



ROBERT KREPLIN TO DISCUSS SOLAR X-RAYS AND PHYSICS



Robert W. Kreplin

At the November 13 meeting of National Capital Astronomers, Robert Kreplin of the Navy's E.O. Hulbert Center for Space Research will speak on the sun's X-ray emissions and some other aspects of solar physics.

The sun has been under observation from ground based observatories for several centuries, but in those wavelengths which do not penetrate the Earth's atmosphere no observations were possible until the development of rocket and satellite astronomy. It is in the X-ray region of the spectrum, i.e. below 100Å, that the active events in the sun's atmosphere produced the most significant signatures. Measurement by X-ray photometers, spectrometers, and telescopes have provided unique insights to the processes going on in solar flares and in solar active regions. A description of some of the more significant X-ray measurements and an interpretation of results will be presented.

An unusual time-lapse color film of the life-history of a solar flare, produced by Lockheed Solar Observatory, will be shown.

Mr. Robert W. Kreplin is head of the Solar Radiation Section, Upper Air Physics Branch, of the Naval Research Laboratory's Space Science Division. Currently, he is involved in investigations of solar X-ray emissions through NRL experiments flown aboard NASA OSO and OSO series spacecraft and through the Navy's SOLRAD satellite program for which he is the Scientific Program Manager.

Mr. Kreplin was born in Cleveland, Ohio and he entered the Navy in November 1944. After discharge in 1946 he entered Dartmouth College where he received an AB degree in 1949. He remained at Dartmouth as a teaching fellow and received an MA degree in 1951.

He spent two summers working in NRL while still at Dartmouth and has worked there continuously, except for a short period, since 1951. He has been primarily concerned with the development of band-sensitive X-ray and UV photometers which have been instrumental in providing a nearly continuous measure of the sun's X-ray emissions since 1964.

NCA NOVEMBER CALENDAR

Saturday, November 13, 6:15PM -- Dinner with the speaker at Bassins Restaurant, 14th and Penna. Ave, N.W. No reservations needed.

Saturday, November 13, 8:15 PM--Monthly meeting of NCA at Department of Commerce Auditorium, 14th and E Streets N.W. Robert Kreplin of NRL will speak.

Saturday, November 20, 2:00 PM--Monthly meeting of all NCA juniors in the basement of McKinley Hall, American University. Call Jean Radoane at 434-0443 for information.

Friday, November 5, 12, 19 and 26, 7:30 PM--Telescope-making classes at McKinley Hall, American University. Call Jerry Schnall at 362-8872 for information.

NOTE

The December monthly meeting will be held on Saturday, December 18, 8:15PM.

Mr. and Mrs. Jerry Hudson will host a star party for NCA juniors at their new home near Harper's Ferry, W.Va. on December 11.

SETH SHULMAN DISCUSSES DIFFUSE X-RAYS

At the NCA October 2 meeting, Seth Shulman of the Naval Research Laboratory spoke about his rocket-borne X-ray studies in astronomy. Among the subjects he discussed were:

- The major X-ray window at 44 Angstroms, permitting effective study of low energy diffuse radiation (0.35-0.24 kev).
- The question of whether the background radiation is really diffuse, or is the sum of emissions from all quasar and pulsar "point" sources in the universe.
- Rocket-borne instrumentation; the currently operating X-ray explorer satellite has increased the number of known astronomical X-ray sources by a factor of four.
- The physics of astronomical X-ray generation: (1) inverse Compton effect, (2) synchrotron radiation; (3) thermal bremsstrahlung.
- The importance of the nongalactic component of X-ray radiation reaching the earth's vicinity. Some think it may be related to the primeval nucleus of big-bang cosmology, and/or the "missing mass" problem.

Dr. Shulman advocated more and wider scientific research on future manned spaceflights.

IS THERE WATER ON THE MOON?

Dr. John Freeman of the Rice University Lunar Science Institute has recently reported an interesting observation made in March 1971 that may indicate the presence of H₂O vapor on the surface of the moon.

Dr. Freeman is the principal investigator for an experiment that has now been carried to the moon 3 times in the Apollo program. His Supra-Thermal Ion Detector Experiment (SIDE), now functioning at the landing sites of Apollos 12, 14, and 15, is a fairly precise instrument for determining the mass and energy of ionized particles within a number of ranges. The March event was the detection of ions in the atomic mass range 17-24. From certain other observations, including the venting of the LEM, Freeman tentatively estimates these ions to have mass 18, that of water. However, several elements and compounds whose lunar presence would not be surprising have atomic masses in the 17-24 range, including solar wind neon, 20.

An obvious question is whether the SIDE observation was of residual water from Apollo operations. *Star Dust* contacted Dr. Donald A. Beattie, NASA's program manager for Apollo Lunar Surface Experiments. He told *Star Dust* that an appreciable quantity of water was left at each of the Apollo landing sites in the descent storage tanks, the discarded backpacks, certain bags, etc. all of which were sealed when left. Subsequent lunar temperature cycling (about 500°F) may have opened leaks through which water could escape. One reason to doubt that SIDE observed waste water is that the event was seen sporadically over a 14-hour period. However, Dr. Beattie points out that escaping water in the lunar vacuum would probably freeze, forming an ice plug to stop the leak. Sublimating ice would continuously be replaced by water freezing from the inside, prolonging the escape substantially.

Dr. Beattie noted that, just 2 or 3 minutes before Dr. Freeman's observation began, a moonquake swarm (a series of microseisms lasting several hours) was observed by Gary Latham of Columbia University's Lamont-Doherty Observatory in New York. Could the venting of gases be associated with seismic activity?

There is almost no indication of any indigenous water on the moon's surface. Indeed, indications from lunar samples are that they were formed in a volatile-free environment. Thus, Dr. Beattie's optimistic interest is tempered with abundant scientific caution.

IMPORTANT EQUATIONS IN ASTROPHYSICS -- VI

The *Zeeman effect* ranks in importance with the Doppler effect in observational astrophysics. The former enables strong stellar magnetic fields to be detected by the fact that the field separates a spectral line into two or more components. If the magnetic field direction is parallel to the observer's line-of-sight, the spectral-line splitting will reveal two lines, each separated from the normal position by

$$\Delta\lambda = 4.7 \times 10^{-5} \lambda^2 B$$

where $\Delta\lambda$ is the line separation distance
 λ is the normal spectral wavelength
 B is the magnetic flux intensity
 L is the Lande factor

Un-ionized iron lines in the red are usually used, with powerful Coude-type spectrographs at large telescopes.

PICTURE OF THE MONTH

Our back cover shows two views of the September 26, 1971 aurora borealis display over Reykjavik, Iceland between 6 and 6:20 P.M. EDT. NCA member Dick Horwitz reports,

"I stepped outside the hotel ... to see what the sky looked like from about 64 degrees north latitude. I did a double-take. What I thought were clouds turned out to be the most spectacular display of aurora I've ever seen.

I was on the edge of a runway outside of Reykjavik with a clear northern sky. It was filled with veils, rays and pulsating patches of red and green.

About 10:15 the display had moved nearly to the zenith and five minutes later it was gone. I rushed inside to convey my excitement to anyone handy -- namely the desk clerk who said he'd long since gotten used to such things. I found out later that a similar display that night illuminated the sky for Japan's Emperor Hirohito as he visited Alaska.

Dick used a Nikon f4, 72° lens for these 1-minute exposures on Tri-X film. Judging from the International Auroral Atlas (1963) this phase of the display would be classified as CR₂B, a coronal rayed band.

TREASURER'S STATEMENT
 20 July 1971 - 20 October 1971

<u>Income</u>		<u>Outgo</u>	
Bal. Fwd.	\$ 415.64	Sky Publishing Corp.	\$820.80
Dues	1,562.10	Star Dust	115.18
Hayden Dinner Surplus	10.61	Speaker's Dinners	11.72
Telescope class	27.00	Office Supplies	10.82
Income total	1,599.71	<u>Astronomical League Dues</u>	<u>41.25</u>
Total	\$2,015.35	Outgo total	\$999.77
		Balance forward	\$3,015.58

On hand and in checking account \$1,534.75

Charles P. Shephard, Treasures, NCA

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