



## JOHNSTON UNRAVELING SS433 WITH NEW OBSERVATIONS



DR. JOHNSTON

Dr. Kenneth J. Johnston of the U. S. Naval Research Laboratory will address the April 4 meeting of National Capital Astronomers. He will speak on high-angular-resolution observations of the peculiar galactic object SS433.

This unusually interesting object exhibits strange characteristics including apparently superluminal-velocity radio jets which were not immediately explained.

The object is believed to be a binary star with one of the members being a neutron star. Plasma jets perpendicular to the rotation axis of the accretion disk may generate the radio picture as reconstructed from measurements made with the Very Large Array of the National Radio Astronomy Observatory. This galactic object may be a Rosetta stone for better understanding of quasi-stellar objects.

Dr. Johnston is Head of the Radio and Infrared Astronomy Branch of the U. S. Naval Research Laboratory. He received his B.S.E.E. from Manhattan College in 1964, and his Ph.D. in astronomy from Georgetown University in 1969. He is a member of the International Astronomical Union, the International Union of Radio Science, American Association for the Advancement of Science, and Sigma Xi.

### APRIL CALENDAR — *The public is welcome.*

- Friday, April 3, 10, 17, 24, 7:30 PM — Telescope-making classes at American University, McKinley Hall basement. Information: Jerry Schnall, 362-8872.
- Friday, April 3, 10, 24, 8:00 PM — Observing with the NCA 14-inch telescope with Bob Bolster, 6007 Ridgeview Drive, south of Alexandria off Franconia Road between Telegraph Road and Rose Hill Drive. Call Bob at 960-9126.
- Saturday, April 4, 6:15 PM — Dinner with the speaker at the Thai Room II, 527 13th Street, NW. Reservations unnecessary.
- Saturday, April 4, 8:15 PM — NCA monthly meeting at the Department of Commerce Auditorium, 14th and E Streets, NW. Dr. Johnston will speak.
- Tuesday, April 7, 14, 21, 28, 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

Mr. Arnold R. Shulman, of Recognition Equipment, Inc., Dallas, Texas, addressed a combined audience of National Capital Astronomers, the Society of Photographic Scientists and Engineers, and the Optical Society of America, at the March 7 meeting of NCA.

He outlined a wide range of techniques for modifying photographic images, all based on the wave properties of light, and indicated that many are quite practical and very useful. The structure of his lecture was a review of the consequences of the wave nature of light, the wave properties of an image, ways to process this wave image in order to reconstitute an image of the original with desired data emphasized, and finally, holography.

Shulman reviewed the behavior of a pinhole in a plane-wave beam. Light diverges from the pinhole in a spherical wave; the pinhole becomes a virtual source. He reviewed Young's double-slit experiment which demonstrated the alternate constructive and destructive interference of the emergent light at increasing angles from the slits. He showed how mutual interference among the divergent rays from many pinholes approximately reconstitutes the original beam, but with additional beams at various angles to the original axis. The pattern of these side lobes is determined by the combined path length differences from the pinholes. For his demonstrations, Shulman distributed to the audience Ronchi rulings on film, these having spatial frequencies of approximately 6 lines per mm. Through them a sequence of secondary images (spectral orders) of a lamp filament appeared on either side of the original (zero order, often called the "dc component," analogous to the electrical case), in a line at right angles to the lines of the rulings.

A lens focuses a parallel beam to an approximate point at a distance of one focal length from the lens; a nearby object is focused at a somewhat greater distance (conjugate focus). A transparent object (e.g., a slide) illuminated by a parallel beam will be imaged at its conjugate focus, but the beam will now contain structure; details in the object will diffract the beam into a pattern that will be distributed around the original point focus. This is the Fourier-transform plane; it contains all of the information in the image, but transformed into spatial frequency data. In this plane, judiciously placed stops can selectively remove image data. Re-imaged by a second lens, the reconstruction will be altered accordingly. A picket fence having a particular spatial frequency (lines per cm) and direction may be eliminated, but others, including finer details, retained. Shulman showed a striking example: an aerial photograph showing a network of geological fault lines in two predominant directions. Those in a selected direction could be cleanly eliminated, reducing clutter and making it far easier to study the sets separately. TV raster lines were suppressed in a similar way. The half-tone dot pattern in printed photographs can easily be eliminated.

In the Fourier-transform plane, the higher spatial-frequency data appear farthest from the central spot, which carries the brightness-range information. Attenuation of the central spot reduces the brightness range without reducing the fine-detail contrast. The data in two images can be either added or multiplied. A double exposure adds the data in the transform; two superimposed (stacked) slides will have their data multiplied in the transform plane. Indeed, the cross products are visible there. Correlation, combining similar images (or the same image displaced) emphasizes similarities. Reversing one image (convolution) permits such startling processes as restoring an out-of-focus picture. A cylindrical lens was used to spread out information so many tests could be applied to a single exposure. Adding lines to a picture permits encoding information into it: Three-color-separation images could be encoded with lines crossed in three directions using rulings of three subtractive primary colors, to store color images on stable black-and-white film, not subject to color fade. The colors would be restored by filters in the transform plane. In the same way, several images can be recorded on the same film and be separated at will.

The relief image in photographic gelatin is customarily suppressed in favor

## OCCULTATION OBSERVATIONS PLANNED

Dr. David Dunham is organizing observers for the following grazing occultations in April. For further information call Dave at 585-0989.

UT Date	Time	Place	Vis Mag	Pcnt Sunlit	Cusp Angle	Min Aper
04-07-81	00:42	Fredericksburg, VA	7.3	77	7S	5 cm
04-08-81	23:56	Elkton, MD	7.9	23	3S	10 cm
04-10-81	23:14	Ellicott City, MD	3.7	45	-3N	5 cm
04-11-81	00:48	Scaggsville, MD	8.7	45	1N	20 cm

ASTEROIDAL APPULSES:	Star Mag	Altitude	Name of Asteroid
04-04-81 10:03	8.6	20	(91) Aegina
04-20-81 23:14	8.7	10	(36) Atalante

## NEW MEMBERS WELCOMED

Andrew Baines  
119 Aragona Drive  
Oxon Hill, MD 20022

John Booth #521  
10201 Grosvenor Place  
Rockville, MD 20852

Alexander R. McMullen  
1207 Ruppert Road  
Silver Spring, MD 20903

Susan T. Woodward  
4704 Chevy Chase Blvd.  
Chevy Chase, MD 20015

## U. S. NAVAL OBSERVATORY COLLOQUIA SCHEDULED

On Thursday, April 9, Dr. Janet Rountree Lesh, AFE/ Technical Services Staff, Bolling AFB, will speak on the Gould Belt Revisited.

On Thursday, April 23, Dr. Maarten Schmidt, California Institute of Technology and Institute for Advanced Study, Princeton, will speak on the Space Distribution of Quasars.

The colloquia are held in Building 52, Room 300, at 3:00 PM. Coffee and tea will be served in the foyer at 2:40 PM. Enter the 34th Street gate on Massachusetts Avenue, NW, where the guard will require identification and provide directions. For further information, call 254-4540.

## NASM TO PRESENT AVENI ON ARCHAEOASTRONOMY

Dr. Anthony F. Aveni, professor of astronomy and anthropology, Colgate University, will speak on Maya, Aztec, and Inca astronomy at the National Air and Space Museum at 7:30 PM on Wednesday, April 15. Because the talk will be held in the planetarium, latecomers may not be admitted.

On the first Saturday morning of each month, NASM also presents free, popular-level talks by staff members in the planetarium. On April 4, 9:00 AM, the Messier Catalog will be discussed. Charles Messier (Mes-yay) (1730-1817) discovered 15 comets and the more-than-100 other comet-like objects which constitute his popular catalog.

of the silver image; but this can be reversed and a far wider dynamic range achieved, perhaps with even finer detail. This useful process seems little used.

Holography produces an unconventional image by physically reconstituting a wavefront similar to the original scene. It thus has unique three-dimensional properties. Shulman approached the topic through Newton's rings (the related zone plate can produce a hologram), and the early Lippman color photographs on black-and-white film, produced by backing up the emulsion with a mercury reflector to produce the necessary interference patterns within the emulsion. He concluded with a brief historic summary of holography, including sonic holographic techniques in which the original image is in sound waves.

Shulman's talk inspired a question and discussion period in which many inquiries were raised regarding potential applications in various fields.

We thank Dr. Gordon Cooper, president of Recognition Equipment, Inc., for making Mr. Shulman available at our request.

## EXCERPTS FROM THE IAU CIRCULARS

1. December 30 — N. G. Thomas, Lowell Observatory, discovered a minor planet (1980 YS) of 15th magnitude in Auriga.

2. February — AAVSO observers reported that GK Persei had undergone another outburst, reaching 12th magnitude.

3. March 2 — S. J. Bus, California Institute of Technology, discovered a comet (1981b) of 17th magnitude in Virgo on a plate taken by K. S. Russell at the U.K. Schmidt Telescope Unit at Siding Spring. The orbital elements by Marsden indicate a period of 6.57 years.

4. March 2 — Tsvetkov, Sternberg Astronomical Institute, discovered a supernova of 12th magnitude in NGC4536.

5. March 9 — R. Evans, Anglo-Australian Observatory, visually discovered a supernova of 12th magnitude in NGC 1316. The University of Chile reported photographic confirmation, but with magnitude estimates of 15 to 20.

## TRADE TELESCOPES

Have 8-inch Celestron, desire 3.5-inch Questar for easier travel. Cash difference. Dr. Charles Weber, O: 699-2140.

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## \* STAR DUST



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