

Physical Sciences Notes

SOLAR SYSTEM ASTRONOMY

Heat from Interplanetary Dust

Thermal emission from interplanetary dust in measurable amounts has been detected for the first time by Dr. Alan W. Peterson of the University of Missouri.

Existence of this thermal emission shows conclusively that the zodiacal dust extends to within 1.7 million miles of the sun, Dr. Peterson reports in the current *ASTROPHYSICAL JOURNAL*. This, he says, "finally" lays to rest the oft-repeated suggestion that all or most of the zodiacal light arises from an earth-centered cloud.

The observations also resulted in the first direct confirmation of the Poynting-Robertson effect, which requires that interplanetary dust migrate toward the sun in orbits of decreasing eccentricity and semimajor axis.

Dr. Peterson made his most recent infrared measurements of the thermal emission of interplanetary dust during the total solar eclipse of Nov. 12, 1966 from Huachacalla, Bolivia, at an altitude of 13,000 feet.

POLYMER CHEMISTRY

Carbon Fibers Reinforce Plastics

The British Royal Aircraft Establishment, which recently developed high-strength carbon fibers, has found they can be added to polymer plastics to increase wear resistance.

Reporting in the June 10 *NATURE*, J. P. Giltrow and J. K. Lancaster describe tests which show the reinforced plastics have wear rates several hundred times less than the same materials without carbon fibers.

Examination of worn samples showed the carbon filler exposed beyond the plastic surface, indicating that the wear load is borne by the carbon.

This is important, said the researchers, because carbon has a relatively low friction coefficient compared to glass fiber, the most common plastic reinforcer. Less abrasive, they won't wear out other materials that come in contact with the reinforced plastic.

SOLID STATE PHYSICS

Basic Property of Liquid Measured

Actual measurements have now been made of a property of a simple liquid suspected only in theory for a century. The new technique may have a direct bearing on future design of underwater detection equipment.

The ability of sonar to detect submarines and other underwater objects varies with such factors as salinity and temperature of the water, measurements for which are not precise from a distance.

However, the property termed "volume viscosity" can now be measured, thanks to the work of Dr. Charles F. Squire, associate dean of the College of Science at Texas A&M.

Volume viscosity differs from the viscosity ordinarily encountered, such as in water or molasses. It is a measure of the influence the liquid exerts on things like sound waves passing through it. Sound travels better in some liquids than in others but researchers have had difficulty fitting observed measurements with theory.

Dr. Squire reasoned that if one could measure how a wave loses energy through friction in one liquid, it

would serve as a basis for measuring this in many other liquids. He therefore measured the intensity of sound waves as they passed through liquid argon to establish a base line. The volume viscosity of any other, more complicated liquid would have to be associated with that of argon.

PLANETARY ASTRONOMY

Atmosphere Found in Saturn's Rings

Dr. Nikolai Kozyrev, a prominent Leningrad astronomer, has discovered atmosphere in the rings of Saturn, according to the Soviet's Novosti Press Agency.

He has obtained direct indications of the atmosphere, which is very rarefied. Dr. Kozyrev calculates that the density of atmosphere within the rings is one-billionth that of earth.

MATHEMATICAL PHYSICS

Progress in Mathematics

An explanation of why red blood cells concentrate in the center core of a blood vessel has been found in a mathematical analysis by Dr. Hyok Sang Lew, a former Korean Air Force lieutenant.

Dr. Lew extended a study by Albert Einstein on the viscosity of suspensions, particles mixed but not dissolved in a fluid, to discover that a non-Newtonian lift force is exerted on suspended rigid spherical particles (red cells) present in the blood fluid in low concentration.

This force pushes the suspended particle sideways. Dr. Lew's results imply that the pressure is higher near the center of a blood vessel and lower nearer its wall, thus accounting for the observed behavior of red cells.

He was able to calculate both the force and rotational velocity on small rigid spheres, such as blood cells, using linear differential equations.

NUCLEAR POWER

Bright Outlook for Reactors

Nuclear power plants in the United States will have a generating capacity of between 120,000 and 170,000 net megawatts by the end of 1980, Atomic Energy Commission chairman Dr. Glenn T. Seaborg predicted at the annual meeting of the Canadian Nuclear Association in Montreal.

The forecast is a revision of one prepared by the AEC last year, which estimated an installed capacity at the end of 1980 of between 80,000 and 110,000 megawatts. It reflects the surge of orders placed, as well as plans announced, by utilities for nuclear power plants during the past year.

The average percentage of annual growth in new generating capacity, both conventional and nuclear, was computed as a group for utilities located in the same region of the country and having similar economic conditions. The same percentage was then applied to the period from 1974 through 1980.

Growth rates for individual areas were in the range of four to ten percent, with a national average of about six percent. In areas where nuclear plants currently are operating, being constructed or planned, it was assumed future growth would be mainly nuclear, in other areas mainly conventional.