physical sciences

NUCLEAR PHYSICS

Small device produces high energy

An explanation for the mechanism by which an unusually high amount of nuclear energy is produced by a small and relatively inexpensive device known as a coaxial accelerator is offered by Dr. Winston Bostick, professor of physics at Stevens Institute of Technology.

The coaxial accelerator implodes plasma at high speeds to produce a controlled thermonuclear fusion reaction on a small scale. Dr. Bostick believes that a portion of the energy delivered by the coaxial accelerator is stored in plasma vortices, tornado-like structures held together by their own electrical, magnetic and velocity fields.

These vortices collide within the accelerator and annihilate each other, releasing an unusually high degree of energy. The process is basically the same as the release of energy in a solar flare.

A device which forces a collision of the vortices may offer a means of producing vast amounts of power economically and could lead to controlled fusion.

RELATIVITY

Pulsar test negative

A third attempt to detect the effect of mass on the frequency of a periodic event, by timing the period of pulsar CP-0950 as its signals passed near the sun, has failed.

Two previous experiments suggested that the presence of mass could affect the frequency of a periodic event (SN: 8/17, p. 156). These were an apparent red shift in the 21-centimeter radiation from Taurus A when the line of sight was near the sun, and a change in the frequency of a portable cesium clock when compared with the frequency of a similar clock at Cape Fear, N. C.

The line of sight of CP-0950 approached the sun during the first part of August, coming within five degrees on Aug. 20. If the relationship between mass and frequency previously suggested was correct, the pulsar's period of slightly more than 0.253 seconds should increase.

No such increase was found, Dr. Dror Sadeh and his co-workers at the Naval Research Laboratory in Washington report in the Nov. 22 SCIENCE. They collaborated with Dr. A. B. Youmans of the Sugar Grove (W.Va.) facility, whose 150-foot antenna was used to make the pulsar measurements.

ASTEROID

Radar indicates Icarus is rough

Radar observations of the asteroid Icarus, made last June at the time of closest approach, indicate it is about half a mile in diameter and rotates about once every two and a half hours.

The radar reflections did not show whether the asteroid's surface is metallic or stony. If it is metallic, the radius of Icarus could be no more than 300 meters; if stony, 600 meters. These limits fix the asteroid's diameter from 600 to 1,200 meters, with 900 meters as a mean.

Prior to these measurements by Dr. Richard M. Goldstein and co-workers at Cal Tech's Jet Propulsion Laboratory, the generally accepted value for the diameter of Icarus was about a mile. The astronomers followed the asteroid by radar in seven spaced experiments of about three hours each during a three-day period when Icarus made its closest approach to earth in 19 years.

The rotation period, Dr. Goldstein reports in the Nov. 22 SCIENCE, is between 1.5 and 3.3 hours. If this is so, Icarus must have a rough, jagged shape, not necessarily the round one usually assumed.

EDUCATION

Mathematical sciences appraised

Society needs a rising level of mathematical literacy and competence at all levels. The mathematical community must, therefore, be prepared to meet new and increasing demands.

These are the conclusions of the first comprehensive effort by U.S. mathematicians to identify the demand in their field, and assess their ability to satisfy it.

"The Mathematical Sciences: A Report" is the first of three volumes prepared by the Committee on Support of Research in the Mathematical Sciences of the National Academy of Sciences (publication 1681, $6 from the Academy, Washington, D.C. 20418). The second volume is titled "The Mathematical Sciences: Undergraduate Education" (publication 1682, $4).

The third volume, "The Mathematical Sciences: A Collection of Essays," will be published later by the Massachusetts Institute of Technology Press.

ASTRONOMY

Volcanic activity on Jupiter

Detailed observations of Jupiter conducted in recent years form the basis for believing that planet is undergoing violent activity, says Prof. Sergey Vsekhsvyatskiy of the Kiev State University. He suggests that the dark band formed at the planet's equator in 1961 was related to an outburst of volcanic activity ejecting large amounts of ash above the cloud layer.

He has attempted to confirm the theory by observing Jupiter's nearest satellite, Io, whose brightness has decreased noticeably. Prof. Vsekhsvyatskiy explains this as a result of the screening action of clouds of ash particles moving around Jupiter or as a result of the settling of volcanic ash on the satellite's surface.

The translated report on volcanic activity on Jupiter appears in the Nov. 6 SOVIET BLOC RESEARCH, a Department of Commerce publication.

PULSAR ASTRONOMY

Slowing period detected

A slight slowing in the period of the fastest pulsar known, NP 0532, has been detected by scientists using the 1,000-foot radio antenna at Arecibo, Puerto Rico. The first observations on Oct. 20 showed a repetition rate of 0.03309014 seconds. This had increased to 0.03309114 on Nov. 15 and 0.00309140 on Nov. 22. NP-0532 is in the Crab Nebula (SN: 11/23, p. 521).

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