

van de Kamp of Swarthmore College's Sproul Observatory. At the American Astronomical Society meeting in Atlanta last week, the director of the Sproul Observatory, Sarah Lee Lippincott, added a third possibility, an 11th-magnitude star a third as massive as the sun called Cincinnati 2354.

Cincinnati 2354 is one of three nearby (16 light-years) red dwarfs recently studied by Lippincott and the only one of the three likely to have a planetary companion that shows up in the evidence. The evidence comes from photographic plates that represent 287 nights of ob-

serving between 1938 and 1966. All the plates were remeasured on a new, very accurate Grant plate-measuring machine.

From the results, Lippincott calculates the existence of a companion with a period of 26.4 years. The mass of the companion may lie between that of a large planet and that of the smallest possible star depending on whether it is totally dark or whether it contributes something to the brightness of the image. Lippincott says, "My inclination is that the mass is well below stellar, about 6 or 8 times that of Jupiter." □

## Carbon-14 dating: New possibilities

A new technique for radiocarbon dating promises to greatly improve the accuracy of the procedure, more than double its range of validity in time and permit the use of much smaller samples. The new method was developed at the University of Rochester Nuclear Structure Research Laboratory by an interdisciplinary team of American and Canadian scientists.

Carbon dating of biological tissues involves measuring the ratio of radioactive carbon 14 atoms to those of ordinary carbon 12 in a sample. Assuming that the ratio of these two isotopes in atmospheric carbon dioxide is constant, one can determine the age of a biological sample by measuring how much of the C-14 is left. Since the "half-life" of C-14 is 5,730 years, a sample that old would have an isotope ratio only half as large as when the organism was alive.

Previously, the measurement of C-14 was done by detecting its radiation, a technique that earned the Nobel Prize for its inventor, Willard F. Libby. This procedure requires several grams of sample material, however, in order to produce a measurable amount of radiation. The new technique involves counting directly the individual carbon atoms released from a source only a few milligrams in size.

Using a mass spectrometer at the Rochester lab, the physicists produced a beam of charged atoms and molecules sputtered from a biological source. Their great fear was that nitrogen ions would be present in the beam, for these would be virtually impossible to separate from ions of C-14. No nitrogen was found, however, and the C-14 atoms were separated from the rest of the beam by passing them through a series of magnetic fields.

Laboratory director Harry E. Gove told SCIENCE NEWS that by counting the carbon ions directly, three great benefits might be obtained compared with the conventional procedure of measuring radiation. First, sample size could be reduced a thousandfold. Second, ac-

curacy could be increased so that at 5,000 years, a sample's age would be uncertain by only about a decade, compared with about 150 years uncertainty using previous techniques. Finally, the device should now be able to date samples as old as 70,000 years and, with modifications, eventually to push back nearly 100,000 years. Present techniques are limited to about 40,000 years.

The potential importance of these advantages is underscored by Meyer Rubin, the director of the U.S. Geological Survey's C-14 dating lab. He told SCIENCE NEWS that by extending the dating age to 100,000 years, the new technique would enable geologists to study events during the last great interglacial epoch. The greater accuracy may help date past events, such as earthquakes, precisely enough to establish their patterns of recurrence—aiding prediction of future events. Also, smaller specimen size will mean that precious archaeological objects can now be sampled.

Finally, the use of smaller samples will permit scientists to check the theory that underlies carbon dating itself: Carbon from individual tree rings can be analyzed to find the degree to which the ratio of atmospheric C-14 to C-12 varies from year to year. Since this variation, in turn, is related to solar activity, climatologists may also learn more about how the sun is related to climate changes.

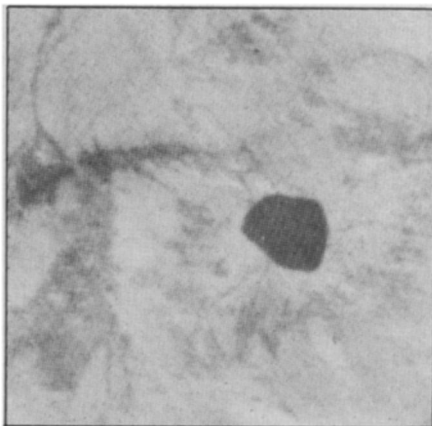
Gove points out that the general technique of separating and counting particular ions in the manner described can also be applied to isotopes other than those of carbon. He suggests, for example, that the new technique might make a very sensitive test for determining the amount of fluorocarbons in the ozone layer of the atmosphere—a subject of much speculation since the discovery that such gases from spray cans may be damaging the ozone layer.

One drawback toward wide application of the new technique will be the cost. Gove estimates that a device built from scratch to perform the new carbon dating procedure might cost half a million dol-

lars. In the existing mass spectrometer facility, however, the individual 6-minute runs required to determine the age of a specimen would not be very expensive compared with conventional carbon dating.

Participants in the research included Harry E. Gove, C.L. Bennett, M.R. Clover and W.E. Sondheim of the Nuclear Structure Research Laboratory (theirs is the mass spectrometer); A.E. Litherland and R.P. Beukens of the University of Toronto (specialists on the physics of C-14); and K.H. Purser and R.B. Liebert of General Ionex Corp. (who supplied the ion source). The work was sponsored in part by grants from the National Science Foundation (U.S.A.) and the National Research Council (Canada). □

## Meteorite crater identified in Alaska



Impact rim rings Sithylemenkat Lake.

The earth has a way of concealing its past. The conspiracy of wind, water and geologic upheaval that continuously erase the signs of yesterday make it a special occasion when a meteorite impact crater—symptom of a process that is clearly visible on other worlds—survives to be discovered on the changing earth. Formed literally in one fell swoop, such a crater thereafter provides a reference point against which to study the processes which have tried to wipe it away.

That's why there is a report (in June 17 SCIENCE) devoted to the single conclusion that Alaska's Sithylemenkat Lake appears to occupy the basin created by a meteorite impact.

The lake and its surrounding basin are well enough known, but the features marking the basin as an impact site were only identified as a result of a detailed search of the entire state of Alaska, using photos taken from orbit by Landsat. The problem was enhanced by the fact that Alaska also has many circular features from other sources, such as periglacial lakes and volcanic vents. The Sithylemenkat Lake basin, however, says P. Jan Cannon of the University of Alaska has a number of

features pointing to an impact origin.

The surrounding area shows no sign of glacial processes that might have excavated the basin, he says. Furthermore, the bedrock shows both radial and concentric fractures similar to those found at such impact sites as Meteor Crater in Arizona and the Wells Creek Structure in Tennessee. The original crater rim, which was probably about 10 kilometers across, shows preferential erosion along known faults in the rock, producing a "distortion" much like that at Meteor Crater.

With the Landsat photos in hand, past data seem to provide additional support. Streams in the area, for example, have been found to have unusually high concentrations of nickel, a metal often found in recovered meteorites. The local bedrock (pre-Cenozoic granite, schist and ultramafic rocks) is of the sort that could provide the nickel, Cannon acknowledges, but "no collaborating evidence could be found for the existence of a parent ore body. . . ." An aerial survey of the region's magnetic field has indicated "a substantial magnetic low," which could have been produced when the igneous and metamorphic bedrock that now shows arose through the fractures created by the impact.

The lake itself is about 3 kilometers across, roughly in the center of the depression whose eroded rim is now about 12.4 kilometers across and 500 meters deep. Its overall structure, Cannon says, is much like that of the Lake Bosumtwi impact structure in Ghana. It has been calculated that a meteorite capable of creating such a feature—a crater some 10 kilometers in diameter—would be "somewhere near 50 million metric tons." □

## The 2nd largest U.S. meteorite



Clarke with 3-ton Old Woman meteorite.

The second largest meteorite ever discovered in the United States was unearthed last week from the Old Woman Mountains, 170 miles east of Los Angeles. Rightful possession of the 3-ton iron-nickel object, however, is

being disputed principally between the finders and the Smithsonian Institution.

David Friburg, Mike Jendruzak and Jack Harwood found the buried meteorite in March 1976 while searching for gold. They did not advertise their discovery, however, so until now only a few individuals were aware of the finding.

The meteorite's weathered appearance indicates it must have lain in the rugged terrain for hundreds, perhaps thousands, of years, said Roy S. Clarke, curator of meteorites at the Smithsonian Institution. The meteorite left no visible impact crater.

Preliminary analyses reveal that the massive 30-cubic foot fragment is one of a rare variety known as Type IIB. Only 14 of the 2,000 known meteorites are definitely this kind.

The three finders claim rightful ownership based on the 1872 Mining Act. The relevant portion of the law refers to any

discovery of an "ore body of commercial size and value," according to Joe Gulliksen, area manager for the Bureau of Land Management in Riverside, Calif. From this standpoint, he said, the meteorite is just a few tons of iron, hardly a commercial quantity.

The Smithsonian claims ownership based largely on substantial legal precedent. Past judicial decisions have invariably awarded possession to the owners of the land on which the disputed meteorite landed, said Gulliksen. In this case, the impact occurred on federal property.

The meteorite's removal was arranged through the Bureau of Land Management and executed by the U.S. Marines. Currently the Old Woman meteorite is on public display at the Bureau's office in Riverside. If all proceeds according to Clarke's arrangements, the huge chunk will be hauled onto a truck bound for Washington, D.C., on July 1. □

## Diet not cause of hyperactivity

University of Wisconsin researchers say they found no evidence to support the popular theory that food additives cause hyperactivity in a large percentage of hyperactive youngsters. The Wisconsin results are being sharply disputed by San Francisco allergist Ben F. Feingold, who has developed a substantial following since he first proposed the connection between additives and hyperkinesis nearly five years ago.

In a series of tests over the past two years, the Wisconsin team of psychologists and neurologists observed and measured the reactions of 46 boys who were previously identified as hyperactive by their physicians, parents and teachers. Hyperactivity more often strikes boys than girls, the researchers say. After an initial two-week period of physical, neurological and behavioral observations of the children while on their regular diets, the youngsters were divided into two groups. Each group was then alternately exposed for three to four weeks to Feingold's prescribed additive-free diet and a control diet that included average amounts of artificial colorings and flavorings.

Feingold had initially suggested in 1973 that perhaps 30 to 50 percent of hyperactivity cases are caused by synthetic colors and flavors. The chemical complexities of food additives have prevented anyone from pinpointing exactly what components might be responsible for hyperactivity, according to J. Preston Harley, a neuropsychologist who headed the Wisconsin study. However, Feingold asserts in a book and other reports that his diet has produced dramatic improvements in up to 50 percent of hyperactive children. While such children's reactions to additives are not allergies in the strict sense of the term, they do indicate some type of behavioral toxicology, Feingold says.

But, says Harley, "Feingold's claims are based on his clinical experience—not on systematic, scientific investigations or published

studies." Fueled by such doubts, Harley embarked on the \$250,000 study in 1975. To maximize the chances of the children's compliance, the university provided the total food supply for the participating families and instructed all family members to eat nothing else. Nonadditive diets were disguised—items such as novelty snack cakes were specially prepared from only natural ingredients—so neither the families nor the observers were sure which diet they were on.

During the testing period, youngsters were rated by parents, teachers and researchers on items such as attention span, restlessness and irritability at home, school and in a laboratory. In addition, follow-up EEG, blood, urine, reaction and motor tests were performed and compared with prestudy measurements. As a further control, all children who were taking antihyperkinesis medication were removed from the drugs prior to the study.

The results: "We are unable to support with anything approaching reasonable scientific certitude Dr. Feingold's far ranging assertions regarding the prominent and predictable causative role played by artificial food colors [and flavors] in the development and maintenance of hyperactive behavior," Harley says. "Our results not only fail to approximate his anecdotal reports, but they fail to support them even in sharply attenuated form."

Diet had no appreciable effect on hyperactivity, according to a statistical analysis of the test data and observations. However, nine preschoolers did show some improvement on the Feingold diet (the sample consisted of 10 preschool youngsters and 36 6 to 12-year-olds) as rated subjectively by their parents, Harley notes. And even though the researchers' observations and neuropsychiatric test results did not corroborate the parents' feelings, the research team performed a follow-up study on those nine children.

For nine weeks, the preschoolers were kept on strict Feingold diets, but they were alter-