

ASTRONOMY

Kendrick Frazier reports from Boulder, Colo., at the meeting of the American Astronomical Society

Pre-Galileo sighting of Jovian moon

A massive effort mobilized by Chinese astronomers and historians of science to sift through 150,000 volumes of ancient astronomical records has uncovered an intriguing record of an apparent naked-eye observation of one of Jupiter's moons (probably Ganymede) in 364 B.C.

Xi Ze-zong of the Institute for the History of Natural Science of the Academia Sinica reports that the sighting was made by one of the earliest astronomers in China, Gan De. Gan De regularly observed celestial objects, especially Jupiter.

What has now been discovered is a reference to the following report written by Gan De: "In the year of Chan Yan . . . , Jupiter . . . was very large and bright. It looked like . . . a small reddish ('Chi') star [was] attached to it." The word Gan De used for this arrangement means "united in common purpose," Xi Ze-zong says. "Obviously, such a record is evidence of the earlier discovery of a Jovian satellite by Gan De." Xi Ze-zong believes it to be Ganymede, the brightest of the Jovian moons and the largest satellite in the solar system.

Is it really possible to see any of Jupiter's moons with the naked eye? Theoretical calculations say yes, if conditions are just right. The discovery of this record prompted astronomer Liu Jin-yi of the same institute in Beijing to carry out an experiment with a group of six observers in 1981. All six could see Ganymede, three Europa as well. Kenneth Brecher of Boston University, who recently visited China, says two of his American astronomer friends claim to have seen at least one of the Jovian moons. Other scientists, such as the American astronomer Edward Barnard, also claimed to see them at times.

As for Gan De's observation, Xi Ze-zong concludes: "We confirm that this discovery was in the summer of 364 B.C., when Jupiter was moving in lunar mansion Wei (Aquarius) — almost 2,000 years before Galileo's discovery of Jovian satellites."

Lunar-cycle markings at Fajada Butte

In the late 1970s, Anna Sofaer of Washington, D.C., and colleagues documented that a unique assemblage of three rock slabs and a spiral petroglyph atop Fajada Butte in Chaco Canyon, N.M., functions as a midday solar calendar, marking in striking fashion the beginnings of the four seasons (SN: 8/26/78, p. 148).

Now she, Rolf M. Sinclair of the National Science Foundation, and L.E. Doggett of the U.S. Naval Observatory have produced evidence that it may mark the 18.6-year lunar cycle as well. Shadows cast by the easternmost of the three slabs at sunrise or moonrise reveal unique markings for risings at declinations 0°, +18.4° and +28.7°. Of these only the 0° has solar significance. The other two declinations correspond to maximum declinations of the moon during minor and major lunar standstills, respectively, circa A.D. 1000. Sofaer concludes that the ancestors of the Pueblos used the Fajada Butte assemblage to record both the annual solar cycle and the lunar standstill cycle.

Plains Indians astronomical records

The "Winter Count" pictographic calendric records kept on animal skins by American Plains Indians, especially the Sioux, are rich with astronomical phenomena, reports Von Del Chamberlain of the Smithsonian Institution. Many bands of Dakota Sioux took dramatic note of a spectacular fireball in the winter of 1821-22. Winter counts termed it "A Big Noisy Star Winter" and "Star Passed By With Loud Noise Winter." Pictographs portrayed a star with a tail of smoke or fire. The Leonid Meteor shower of 1833, spectacular over North America, also strongly impressed the Dakotas ("Many-Stars Fell Winter," and "Storm-of-Stars Winter"). It was recorded pictorially also.

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EARTH SCIENCES

Columbia Glacier: A hasty retreat

The majestic, icy slopes of Columbia Glacier near Valdez, Alaska, last year retreated at the fastest rate recorded since the geologist G. K. Gilbert first mapped and studied the glacier in 1899. Scientists from the U.S. Geological Survey predicted in 1980 that the glacier's retreat would accelerate during the next two or three years, causing the glacier to discharge 20 to 27 million tons of icebergs per day from 1982 to 1985, or about six to eight times the amount discharged during 1978 (SN: 7/12/80, p. 23). Although the glacier is thickening as a result of heavy snowfall in recent years, growth rate is too slow to reverse the retreat of the terminus, or lower margin of the glacier. Mark Meier, chief of the USGS glaciology project in Tacoma, Wash., explained that Columbia Glacier is caught up in a difficult cycle of cause and effect that in a year or so will make its retreat irreversible. The glacier's position depends on the rate at which it discharges icebergs, which in turn depends on the depth of water. Water depth, unfortunately, depends on the position of the terminus, which in this case is on the upstream side of a shoal. If the glacier retreats a little, the water depth at the terminus increases, causing icebergs to shear off and prompting the glacier to retreat even more. Scientists predict that once "drastic" retreat begins in the next 30 to 50 years, the glacier will be reduced by half, from a length of about 41 to 22 miles. So far, Meier said, icebergs pose little threat to the oil tankers that move through the Valdez Arm of Prince William Sound. Captains cope with the iceberg hazard by reducing vessel speed, switching traffic lanes, or avoiding the area after dark.

Mt. St. Helens updates

- The blue-green algae, *Anabaena flos-aquae*, living on the edges of the ashfall area of the May 18, 1980 eruption of Mt. St. Helens were more affected by toxicity than were the same kind of algae in lakes receiving the heaviest doses of volcanic ash, the U.S. Geological Survey reports. Apparently, lighter weight organic carbon from trees and other plants destroyed by the blast was carried farther by winds than heavier, often larger ash particles derived from rocks and other minerals, resulting in greater concentrations of carbon toward the edges of the ashfall. Laboratory tests showed that when volcanic ash from the edge of the ashfall zone was leached with water similar to natural lake water, the resulting solution was toxic to test algae.
- During its first year of operation, the first flash flood warning system to be installed on the flanks of an active volcano performed with "better than 90 percent reliability," reports Sierra-Misco, Inc., builders of the system. The \$500,000 system is operated by the National Weather Service, Western Region and covers about 200 square miles. Hazards of normal seasonal flooding of the region's major rivers are compounded by ash and other volcanic debris on the mountainside's slopes and by the nearly complete destruction of vegetation that helps to slow runoff of rain waters.
- The U.S. Department of Agriculture's Forest Service has designated Mt. St. Helens the first National Volcanic Area. The area includes 84,710 acres within and adjacent to the Gifford Pinchot National Forest in the State of Washington.

Steamboat Geyser: Old Unpredictable

Only ice-encrusted trees and sand-flecked snow witnessed the initial eruption of Steamboat Geyser recently in Yellowstone National Park, Wyo. The geyser, one of the world's tallest, last erupted in 1979. Geologists, observing the secondary, steam phase of the eruption and nearby soil and vegetation, estimate that Steamboat spurted 205°F water 300 feet into the air.

59