL ultraviolet instruments flown on Skylab.

Since 1973 he has engaged in the design and construction of the new high-resolution telescope and spectrograph flown on a sounding rocket on July 21, 1975, and obtained for the first time high-resolution spectra of the Sun in the far ultraviolet.

Dr. Brueckner is a member of Sigma Xi, the International Astronomical Union, and several NASA committees.

NOVEMBER CALENDAR — *The public is welcome.*

Saturday, November 1, 6:15 PM — Dinner with the speaker at O'Donnell's Sea Grill, 1221 E Street, NW. Reservations not necessary.

Saturday, November 1, 8:15 PM — NCA monthly meeting at the Department of Commerce Auditorium, 14th and E Streets, NW. Dr. Brueckner will speak.

Monday, November 3, 10, 17, 24, 7:30 PM — Telescope-making classes at the Chevy Chase Community Center, Connecticut Avenue and McKinley Streets, NW. Information: Jerry Schnall, 362-8872.

Friday, November 7, 14, 21, 28, 7:30 PM — Telescope-making classes at American University, McKinley Hall basement. Information: Jerry Schnall.

Friday, November 7, 8:00 PM — Group observing with the NCA 5-inch Clark refractor at the U. S. Naval Observatory. Your NCA pass will admit you to the grounds. Go directly from the gate to the guard desk in the lobby. Information: Larry White, 978-9681.

OCTOBER LECTURE

At the October 4 meeting of the National Capital Astronomers, John J. Cowan of the University of Maryland summarized some of his recent studies of the distribution of gas and ionizing sources in the galaxy.

Describing the three principal sources of ionizing radiation, supernovae, O- and B-type stars, and the central stars of planetary nebulae, he related their places of origin, lifetimes, and motions with their resulting distributions in the galaxy. Considering the galaxtic distribution of gas densities, he then related their energies to their relative importance in the ionization of the gas where they are found.

Cowan explained the development of the galactic structure according to a highly controversial theory. A shock wave of some unspecified nature is invoked to create a density contrast in the inner edges of the trailing spiral arms. It is only within this density gradient that stars are formed. Stars which become supernovae — main-sequence stars of 4 to 8 solar masses — do so after about 10^7 years; they cannot move out of the spiral arms in this short time. After the supernova outburst, the remnant may last 10^5 years. OB stars also last only about 10^7 years and are found only in the spiral arms. Of lower energy than supernovae, they excite smaller H II regions, but for a much longer time. Ultraviolet stars, the central stars of planetary nebulae, exist as main-sequence stars for about 10^{10} years before ejecting their outer envelopes to expose their extremely hot cores, thus becoming UV stars. Thus, they can move far from their origins to be found in all parts of the galaxy. At temperatures around 10^5 °K, for about 20,000 years they excite small H II regions generally consisting of the still-expanding residue of their own outer substance.

Thus, in the low-density interarm regions of the galaxy the UV stars are important sources of ionizing radiation. The higher density of the spiral arms requires higher energy for ionization; and there are found the higher-energy sources — supernovae and OB stars. The latter are far more numerous than the former, but supernovae are important in regions of highest density.

Gamma-rays observed by Small Astronomy Satellite 2 (SAS-2) for the past two years seem plausibly to be decay products of cosmic-ray emission from supernovae. If this is the case, the observed radiation flux from directions tangent to the spiral arms is consistent with a density contrast of 5 or 10.

A computer model incorporating these assumptions has been developed by Goddard Space Flight Center and the University of Maryland, and correlates well with the observations.

SOLAR MONOPOLE TIME?

Bill Winkler points out that the various indices of solar activity do not occur simultaneously. The first high-latitude spots of the present new cycle (number 21) were noted in the autumn of 1974, but the month of the minimum average sunspot number so far was April 1975. The first significant flare activity occurred in August 1975 in a spot group at 28° North.

According to *NOAA Week*, October 10, it may now be time for the Sun to display a magnetic monopole for a period of about three months; this curious behavior was observed by several independent means in 1965, when for a similar period the Sun's field was almost entirely radial.

NCA WELCOMES NEW MEMBERS

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NCA PICNIC AND STAR PARTY

The annual NCA picnic and star party was held at the vacation cabin of Dick and Nancy Byrd near King George, Virginia, October 11. Morning rains and bleak cloud conditions until late afternoon dimmed observing prospects. Nevertheless, the undaunted ones who made the 1½-hour drive from Washington enjoyed mild fall weather and a relaxed supper around an open fire at the Byrd's. Evening ground fog in the wake of the rains limited observing to Jupiter and other bright objects. When a few clouds moved in the group adjourned to the log cabin for conversation and snacks provided by the Byrds, and resumed observing for awhile later on. Our gracious hosts made the evening a pleasant one despite the mediocre weather conditions.

NOVA CYGNI 1975 WIDELY DISCOVERED

Lyle Johnson writes from North Carolina that at least one NCA member independently discovered the August 29 nova. When Lyle spotted it at 9:30 PM it was so conspicuous that he was sure it had been reported, so he wrote rather than telephone or wire Cambridge. According to Circular 2826 he was at least 21st. A former member, David Wallace, also reported it from Arecibo.

The nova was just outside one of the NCA patrol areas!

X-RAY ASTRONOMERS MEET AT GODDARD

A symposium-workshop on X-ray astronomy was attended by about 100 United States and foreign astronomers at Goddard Space Flight Center, Greenbelt, Maryland, on October 20-22.

Information was exchanged on a number of particularly interesting binary star systems that emit X-rays, and for which there are observations in many other bands of the spectrum — radio, optical, ultraviolet. A better understanding of these objects is expected to result.

Five satellites are now observing in X-rays — Copernicus, Orbiting Solar Observatory-8 (OSO-8), the Small Astronomy Satellite-3 (SAS-3), ANS-1 (Netherlands), and Ariel-5 (United Kingdom).

There are perhaps 100 binary X-ray objects in our galaxy alone. The compact, neutron-star member of the pair typically has a mass somewhat greater than that of the Sun, but a diameter of only about 10 km. The extreme gravitational acceleration of electrons results in the emission of X-ray energy. Six X-ray novae have been discovered by spacecraft in the past year.

EXCERPTS FROM THE IAU CIRCULARS

1. September 15 — E. J. Reese, New Mexico State University Observatory, observed two bright spots at the south edge of Jupiter's North Temperate Belt. Both spots were 7,000 x 4,400 km in size.

2. September 20 — G. W. Clark, MIT, reported the detection by the SAS-3 spacecraft of another X-ray nova in Monoceros. Schmidt and Angel, Stewart Observatory, photographed the area of MX0656-07 with the 229-cm reflector on September 24, but found no new optical objects brighter than magnitude 19.

3. September 30 — C. Kowal, Hale Observatories, discovered a probable new satellite of Jupiter on three plates taken with the 122-cm Schmidt telescope at Palomar. The object was of 21st magnitude.

4. October 5 — H. Mori, Y. Sato, and S. Fujikawa, Japan, independently discovered a comet in northwest Hydra. Of 11th magnitude, Comet Mori-Sato-Fujikawa (1975j) was moving southeast.

5. October 5 — S. Suzuki, Y. Saigusa, and H. Mori, Japan, independently discovered another comet near ψ-Ursae Majoris. Of 9th magnitude, Comet Suzuki-Saigusa-Mori (1975k) can best be seen in the mornings. Hiroaki Mori thus has the distinction of having discovered two comets in an hour and a quarter!

This listing courtesy R. N. Bolster.

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