★ STAR DUST

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SHULMAN TO DISCUSS COHERENT OPTICS

ARNOLD R. SHULMAN

Mr. Arnold R. Shulman of Goddard Space Flight Center will speak at the April 3, 1976 meeting of the National Capital Astronomers. He will discuss the fundamentals of coherent optical data processing. Starting at an elementary level he will build on this to explain, in physical terms, the hows and why of coherent optics. Instead of using mathematics to explain coherent optics, he will use physical examples and demonstrations to explain the mathematics. Explanations of the Fourier transform, auto and cross correlation, convolution will be illustrated in physical terms. Not only will these mathematical terms be explained, but their use in performing spectrum analysis, optical filtering, matched filtering will be illustrated. Included in the talk will be an explanation of holography and its use in making 3-D images, optical memories and as a matched filter. Although the talk covers a tremendous range of disciplines and material, the listener will go away with a good understanding, if not a working knowledge, in the field of coherent optics.

Mr. Shulman has an M. S. E. E. degree from Newark College of Engineering and is author of the book *Optical Data Processing* published by John Wiley. He teaches coherent optics at George Washington University at a graduate level.

APRIL CALENDAR — *The public is welcome.*

Friday, April 2, 9, 16, 23, 30, 7:30 PM — Telescope-making classes at American University, McKinley Hall basement. Information: Jerry Schnall, 362-8872.

Saturday, April 3, 6:00 PM — Dinner with the speaker at O'Donnell's Sea Grill, 1221 E Street, NW. Reservations not necessary.

Saturday, April 3, 8:15 PM — NCA monthly meeting at the Department of Commerce Auditorium, 14th and E Streets, NW. Arnold R. Shulman will speak.

Monday, April 5, 12, 19, 26, 7:30 PM — Telescope-making classes at the Chevy Chase Community Center, Connecticut Avenue and McKinley Street, NW. Information: Jerry Schnall, 362-8872.

MARCH LECTURE

John B. Carlson, Astronomy Program, University of Maryland, spoke at the March 13 meeting of National Capital Astronomers on the origin of the lodestone compass.

Normally a radio astronomer specializing in small extragalactic sources, our speaker became interested a few years ago in archaeoastronomy, and worked with Dr. John C. Brandt on the Crab Nebula Supernova rock-art project in the southwestern United States and Mexico. He has sought astronomical implications in the rigorous alignments of buildings, tombs, and cities of

ancient civilizations, particularly of the Aztec, Maya, Zacatec, and Olmec cultures.

Carlson's theme centered on a unique Olmec artifact found in situ by a group led by Michael Coe of Yale University. The small, highly polished bar of hematite, 9x4x34 mm, broken at one end, appears to be approximately one-half of a magnetic compass pointer. In his fascinating development of the indications that here may have been the world's first lodestone compass, Carlson led his audience through a vicarious tour of the Olmec community of 3,000 years ago. Slides of giant heads carved in basaltic rock, strange and beautiful statuary, bas-relief, carvings in fine jade, and expert fabrications in hematite, or magnetic iron ore, introduced the culture of these ancients about whom relatively little is known.

The suspected compass pointer has a precisely formed hemicylindrical groove along the assumed top, at an angle of approximately 2° to the longitudinal axis. The angle is obviously deliberate, as the entire piece is quite precisely formed and highly polished. It appears to be a calibration, perhaps to true north as determined astronomically. When floated on mercury or on a cork pad on water the device proved to be capable of indicating within 0°.5 repeatedly. Cinnabar, mercuric sulphide, was available to the Olmec, and was used as a pigment; it needs only to be heated to yield liquid mercury. Carlson believes that such a compass would not have been used for navigation, but rather for geomancy — the art of aligning cities, buildings, burials, in a manner which they believed to be in harmony with the universe. Indeed, they meticulously disposed such things on and symmetrically about an axis 8° west of north. The magnetic declination of that time is unknown, but is expected to be determined within a few years when sufficient data have been gathered. Fire pits or hearths where magnetic ores are found can hold such information. Heating destroys the magnetic remnant; upon cooling, the ore assumes the magnetic axis of the ambient field. Thus, the local direction of the Earth's field upon the last cooling is recorded. Secular variations in the magnetic direction could be as large as several tens of degrees in the intervening 3,000 years.

Precession of the Earth's axis, which is quite accurately known, has moved celestial north by about one-eighth of the 25,000-year cycle, or about 18° in 3,000 years. The question is open until the ancient magnetic declination can be determined. Carlson identified the ore and its magnetic vector by Mössbauer spectrometry and spinner magnetometry, and found the orientation to be consistent with the floatation results, and appropriate to the function of a compass. He was also able to determine the probable source of the material as the Isthmus of Tehuantepec, 100 to 150 km from where it was found.

The ancient Chinese, from about 200 BC to about 200 AD are usually credited with the origination of the lodestone compass. If Carlson's conjecture is correct, the Olmec compass antedates the Chinese by a millenium!

Our speaker summarized the observations supporting his interpretation. The unique morphology of the artifact, including the magnetic orientation, is appropriate to the purpose; it appears utilitarian rather than artistic; the groove appears to be a calibration; the demonstrated Olmec expertise in working these magnetic materials offered ample opportunity to encounter their magnetic properties.

Albeit remarkable, the lodestone compass shared the spotlight with another Olmec artifact — one of particular interest to this audience. Also made of hematite, it was a highly polished concave mirror about 5 cm in diameter, capable of good optical imaging! Being already fully oxidized, this material has retained its high polish for 3,000 years. Its focal length is about 80 mm, or F/1.6. Only a very few of these remarkable mirrors have been found, in

NOMINATING COMMITTEE REPORTS

Chairman Henning Leidecker reports that the nominating committee offers the following candidates for fiscal 1977 NCA offices:

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

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.

SPECIAL EVENT FRIDAY, MAY 7 — *A letter from the President of NCA....*

On behalf of the Board of Directors of the Cornell Club of Washington, I am privileged to invite NCA members and their families to join with the Cornell Club to hear Dr. Carl Sagan lecture on *The Exploration of the Planets and the Search for Life.*

Professor Sagan is Director of the Laboratory for Planetary Studies at Cornell University and is one of the Nation's most distinguished astronomers. He was an experimenter on the Mariner II Venus Probe and the Mariner IX Mars Orbiter, and is an experimenter on the Vikings scheduled to land on Mars this summer. He has authored, coauthored, and edited numerous books and journal articles on planetary science and the search for extraterrestrial life, including the popular book, *The Cosmic Connection.* He has appeared in astronomy documentaries on educational television and has been a guest several times on the Johnny Carson *Tonight* show.

The lecture will be held in the Smithsonian Institution's Baird Auditorium in the Natural History Building, 10th Street and Constitution Avenue, NW, at 8 PM, Friday, May 7, 1976.

The lecture is *not* open to the public; seating is limited and the invitation can be extended only to NCA members and their immediate families. *If you plan to attend, please telephone me* at home as soon as possible and let me know the number in your party. (Telephone: 776-6721. Dial area code 301 if you call from Virginia). If you cannot reach me by phone, send me a postcard (8704 Royal Ridge Lane, Laurel, Maryland 20811).

I am certain that you will find the evening most stimulating.

Sincerely,
Benson J. Simon
President, NCA
Member of the Board,
Cornell Club of Washington

diameters ranging from about 25 to 100 mm. They are believed to have been worn by the rulers as symbols of their position, and probably were used either ceremonially or practically. One has been used to start a fire by concentrating sunlight. The optical figure suggests imaging rather than purely decorative use.

The ensuing question period ranged over the anthropological, astronomical, artistic, and technological aspects and implications of the Olmec culture of 3,000 years ago. rm

EXCERPTS FROM THE IAU CIRCULARS

1. February 19 — W. A. Bradfield, Dernancourt, Australia, discovered a 9th-magnitude comet in Fornax. Comet Bradfield (1976a) is moving north and east, but is not expected to be brighter than 8th magnitude.

2. February 25 — H. Schuster, European Southern Observatory, discovered a 15th-magnitude comet in Vela. The orbital elements of comet 1976c by Marsden suggest that it has the largest known perihelion distance, 7.16 au.

3. March 3 — W. A. Bradfield discovered another 9th-magnitude comet, 1976d. Moving slowly north and east, it is also not expected to brighten.

4. March 5 — A. A. Schoenmaker, Leiden Observatory, reported that V1500 Cygni is now surrounded by a circular nebulosity 10 seconds in diameter.

5. Comet West (1975n) — Numerous observations of the comet were made in daylight, both naked-eye and telescopically, during February 25-27. Several secondary nucleii have been observed during March 6-14.

This listing courtesy R. N. Bolster.

FOR SALE

Three-inch Unitron altazimuth refractor. Also 80-mm Jaeger's spotting scope. Half price. Samuel Gordon, (301) 577-9064.

Three-inch Edmund reflector with Barlow lens and eyepiece. Perfect condition. $50.00. Ed Kennedy, (301) 277-9259 evenings.

Mirror, 6-inch, F/8, made in NCA class. Good figure. Best reasonable offer. (202) 363-0698 evenings.

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