physical sciences

SOLID STATE

Barium superconducting under pressure

The element barium becomes an electrical superconductor when subjected to extreme pressure, report Drs. Jörg Wittig and B. T. Matthias of the University of California of San Diego at La Jolla in the March 31 PHYSICAL REVIEW LETTERS.

Superconductivity had previously been found in lanthanum and cerium, barium's neighbors in the periodic table, and, says the report, "it seemed worthwhile to look at barium, naively assuming similar electronic properties might exist if it were compressed to the same density."

They found that pressures 55,000 times that of the atmosphere caused barium to assume a structure they call Ba-II, and in this state it becomes superconducting at temperatures somewhat lower than 1.3 degrees Kelvin. The superconducting temperature rises sharply with the pressure. At pressures above 140,000 times the atmosphere another kind of structure occurs which has a superconducting temperature approximately 5 degrees K.

Observations of this kind tend to agree with theoretical ideas of Dr. Matthias that for certain metals the entire electronic structure plays a part in determining the superconducting temperature, rather than only the conduction electrons as some other theories propose (SN: 2/15, p. 169).

PLANETARY ASTRONOMY

Mars by light and radar

Dr. J. C. Robinson of New Mexico State University has compared photographs of the surface of Mars with records of radar reflection to see how the two coincide.

He reports, in SCIENCE for April 11, that areas that are visually dark exhibit a high reflectivity for radar while the so-called cloudy desert areas, which show up bright on photographs, reflect a minimum amount of radar.

Since radar reflectivity depends on the smoothness of the surface concerned, he concludes that the data may be taken as evidence that the dark areas are smooth and the deserts rough.

EQUIPMENT

Omnitron kaput

The Lawrence Radiation Laboratory has dropped plans to build the Omnitron, a machine for the acceleration of heavy ions (SN: 3/18/67, p. 257). Several unsuccessful attempts over the last few years to get funds for the machine have convinced the Lawrence physicists that they are unlikely ever to get the $30 million that Omnitron would have cost, so they are concentrating on a project to rebuild their existing Heavy Ion Linear Accelerator.

Omnitron would have been a two-billion-electron-volt synchrotron and storage ring. It would have brought heavy atomic nuclei containing more than 200 neutrons and protons each to an energy of about 400 million electron volts per neutron or proton. This is the level of energy necessary to use such ions in experiments where they are collided with each other in the hope that they will fuse into elements heavier than any now known (SN: 12/14, p. 592).

Lawrence physicists find that by adding a synchrotron to the existing linear accelerator they can reach the 400 MeV-per-nucleon energy range. Such modifications are budgeted at only $2.65 million.

RESEARCH SUPPORT

Slicing up the pie

Massachusetts Institute of Technology received more Federal money than any other school during the 1967 fiscal year, according to a study released by the National Science Foundation.

MIT gathered in $96,047,000 in Government funds, with the largest single bequest being more than $47 million from the Defense Department.

The University of Michigan ranked second among the schools, with $64,758,000. It was followed by the University of Illinois with $63,660,000, Columbia University with $55,908,000 and the University of California at Berkeley with $52,757,000.

Rounding out the top 10 are the University of Wisconsin, Harvard, UCLA, Minnesota and Stanford.

MIT's support from the Defense Department is nearly four times the size of its nearest competitor, Michigan, which was awarded just over $13 million in Pentagon funds.

Michigan, with over $35 million, was the largest beneficiary of money disbursed by the Department of Health, Education and Welfare, much of whose support goes toward biological and medical research. Harvard received more than $34 million from HEW.

CELESTIAL MECHANICS

Minimoons

The earth may have at least 10 tiny natural satellites, says Dr. John P. Bagby of Hughes Aircraft Company, in ICARUS, Vol. 10, p. 69.

For decades astronomers have speculated that the earth in its travels through space might pick up small bodies and constrain them to orbit around it. From time to time sightings have been made of objects that might be such satellites, and orbits have even been computed for them.

But, says Dr. Bagby, "the existence of such objects has never been generally accepted . . . except for the Kordylewski cloud satellites. . . ." (SN: 2/1, p. 118). Lately, however, Dr. Bagby has been studying the orbital data published for artificial satellites, and he finds that these have repeatedly undergone sudden drastic changes in their flight patterns. He points out that these changes can easily be explained by near collisions with the miniature natural satellites, and he finds that the changes occur near locations where the orbits of artificial satellites cross those calculated for the natural ones.

He therefore suggests that a group of sightings over recent years represents at least 10 small natural satellites. When he traced their history he found them all at the same spot on Dec. 18, 1955, and he surmised from this that they all originated in one object that broke up on that day.