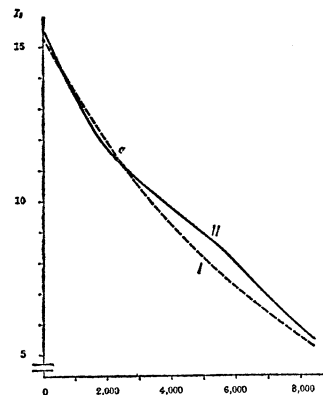


Physical Sciences Notes

PLANETARY PHYSICS

Radiocarbon Dating Questioned

The radiocarbon method of dating ancient artifacts depends on several assumptions that could not be easily verified when the method was first developed by Dr. Willard F. Libby, the Nobelist now at the University of California at Los Angeles.



Solid line shows new radiocarbon dates.

One of the most important of these assumptions is that the rate of carbon 14 formation, now known to depend upon the intensity of the earth's magnetic field, is constant. Carbon 14 originates in the upper layers of earth's atmosphere, produced by the bombardment of cosmic rays.

When the earth's magnetic field decreases in strength, the cosmic ray flux and, therefore, the rate of carbon 14 formation increases; higher values of the field have the opposite effect. These facts have now been verified directly.

Several years after Dr. Libby discovered radiocarbon dating scientists learned how to gauge the intensity of earth's magnetic field in the remote past by measuring the magnetization remaining in burnt archaeological objects.

Samples from various countries measured by this technique have shown that the earth's magnetic field has ranged from one-half to one and a half times its present value during the past 8,500 years.

Drs. V. Bucha and E. Neustupny of the Czechoslovak Academy of Sciences in Prague have found that radiocarbon dates should be corrected by as much as 750 years for artifacts as old as 6,000 years. They report in the July 15 *NATURE* that their investigations prove "the necessity of including the influence of the changes of the earth's magnetic field in radiocarbon dating."

GEOPHYSICS

Extraterrestrial Ring Current

Instruments aboard Explorer 34, launched May 24, are directly measuring, for only the second time, the huge electrical current ringing earth thousands of miles out.

The current is believed to consist of electrons and protons from the sun circling earth's equator at a distance of 10,000 to 20,000 miles. This is within the outer Van Allen radiation belt.

First postulated by British physicist Sydney Chapman in 1932, the ring current is thought to account for periodic disturbances in earth's magnetic field. Auroras and radio blackouts are among phenomena associated with magnetic field disruptions.

The instruments aboard Explorer 34 were designed by Louis A. Frank of the University of Iowa.

PLANETARY ASTRONOMY

Mapping Planetary Surfaces

Space probes sent close to the moon and planets have made it possible to study the surfaces of these objects with bi-static radar—that is, with transmitter and receiver separated from each other by large distances.

Continuous signals received on earth from Lunar Orbiter I after reflection from the moon have shown this method can yield much information about the lunar surfaces. For planetary investigations, it would be preferable to have the transmitter on earth and the receiver in the space probe, since much greater power is available from earth-based transmitters (SN: 5/14/66).

Drs. G. L. Tyler, Von R. Eshleman, G. Fjeldbe, H. T. Howard and A. M. Peterson of Stanford University's Center for Radio Astronomy in California report results of their "preliminary analysis of the first bi-static radar echoes obtained from a celestial body" in the July 14 *SCIENCE*.

The Lunar Orbiter experiments, made on Oct. 12, 1966, show it is possible to use the reflected radar waves to make a two-dimensional map of the lunar surface. The returned signals also gave strong evidence that bi-static radar would be valuable "for eventual detailed mapping and radar reflectivity studies of planetary surfaces."

METEOR ASTRONOMY

Meteor Sets Low Height Record

The lowest height at which a meteor has been recorded by radar is reported by Springhill Meteor Observatory of the National Research Council of Canada.

The radar measured as 28 miles the height of a brilliant fireball that passed close to Springhill, Canada, at 9:44 p.m. EDT on June 14, 1967.

According to Dr. Bruce McIntosh of the Research Council, meteors are seldom recorded by radar at less than 50 miles above the earth; most burn out between 65 and 55 miles up.

Dr. McIntosh estimates that the June 14 fireball weighed between one and two pounds and was traveling at about 40,000 miles per hour. The meteor's size suggests that it would have burned out before striking earth.

The fireball's path began over Pembroke, crossed the St. Lawrence River at Iroquois, and ended near Potsdam, N. Y.

NUCLEAR ENGINEERING

Gas Centrifuge Development

The gas centrifuge, billed as a potentially cheap and easy way to separate bomb-type uranium 235 from the less-useful U-238, is being developed once more by Electro-Nucleonics, Inc., this time under contract with the Atomic Energy Commission.

Electro-Nucleonics was one of a number of companies that were using their own money to develop the machine when the AEC cut off private research last March (SN: 4/8). The U.S. is afraid the centrifuge, if developed and made available, could enable non-nuclear countries to build their own bombs, so the research is being tightly regulated.