THE LODESTONE COMPASS: CHINESE OR OLMEC PRIMACY?

JOHN B. CARLSON

There exists a unique Olmec (1000 BC or earlier) artifact that may have been the world's first known geomagnetic compass. At the March 13 meeting of National Capital Astronomers, John B. Carlson, researcher in the Department of Physics and Astronomy, University of Maryland, will describe his archaeoastronomical studies of the Olmec culture and his analyses of such artifacts, which he reported in *Science*, September 5, 1975.

Note that the meeting date for March only has been moved to the second Saturday.

The Olmec developed the New World's first real civilization beginning around 1500 BC along Mexico's Gulf coast. Analysis of the Hematite artifact using Mössbauer spectroscopy, spinner magnetometry, examination of Olmec ceremonial center alignments, and our knowledge of the Olmec culture has led to the speculative hypothesis that the artifact in question may have been part of the first known magnetic compass — probably used by the Olmec for geomantic purposes.

John B. Carlson received his B.A. in physics and mathematics from Oberlin College, Oberlin, Ohio, in 1967, and his M.S. in astronomy from the University of Maryland in 1971. He expects his Ph.D. in astronomy from Maryland in 1976. He has held teaching assistant and instructor positions at Maryland since 1967, where in 1975 he developed and taught a course in archaeoastronomy, a new interdiscipline. During the summers of the past several years he has done solar and supernova research at Goddard Space Flight Center. His research experience and publications combine astronomy and anthropology.

MARCH CALENDAR — *The public is welcome.*

Monday, March 1, 8, 15, 22, 29, 7:30 PM — Telescope-making classes at the Chevy Chase Community Center, Connecticut Avenue and McKinley Street, NW. Information: Jerry Schnall, 362-8872.

Friday, March 5, 12, 19, 26, 7:30 PM — Telescope-making classes at American University, McKinley Hall basement. Information: Jerry Schnall.

Saturday, March 13, 6:00 PM — Dinner with the speaker at O'Donnell's Sea Grill, 1221 E Street, NW. Reservations not necessary. Note new time.

Saturday, March 13, 8:15 PM — NCA monthly meeting at the Department of Commerce Auditorium, 14th and E Streets, NW. John B. Carlson speaks. NOTE that the date of the meeting for March only is the second Saturday. NCA relinquished its auditorium reservation to a charitable organization for the 6th.

FEBRUARY LECTURE

Research astronomer Dr. Thomas Van Flandern, of the U. S. Naval Observatory, presented his recently developed evidence of a missing planet at the February 7 meeting of National Capital Astronomers.

Over 200 years ago, Titius discovered, and Bode publicized, a simple series of numbers which gives the approximate distances of the planets from the Sun: Write 0, 3, 6, 12, 24..., add 4, and divide by 10. The Earth's distance is 1, which defines the astronomical unit. The gap at 2.8 au led to many searches for the missing planet, where many years later, on January 1, 1801, Giuseppe Piazzi discovered Ceres, the first of many thousands of asteroids to be discovered, all having a mean solar distance of 2.8 au, but in widely differing orbits. Speculation began that a planet either disintegrated or failed to form at 2.8 au. As recently as a decade ago a planet-formation model of the hypothetical condensation nebula indicated that a large planet should have formed at 2.8 au. The total mass of the asteroids, however, is less than one-thousandth of that of the Earth.

In 1971, Canadian astronomer Michael Ovenden published a new dynamical principle, which he calls the principle of least-interaction action, which postulates that the time average of all perturbations in an orbiting system must be a minimum. Tested on many systems, such as planetary satellites and multiple star configurations, it is consistent with observations except for the solar system; the planets are not in a minimum-interaction equilibrium. Ovenden's hypothesis provides a dynamical basis for the Titius-Bode law, however, and indicates not only the solar distances of the planets, but also specifies that a planet of 90 Earth masses — the size of Saturn — must exist at 2.8 au. When such a planet was inserted into the solar system calculations, the orbits of all the planets were found to be in equilibrium. Moreover, the calculations show that the planet must have existed until not more than 1.6×10^7 years ago, perhaps even more recently.
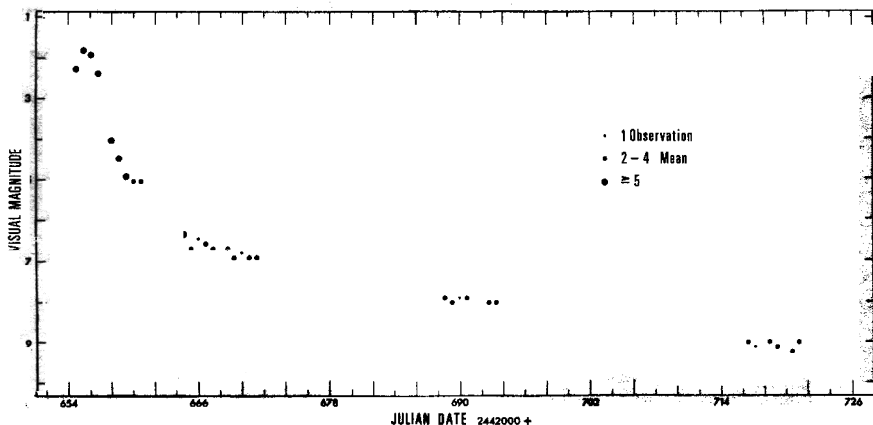
At the Naval Observatory, Van Flandern found Ovenden's principle to be a needed tool, provided it could be validated. Seeking tests, he considered the small total mass of the asteroids and the large mass of the postulated planet. If such a planet disintegrated, the event must have been violent enough to eject most of the mass from the solar system. The necessarily wide range of fragment velocities must include some corresponding to orbital periods such that the fragments would just now be returning for the first time. Could this have been the origin of the very-long-period comets? If and only if the comets originated in this way, certain evidence will be contained in their orbital elements. For example, he calculated that the distribution of perihelia should show a ratio of tangential-to-radial directions of about 2.4:1. He found 60 very-long-period comets whose orbits are known well enough to make the test. Of these, by actual count, the ratio was 42:18, or 2.3:1. All, of course, must return to their origins unless perturbed. Perturbations of these first-returning comets are of two sources, passing stars and the galactic gravitational field. Several stars could be expected to pass within aphelion distance of the comets in 5×10^6 years. These are rapid encounters, and, as Van Flandern put it, would be much like a bullet through a swarm of bees — while a few individuals would be drastically influenced, most would be not much affected. The average perturbations would be small, and the problem can be approached statistically. Galactic gravitation would represent the larger perturbation, and can be calculated dynamically. Projection of the 60 orbital planes on Sun-centered celestial sphere shows some clustering. Four unrelated orbits intersect within $0°.01$. Integrating backwards in time and accounting for galactic perturbations, Dr. Van Flandern plotted a great variety of periods. His slides show intense clustering at 5.8×10^6 years, his current best estimate of the disintegration epoch. The clustering thins out both before and after. His present upper limit is 10^7 years, narrowed from the previously given 1.6×10^7 years. His calculations, as well as the distributions rule out galactic gravitational alignment as the clustering mechanism.

The effect of the original planetary orbital velocity — 18 km sec^{-1} — should be registered in the orbital elements of the comets. Applied violently, the

NCA-AAVSO SECTION REPORTS

The NCA Section on Activities of the American Association of Variable-Star Observers, led by Daniel Costanzo, reports on the continuing surveillance of Nova V1500 Cyg. In Costanzo's compilation, plotted here by Walter Nissen, each datum represents an 18-hour mean of the number of observations indicated. Some observations from sources other than the NCA section have been included.

On JD 818.51 (February 10.01) Costanzo reported the magnitude as 10.4.

- 1 Observation
- 2 – 4 Mean
- ≥ 5

VISUAL MAGNITUDE

JULIAN DATE 2442000 +

Although V1500 Cyg displayed the magnitude r a n g e characteristic of a supernova, its rapid peaking easily identified it as a fast nova of unusually large amplitude.

Like many novae, V1500 Cyg showed some small short-period variations. For example, on JD 664 (September 9) Costanzo observed a 0.3-magnitude brightening: JD 664.54, magnitude 6.6; 664.67, 6.4; 664.75, 6.3.

On JD 818.51 (February 10.01) Costanzo reported the magnitude as 10.4.

SPECIAL EVENT PLANNED

Arrangements are being completed for the special event for NCA members and their immediate families on Friday evening, May 7, mentioned in February *Star Dust*. Keep the date open and watch for details.

energy necessary to achieve retrograde orbits would likely vaporize the frag-ments, while those departing in a forward direction would be more likely to escape entirely. Thus, a velocity-selection mechanism should be evident in the distribution of inclinations; most should be intermediate. Observations show very few in retrograde orbits, and few at very high or low inclinations. The perihelion distances, also, are distributed consistently with his perturbation calculations. Moreover, if the comets originated in this way, perihelion distan-ces and directions should be related, since those injected into tangential orbits should have the largest perihelion distances, while those injected into radial orbits should have the lowest perihelia. Observation is again consistent with the prediction.

Every prediction regarding the orbital elements has been verified by obser-vation. No other theory at present fully accounts for these anomolies.

Independent evidence has been found by Ovenden in carbonaceous chondrite meteorites.

Dr. Van Flandern emphasized that there is no known mechanism whereby a planet could explode so violently as to leave so little residue. Every known possibility has been considered; he only presents the dynamical evidence that so insistently points to such an event.

In closing, Dr. Van Flandern anticipated a number of unfounded speculations sure to be advanced by the pseudo-science school. "One need not know the facts in order to speculate." rm

EXCERPTS FROM THE IAU CIRCULARS

1. January 23 — J. Bortle, Brooks Observatory, reported the results of the reduction of over 100 visual magnitude estimates of θ^1 Orionis A provided by AAVSO, RASNZ, and *Sky and Telescope*. The time of eclipse minimum was 1975 December 5.51 ± 0.03 UT, and the duration about 0.8 day.

2. February 5 — D. Morrison, Lunar and Planetary Observatory, reported that photometric and polarimetric observations of asteroid 1976 AA show that it is 0.8 km in diameter and physically similar to other Earth-approaching asteroids.

3. Februaty 5 — Observations of Comet West (1975n) by Southern Hemisphere observers show it to be slightly brighter than predicted. Ney and Merrill, University of Minnesota, note that it is very similar to comet 1973 XII (Kohoutek).

4. February 9 — W. H. G. Lewin, MIT, reported that the SAS-3 Group observed two strong X-ray bursts from the vicinity of the galactic center. The bursts were 2 and 4 seconds long, separated by 9 seconds.

This listing courtesy R. N. Bolster.

NOMINATING COMMITTEE APPOINTED

President Benson Simon has appointed a committee to nominate candidates for FY 1977 NCA officerships: Chairman, Dr. Henning Leidecker, Daniel Costanzo, Mrs. Richard Byrd, and Wolfgang Schubert.

The committee will submit candidates at the April meeting of NCA. Other nominations may be made prior to the May election by petition to the trustees by 10 members in good standing.

FOR SALE

Two new drive-gear sets: 1 — 11.5-inch gear with 360 teeth, stainless steel worm. Anti-backlash construction, made by Allan Mackintosh. $75.00. 2 — 5-inch diameter, 180-tooth with stainless steel worm, $25.00. Also manual control cable, heavy-duty steel, 0.375-inch diameter, $15.00 pair. Bruce Copping, 5109 Knickerbocker Drive, #2, Alexandria, Virginia 22310, or call O: 523-7091. H: 971-7847.

STAR DUST may be reproduced with proper credit to National Capital Astronomers

FIRST CLASS MAIL