BUFFALO ASTRONOMICAL ASSOCIATION INC.
BUFFALO MUSEUM OF SCIENCE
HUMBOLDT PARKWAY
BUFFALO NEW YORK 14211

the Spectrum

Editor: Ernst E. Both

SEPTEMBER - OCTOBER 1975

SEPTEMBER MEETING: For our first meeting of the new season (September 12, 1975, 8:00 p.m. Club Room, Buffalo Museum of Science) we are happy to welcome beack Mr. Ray D. Manners. Mr. Manners is Product Engineer, Advanced Technology, Bell Aerosystems, as well as a Fellow, Royal Astronomical Society and a member of the British Astronomical Association. The topic of Mr. Manners' lecture will be announced at the meeting - but from past experience we are certain that this will be a most interesting evening. Refreshments afterward - we are very happy to welcome RAY D. MANNERS!

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OCTOBER MEETING: Friday, October 10, 8:00 p.m., Club Room at the Museum. It is our pleasure to present Dr. Lyle B. Borst, Professor of Physics and Astronomy, State University of New York at Buffalo. D. Borst's lecture is entitled "Problems with the Expanding Universe." Dr. Borst has carried out researches in many areas of physics and astronomy, including supernovae, helium at very low temperatures, prehistoric astronomy, to mention a few. It is with great pleasure that we welcome DR. BORST!

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NOVA CYGNI 1975: A bright nova or supernova is adorning our evening skies - discovered by the Japanese amateur Minoru Honda, well known comet observer, the nova increased very rapidly from 14^m around August 27 to about 2^m or brighter on August 29, 1975. Located just 5^o north-east of the star Deneb in Cygnus (the top of the northern cross) it is nearly as bright as Deneb itself, and judging from past performance of novae it ought to be visible to the naked eye for some time. If it is a supernova, it would be the first one in our galaxy since 1604. More information at the September meeting. Co-ordinates of Nova Cygni 1975 are: R.A. 21^h 10^m; Decl. + 48^o.

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Comet KOBAYASHI-BERGER-MILON (1975h). This unexpected visitor was well-placed in the eveing sky during August. It reached perihelion on September 5, 1975 (distance from Sun 39.6 million miles) and should soon be visible low near the horizon in the northeast just before sunrise. Co-ordinates for September are as follows:

September	10:	R.A. 10h 38.26m,	Decl. +22°	40!4	magnitude: 4.1
	15	10 32.04	16	46.1	4.6
	20	10 28.84	10	51.1	5.3
	25	10 27.74	5	6.7	5.9
	30	10 27.95	- 0	23.7	6.6
October	5	10 28.96	- 5	40.1	7.2
	10	10 20.38	-10	43.5	7.7
	15	10 31.96	-15	35.4	8.1
	20	10 33.49	-20	16.7	8.5
	25	10 34.84	-24	48.4	8.9

As can be seen, the best chance of observing the comet will come during the second half of September. Thereafter, the comet fades fairly rapidly, moving south in declination so that observations will become increasingly difficult. Good luck!

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A REMINDER: DUES ARE AGAIN DUE - PLEASE CONTACT WARREN STEINBERG AS SOON AS POSSIBLE!!!

THE ASTEROIDS: SIZES, MASSES, AND COMPOSITIONS By Dr. Frederick R. West

In the article that appeared in the May-June 1975 issue of the Spectrum, certain properties of asteroid orbits and various asteroid orbit groupings were discussed. Detailed attention was paid to several interesting groups (the Amor and Apollo) of asteroid orbits whose members periodically approach the Earth; some members of these groups may eventually collide with the Earth, Mars, or Venus. Without waiting for such a cosmic catastrophe to get first-hand knowledge of the physical makeup of asteroids, this article discusses the physical properties that can be deduced from astronomical observations of asteroids, especially some recent advances in such research.

The largest asteroids whose orbits are situated between those of Mars and Jupiter, are the ones about which most is known physically; this is because they are much larger, hence brighter, than the smaller objects which are associated with or come close to the Earth. This is timely, since two of these large asteroids, Vesta (magnitude 6.2) and Pallas (magnitude 8.4) are in opposition on September 18 and 21 respectively. On these dates the distances of Vesta and Pallas from Earth will be 129,200,000 miles and 187,500,000 miles respectively.

Physical properties of asteroids are found by measurement of the light received from them (photometry), polarization of such light (polarimetry), and brightness variations. Also, masses of the three large asteroids Vesta, Pallas, and Ceres have been determined by careful measurements of changes in orbital motion of smaller asteroids that have been caused by the gravitational pulls of these large asteroids. Relevant here in addition is the unproved conjecture that some meteorites may either be very small asteroids or may be fragments from two asteroids (or more) which have collided. If this is true, then the composition of meteorites can give us some clues about asteroid composition.

Until recently, our estimates of asteroid diameters were found by the assumptions that a given asteroid reflects light 1) either like the Moon or Mercury, or 2) like a given kind of meteorite. The albedo (ratio of reflected light to light incident on the object) is well known for the Moon and meteorite samples. From the measured brightness of an asteroid and its distances from the Sun and Earth, a diameter could then be calculated for the asteroid based on the assumed albedo. None of the asteroids is large and close enough to present a telescopic disk large enough for accurate direct measurement even at opposition.

Recent advances in infrared astronomy have allowed photometry of the brighter asteroids to be carried out as far in the infrared spectrum as 20 microns wavelength. At such long infrared wavelengths, the asteroid's own heat emission is much greater than reflected sunlight. Combined visual and infrared photometry allows the albedo of an asteroid over a wide range of wavelengths to be determined. Once the albedo is found, a more accurate diameter can be calculated. Also the reflection properties of the asteroid can then be compared to those of meteorites and other materials.

This work was begun by Allen and Matson and more recently has been extended by the albedo studies of David Morrison and Dale Cruikshank at the University of Hawaii. Of the 40 asteroids that have now been studied by them, many are found to have significantly different albedos than the Moon (0.07). Vesta is found to have an albedo of 0.24, while the asteroid 324 Mamberga has an albedo of 0.03, considerably darker than the Moon.

From the more accurate diameters, the mass estimates give the following mean density estimates for asteroids: Vesta = 3.5 g/cm^3, Pallas = 2.5 to 3 g/cm^3, and Ceres = 2 g/cm^3. The densities indicate these asteroids may be mainly of rocky material.

Studies of asteroid reflection properties for 98 asteroids have been conducted by Drs. Thomas McCord and Clark Chapman at MIT and the University of Arizona. Comparison with the reflection properties of known materials has shown that the asteroids studied tend to fall into two groups:

1. Bright, reddish asteroids whose reflection properties correspond closely to those of silicates and metal sulfates. Vesta is an example of this group.

2. Dark, neutral colored asteroids, whose reflection properties are close to those of the chondrite material found in stony meteorites. Ceres and Bamberga are examples of this group. Asteroids with aphelion distances beyond 3.4 a.u. seem to show reflection properties corresponding to this carbonaceous chondritic type.

Any such difference in physical composition across the asteroid belt is connected with the origin of the asteroids and the origin of the solar system itself. As described in the previous article, Jupiter is probably responsible for the absence of a major planet near the n = 3 position in Bode's law and may have caused depletion of nearly all material that was in the asteroid belt four or five billion years ago.

During the remainder of this century, we can expect to learn much more about the asteroids. Some of this knowledge will come from extended photometry, polarimetry, and radar reflection off the asteroids. Also by 1985 it should be possible to send at least an unmanned spacecraft to perform a flyby of one of the asteroids, and provide close-up photography and measurements. This will probably be done first for one of the small asteroids which periodically approaches the Earth. More ambitious expeditions into the asteroid belt should follow this, with spacecraft orbiting and making a soft landing on at least one of the large (100 mile diameter or grater) asteroids. Such an expedition may even be able to return asteroid material to the Earth by the year 2,000, where direct laboratory comparison of such asteroid samples can be made with meteorite samples.

In the centuries beyond 2,000, it is possible that manned expeditions may accelerate the depletion of the asteroid belt. The mining of asteroid material by such expeditions has been suggested by Dr. Gerard O'Neill to supply resources for the advanced colonization of outer space after the year 2,000. Dr. O'Neill has suggested that space colonies before that date would find that mining activities on the Earth's Moon would best fill their need for resources.

ADDENDUM: As additional reading we suggest Clark R. Chapman's excellent article "The Nature of Asteroids," in the January 1975 issue of Scientific American. Dr. Chapman is a former Buffalonian, the son of Dr. Seville Chapman.

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STELLAFANE 1975, by Darwin Christy.

The Stellafane Telescope Maker's Convention in Vermont was held August 8 and 9 with a good representation from the Buffalo Astronomical Association. Present from our group were the Deazley's, Lindberg's, Whyman's and Christy's, I believe 12 in all. The afternoon program had papers on "Experiments with Fired Clay Optics," "The Optics of Galileo and Newton," "An Electronic Guider for Astrophotography," "Precise Alignement of the Equatorial Telescope" and a paper on "Local polish with thin Flint-Class Ring."

29 Telescopes were judged in the afternoon according to mechanical details, workmanship, etc. Only those parts made by amateurs were judged, our own Ed Lindberg being one of the judges. To top things off, Comet Kobayashi was the interesting event in the telescopes on display - also to the naked eye in the clear Vermont skies.

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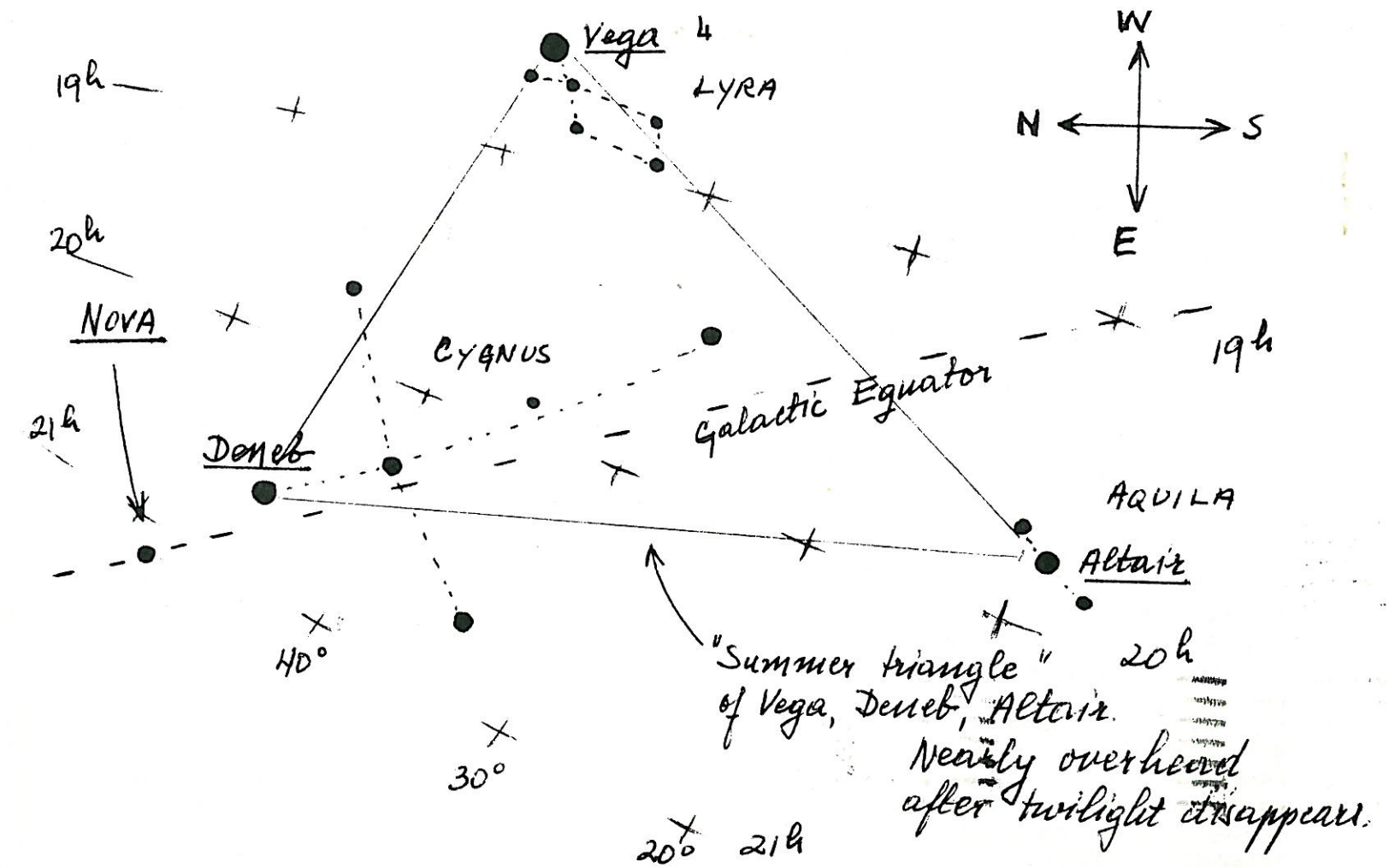

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