☆ STAR DUST

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ANNUAL MEETING, ELECTION, FILM NIGHT MAY 1

The annual NCA business meeting and election will be held on May 1 following a selection of films. Only the films will precede the election.

1. *The Challenge of Unanswered Questions* presents the principle features of the aurora, the theory of its cause, and some of the instruments and techniques used in studying it at the Geophysical Institute of the University of Alaska. Produced by the University of Minnesota.

2. *Jupiter Odyssey — Pioneer 10* tells the story of the first spacecraft to probe the asteroid belt beyond Mars, tells of questions answered and new questions raised. Pioneer 10 has now passed the orbit of Saturn on its way out of the Solar System. A NASA film.

3. *The Mission of Apollo-Soyuz* — a precedent-setting event in international spaceflight. The film follows the mission events with flashbacks to the period of development and training, and projects the future of international flights, Space Shuttle, and the European Space Lab. NASA film.

The annual election of officers will follow the films. Candidates offered by the nominating committee are:

President: Benson Jay Simon (incumbent)
Vice President: Geoffrey P. Hornseth
Secretary: William R. Winkler
Treasurer: Robert M. Lynn
Trustee: Daniel C. Costanzo, G. Robert Wright
Sergeant at Arms: Richard J. Byrd

Lawrence C. Torrance, our incumbent treasurer, has also been nominated for trustee by petition.

Additional nominations may be made by written petition of ten full members in good standing, submitted to the trustees prior to the May 1 election.

MAY CALENDAR

Saturday, May 1, 6:15 PM — Pre-meeting dinner at Bassin's Restaurant, 14th Street and Pennsylvania Avenue, NW. Reservations not necessary.

Saturday, May 1, 8:15 PM — NCA annual business meeting at the Department of Commerce Auditorium, 14th and E Streets, NW. All members are urged to attend in order to assure a quorum.

Monday, May 3, 10, 17, 24, 31, 7:30 PM — Telescope-making classes at the Chevy Chase Community Center, Connecticut Avenue and McKinley Street, NW. Information: Jerry Schnall, 362-8872.

Friday, May 7, 8:00 PM — Lecture by Dr. Carl Sagan, Director of the Laboratory for Planetary Studies, Cornell University. NCA members and their immediate families only. Reservations required: Call Benson J. Simon as early as possible to reserve space: (301 if in Virginia)-776-6721 evenings. Baird Auditorium, Smithsonian Institution, Natural History Building, 10th Street and Constitution Avenue, NW.

Saturday, May 8, 9:00 PM — *Exploring the Sky*, presented jointly by NCA and The National Park Service. Glover Road south of Military Road, NW, near Rock Creek Nature Center. Planetarium program if cloudy. Information: Bob McCracken, 229-8321.

Friday, May 14, 21, 28, 7:30 PM — Telescope-making classes at American University, McKinley Hall basement. Information: Jerry Schnall, 362-8872.

APRIL LECTURE

Arnold Roy Shulman, of Goddard Space Flight Center, addressed the April 3 NCA meeting on coherent optics.

He began with an elementary discussion of the diffraction phenomenon and defined 1) spatial coherence (among parts of the same wavefront, as in holography) and 2) temporal coherence (among different wavefronts, as in split-beam interferometry), pointing out that the contrast of the interference fringe patterns represents the degree of coherence. He demonstrated the diffraction spectra of Ronchi rulings of various spatial frequencies, then the moire spectra of two and three crossed rulings of different frequencies, and showed qualitatively the relationship between an image and its Fourier transform. Projecting a photograph of a girl's face with a very fine-line ruling superimposed, he showed that in the Fourier transform plane the spectrum of the ruling (the highest-frequency component) was the most prominent feature. Then, powerfully demonstrating that each order of the ruling spectrum (each appearing as one of a pattern of dots in the Ft plane) contains all of the information in the photograph, he defocussed the spectrum whereupon each dot, instead of blurring, grew into a face — sans ruling! This also demonstrates that the ruling information is only contained in the series of spectral orders, requiring that all of the dots be projected in order to reimage the ruling properly. Thus, by blocking out dots selectively, he demonstrated the removal, as well as the enhancement of the ruling. In principle, and to a great extent in practice, these spatial filtering techniques offer the possibility of selective optical removal of picket fences of different spacings and directions from a landscape photograph, perhaps the removal of some and the enhancement of others in the same photograph. Or, as our speaker pointed out, to remove the halftone dots in printed pictures, as in *Star Dust*. (In printing *Star Dust*, our problem is putting the dots *into* the pictures properly — *Ed.*) Shulman demonstrated practical applications such as the enhancement of certain geological features sought in aerial photographs, and optical encoding and decoding of multiply exposed images by crossed rulings and spatial filtering, with both binary and continuous-tone images. To reduce the dynamic range of a photograph and preserve the details in both highlights and shadows, he reduced the low-frequency terms, using neutral-density attenuation rather than opacity, which would result in frequency doubling (because light cannot have negative intensity). This is the problem in photographing the solar corona during an eclipse, when it is desired to record details far from the limb of the Sun without losing the details close in by gross overexposure. Sunspot photography is another example of the problem.

A problem in using coherent light techniques is that even the smallest dust particle in the optical system is imaged as a target-like system of concentric rings. Shulman showed some ingenious techniques for dealing with the problem by, for example, rotating the lenses on their optical axes during the exposure. He also showed how the Fourier transform and image can be projected by a single lens.

Following a tantalizingly brief discussion of optical autocorrelation, cross correlation, convolution, holography, zone plates, and matched filters, our speaker closed with many untold marvels still remaining in his fascinating bag of tricks.

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AURORA VISIBLE IN AREA

Apparently the first general aurora visible in the Washington, DC area since 1967 was observed by William Winkler on March 26. It had peaked when Winkler first saw it at 08:20 UT. Similar to plate 16 of the *International Auroral Atlas* (1963), it displayed a rayed band of the typical green-white of nitrogen, with patches of red (oxygen) in the northeast and northwest. Individual forms moved from west to east. As seen at Bowie, Maryland, it lasted less than an hour, increasing in altitude from about 35° to about 55° as it faded by 08:50 UT.

OBSERVING TECHNIQUES SUGGESTED

An active observer, Daniel Costanzo leads NCA observing groups for novae, variable stars, comets, meteors, and planetary monitoring. Some of the techniques he has found useful may be of interest to others. Those interested in more than the brief descriptions given here can obtain details, suggestions, and literature references from Costanzo. He can be reached at (703) 841-0051.

Subjective errors in visual comparisons of the integrated magnitudes of extended objects with those of point sources — stars — can be reduced by a method used by ALPO. It is particularly suitable for umbral and total phases of lunar eclipses. Reversed binoculars reduce the apparent size and magnitude of the object; the comparison star is viewed by naked eye. The magnitude reduction is given by

$$M = m-(5 \log P+0.2)\pm E$$

where M is actual magnitude, m is apparent magnitude, P is the nominal magnification of the binoculars, and E is a separately determined correction for differential atmospheric extinction. Costanzo has a table for the purpose. It is 1.0 if the objects are at the same altitude.

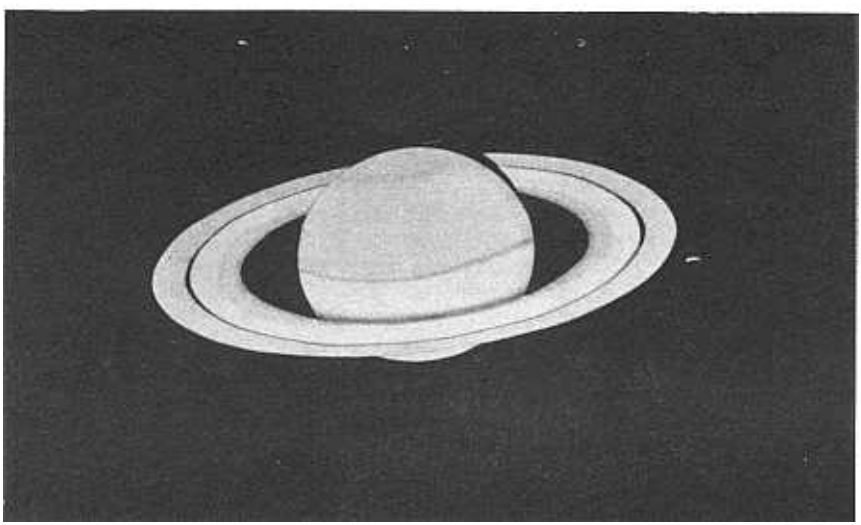
In another method, a convex reflector forms a reduced virtual image of the object. The reduction can be adjusted by eye distance to match the comparison star, which is viewed naked eye. The reduction is

$$M = m+K-5 \log R\pm E$$

where R is the distance from the reflector to the eye, and K is a calibration by objects of known magnitude, or by calculation.

A sketching technique, variants of which are widely used at the telescope for recording lunar and planetary details, may be unfamiliar to some who would find it useful. The sketching paper is first prepared by lightly graying with soft pencil and rubbing to uniformity. A sharpened eraser is then used to draw highlights, and the sharpened pencil to put in the shadows.

Costanzo often adds his own techniques, variants, and combinations to achieve the results he desires. For example, he carefully selected different paper textures and colors for sketching the rings and disc of Saturn, a third for background, and combined them to make the composite shown here. He used a 10-inch Cave reflector at 230x to depict Saturn on March 23, 1976, from 00:45 to 02:06 UT.



SLABINSKI ATTACKS SKYLIGHT

In the April 1976 issue of the IEEE *Spectrum*, Dr. Victor Slabinski responds to a previous article on street lighting, pointing out the energy savings possible by simply shielding outdoor lights from the sky. Other benefits are, of course, apparent. Thank you, Victor!

EXCERPTS FROM THE IAU CIRCULARS

1. April 8 — D. W. Dunham, Cincinnati, Ohio, predicted that Phobos would occult -Geminorum after its reappearance from occultation by Mars. The event, expected to last only 1 second, should have been visible in a 20-km-wide path across the Gulf coast states. No observations have yet been reported.

2. April — R. Wood, Royal Greenwich Observatory, refuted an earlier observation of nebulosity surrounding V1500 Cygni. Spectra and direct plates taken with the 250-cm telescope showed no nebulosity as large as 3 seconds in diameter.

3. Comet West (1975n) — Nucleus B has usually been seen as 2 magnitudes fainter than A, but was 0.8 magnitude brighter on March 29. It is predicted to be 31 seconds from A on April 22. Nucleus C was last seen 5 magnitudes fainter than A on March 27. Nucleus D, 1 to 2 magnitudes fainter than A, is expected to be 13 seconds distant on April 22.

This listing furnished courtesy R. N. Bolster.

* STAR DUST

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