physical sciences notes

PRESSURE

Limit of solid strength reached

The theoretical limit of the ability of terrestrial solids to withstand pressure has been reached by a group of Soviet researchers, according to a report in the November 1967 Russian monthly SCIENCE AND LIFE. The Soviet physicists, Professor R. Gerber and Drs. Igor Mikhailovsky and Joanna Dranova of Kharkov, have produced a thread-like crystal of tungsten that will sustain a load of 230 metric tons per square centimeter.

According to the report, the best kind of special steels can stand not more than 30 tons per square centimeter. In 1956 German physicists made thread-like iron that stood about 143 tons. Previously the thickness of the smallest thread-like crystals was two ten-thousandths of a centimeter. In the course of their work, the Ukrainian physicists developed a method of making structurally ideal metal threads whose diameter is only about two millionths of a centimeter.

"I think," says Professor Gerber, "we have succeeded in reaching the natural limit of the durability of solid substances."

ASTRONOMY

No planetary X-rays found

A search by a balloon-borne detector for X-rays emitted by the planets Mars, Venus, and Jupiter has yielded a negative result. No radiation above the sky background was found for any of the planets although the equipment would have detected as little as one photon every 50 seconds. The result is no surprise in the cases of Venus and Mars; they weren't expected to emit X-rays.

Jupiter, however, was thought to be a possible X-ray source because of its unusual radio emission. X-rays from Jupiter may still be found by more sentitive detectors. The authors of this attempt, Drs. R. C. Haymes, D. V. Ellis, and G. J. Fishman of Rice University, Houston, Texas, suggest in the Feb. 1 JOURNAL OF GEOPHYSICAL RESEARCH, that planetary X-ray astronomy "may be of considerable significance if the sensitivity of the detectors can be increased. . . ."

SELENOLOGY

Metals on the lunar surface

There may be up to 180 tons of metallic iron, 90 tons of aluminum and 75 tons of magnesium on each acre of the moon, according to Dr. Kuan H. Sun, a physicist at Westinghouse Research Laboratories in Pittsburgh. Dr. Sun sees the moon as a giant natural refinery, in which the solar wind reduces metallic ores to pure metals. Protons in the solar wind would form the refining agent —atomic hydrogen—by picking up electrons from the surroundings. Hydrogen is chemically very reactive and would tend to combine with nonmetallic elements in the ores and free the metals to gather together as pure metallic dust.

Other investigators discount this process because of the small number of protons in the solar wind, but Dr. Sun feels that over billions of years enough hydrogen would appear to refine a fair amount of metal, especially since the lunar surface is continually plowed by volcanic and meteoritic action, and new ore is constantly being exposed. Dr. Sun suggests that astronauts might be able to use the iron for construction and the aluminum and magnesium as fuels. "The maximum possible energy content is equivalent to the fuel value of 40 tons of coal per acre," he suggests in the Jan. 20 NATURE.

Magnets on Surveyor 5 disclosed some metallic dust on the moon.

ANALYTIC CHEMISTRY

Laser mass spectrometer

Laser light can now be used to aid chemical analysis of tiny samples of material that the investigator does not want to destroy. An instrument called the laser mass spectrometer by its developer, Dr. Francis J. Vastola of The Pennsylvania State University, can directly and quickly identify ultramicroscopic amounts of complicated organic materials such as may be found in mineral samples from the earth or meteorites. Most other methods are indirect or require destruction of the sample, Dr. Vastola says.

The device works by focusing a beam of light from a ruby laser through a microscope and onto the sample. The light vaporizes a very small portion of the sample without damaging the rest. The spectrometer then analyzes the vaporized material, identifying its constituents by their molecular weights. "Because the technique is so gentle and analyzes such a small area," Dr. Vastola says, "it would be especially valuable for identifying . . . the chemical constituents of delicate cells and tissues."

MATHEMATICS

Computer typesetters to learn math

One of the most challenging problems in the development of computer typesetting, that of setting mathematical texts, is now being tackled by the American Mathematical Society in Providence, R.I.

Although any fifth grader can write a fraction or put an exponent on a number, computer typesetters still have to learn to place figures in raised or lowered positions, or to center the numerator over the denominator. The National Science Foundation has awarded a $152,000 grant to the math group for the project, aimed at increasing the speed and efficiency of supplying scientific information to scientists.

A valid system to instruct a computer how to handle complicated texts should appreciably reduce the time necessary to set type for scientific journals. It should also simplify production of a machine-readable record of the contents of journals, so that abstracts, indices and other selections of specific information can more easily be made.