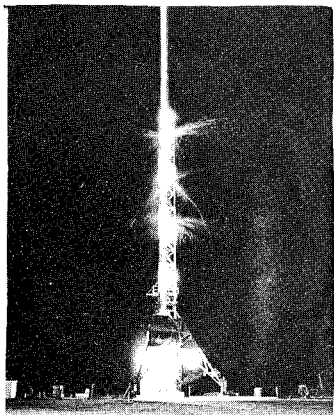




## SETH SHULMAN: THE DIFFUSE X-RAY BACKGROUND



*Aerobee launch at White Sands*

Dr. Seth Shulman of the U. S. Naval Research Laboratory will discuss his research in X-ray astronomy at the October 2 meeting of the National Capital Astronomers. The advent of sophisticated balloon, rocket, and satellite experiments has enabled us to observe astronomical objects in new areas of the electromagnetic spectrum. In the X-ray region, many sources have been found which are completely different in nature from the sources of classical optical astronomy. These X-ray emitters seem to be among the most energetic objects in the universe, and the mechanism by which this energy is released is one of the great puzzles of astrophysics. Besides point sources of X-rays, a diffuse glow also has been observed. Recent experimental work has measured this diffuse X-ray background, but its origin remains

obscure. It is most likely the sum of galactic and extragalactic contributions, and its unraveling eventually should provide new insights into the structure of

Dr. Shulman is an E. O. Hulbert Fellow at the NRL E. O. Hulbert Center for Space research in Washington, D. C. He graduated from Harvard in 1963 and received his doctorate from Columbia; his dissertation dealt with a search for quarks in the cosmic radiation. He spent a year at NASA's Goddard Institute for Space Studies, working on microwave observations of the interstellar medium.

Among Dr. Shulman's published papers are, "Line Emission in the X-ray Background" (*Astrophysical Journal Letters*), and "X-ray Intensity Fluctuations in Cyg XR-1" (same *Journal*).

### CALENDAR

October 2 (Saturday), 6:15 PM -- Dinner with the speaker at Bassin's, 14th Street and Pennsylvania Avenue, NW. No reservations required.

October 2 (Saturday), 8:15 PM -- Monthly meeting of NCA at the Department of Commerce Auditorium, 14th and E Streets, NW. Dr. Shulman speaks.

October 16 (Saturday), 7:30 PM -- Exploring the Sky, presented jointly by the NCA and National Park Service. South of Military and Glover Roads, NW, near Rock Creek Nature Center. Information: Bob McCracken, 229-8321.

NCA meeting for all Juniors. Information: Jean Radoane, 434-0443.

October 17 (Sunday), 5:00 PM -- NCA picnic and star party at Manassas National Battlefield Park. Cloud date, October 23 (Saturday). See page 7.

Each Friday, 7:30 PM -- Telescope-making class, McKinley Hall basement, American University. Information: Jerry Schnall, 362-8872.

There will be no discussion group in October.

## O'KEEFE REPORTS ON LUNAR QUAKE DATA

Dr. John O'Keefe of NASA spoke to NCA about current ideas on the internal structure of the moon at the society's September meeting. He began by reviewing briefly seismic and tidal techniques for studying the earth's interior. He then compared earth and moon composition, pointing out that the former's core is about 70 percent iron, 20 percent silicon, and 10 percent nickel. A major dispute among solid-earth physicists is whether the liquid iron core was formed early in our planet's history, or is still being formed. O'Keefe favors the first concept. Whereas the iron core of the earth accounts for 30 percent of its mass, the moon's core accounts for at most, 1 percent of the lunar mass.

The September speaker discussed *isostasy* as it applies to the Andes mountains on earth, and the lunar maria. These have much higher gravity potentials than their surroundings, but are underlain by much lighter, weaker material.

O'Keefe noted that three confirmed seismic regions have been located on the moon, all near straight-rill features and not associated with lunar transient phenomena. These regions were found by means of detectors left by Apollos 12, 14, and 15. These may be interpreted as areas of escaping volcanic gases, pending further research. Dr. O'Keefe answered numerous questions put to him throughout his talk. He supports the volcanic theory of lunar region formation as opposed to the meteor-impact theory.

## IMPORTANT EQUATIONS IN ASTROPHYSICS - V

The June 1971 issue of *Star Dust* discussed the total energy  $E$ , radiated by a black body at temperature  $T$ . This was the Stefan-Boltzmann law. The way in which this energy varies with wavelength  $\lambda$ , is given by Planck's law:

$$E = \int_0^{\infty} \frac{8\pi c^2 h}{\lambda^5 (e^{ch/k\lambda T} - 1)} d\lambda$$

where  $c$  is the speed of light,  $h$  is Planck's constant,  $e$  is the natural logarithm base,  $k$  is an experimental constant. The integral is taken over all wavelengths.

## NOTES ON CURRENT RESEARCH

J. Martin Baily of George Washington University has applied three-body mathematical techniques to a study of the origins of Jupiter's seven outer satellites. He finds that they very likely were captured from the asteroid belt, parts of which intersect the orbits of Mars and Jupiter. Calculations suggest that satellites VI, VII, and X (direct orbits) were captured during a Jovian perihelion; satellites VIII, IX, XI, and XII (retrograde orbits) were captured during an aphelion. These bodies are detectable only by means of long-exposure photography. (*Science*, 27 August)

Dr. S. A. Volobuev and his associates report that Cosmos 251 and 264 have detected 100-mev gamma rays from a  $5 \times 20$ -degree area centered on galaxy 3C120. More refined observations may confirm this as the first-known gamma-ray galaxy. This object is subject to sudden increases in amplitude at longer wavelengths. (*Science*, 19 June)

## NEWS NOTES

Jerry schall reports that his Friday night telescope-making classes in McKinley Hall, American University, are attended by eight persons on the average; occasionally there have been 35 in attendance. Three 8-inch, five

6-inch and one 4-inch reflectors are nearing completion. Thirty more 6-inch reflectors are in various stages of completion.

More than three hours of slides and movies were shown at the September discussion group held at the Department of Commerce. Jerry Hudson showed pictures of some novel telescopes exhibited at Stellafane in 1967, 1968, 1970, and 1971. Bill Winkler showed "fish-eye" scenes of the 1971 Astronomical League convention at Memphis; Bob McCracken showed films of the construction of a mountain-top observatory site. Jim Krebs showed color slides of Mars and Jupiter taken with his 6-inch Maksutov; Bob Bolster and Jerry Hudson showed slides of the Perseus double cluster and the North American nebula made with their 10-inch Wright-Schmidt camera.

Several NCA members saw the luminous cloud associated with the launching of a barium shot from Wallops Island, Virginia, Monday evening, September 20. It appeared in the east-southeast sky between 7:30 and 8:00 PM EDT.

It is hoped that more NCA-wide Junior activities will be possible this year. Plans are being made to hold monthly meetings in a more central location, probably at McKinley Hall, American University, on the second Saturday of each month.

#### NEW MEMBERS

Mark S. Goldberg  
2706 Jennings Road  
Kensington, Maryland 20795

Robert F. Johnston  
6554 Lee Valley Drive, Apt. 102  
Springfield, Virginia, 22150

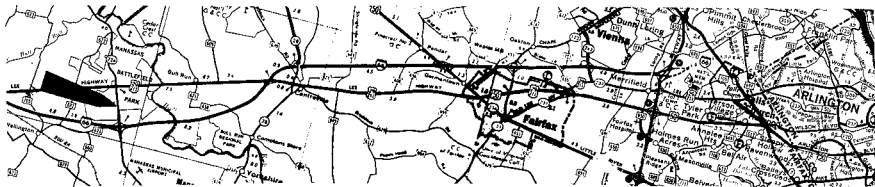
Dr. Victor J. Slabinski  
3539-A South Stafford Street  
Arlington, Virginia 22206

Richard T. Stouffer  
4041 Majestic Lane, Apt. C  
Fairfax, Virginia 22030

Dr. and Mrs. Thomas C. Van Flandern  
U. S. Naval Observatory  
Washington, D. C. 20390

#### NCA PICNIC, STAR PARTY

The annual NCA picnic and star party will be held at Manassas National Battlefield Park on Sunday, October 17, at 5:00 PM. If clouds interfere, try again Saturday, October 23. Go west on I-66 to the route 234 exit, then north about 1/2 mile to the park (or, 1/2 mile south of 29-211). Bring telescopes, food, portable grills.

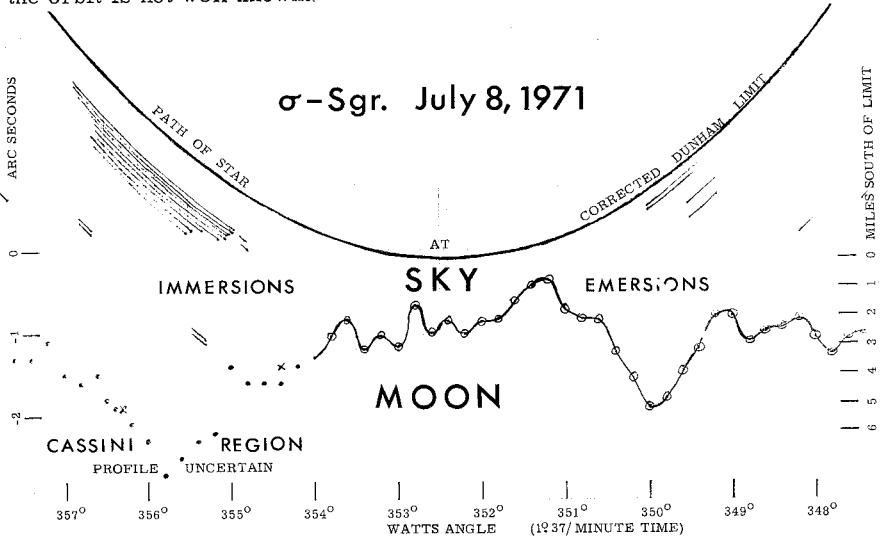


#### OCCULTATION RESULTS: THE $\sigma$ -SGR GRAZE ON JULY 8, 1971

The lunar profile is plotted as superimposed upon a flat moon, hence the parabolic star paths represented for each observer. Not all observed emersion. Several independent, off-line observations are also represented. A nearly 2-mile error is indicated between the observed events and the predicted profile. It appears as approximately 5 miles on the surface of the earth, increased by

a factor of almost 3X by the projection angle.

This observation was particularly valuable, as it was made only a few hours before full moon, where, because few such observations have been possible, the orbit is not well known. RMcC



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