SCIENCE NEWS

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RECORD HIGH PRESSURES

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NEW world's record high pressures, as much as 3,500,000 pounds per square inch, have been achieved by Dr. P. W. Bridgman in Harvard's physics laboratories through use of nests of high pressure vessels in which inside apparatus receives outside support at critical parts.

A piece of tool alloy, Carboloy, composed of tungsten carbide and cobalt, was subjected to a compressive stress of between 200,000 kilograms per square centimeter (2,800,000 pounds per square inch) and 250,000 kg./sq. cm. (3,500,000 lb./sq. in.) without fracture. Carboloy's crushing strength under normal conditions is not more than 70,000 kg./sq. cm. (1,000,000 lb./sq. in.). The confining pressure that made possible these new high pressures was about 25,000 kg./sq. cm. (350,000 lb./sq. in.).

Dr. Bridgman, in reporting his results to *The Physical Review,* also made known that under such extreme pressures, carbon in the form of a thin plate of crystal graphite is not converted to diamond at room temperature. Both graphite and diamond are carbon. There had been hope that pressure alone might cause the formation of diamond out of the other form of carbon. "It is probable that no pressure, however high, will accomplish the conversion at room temperature," Dr. Bridgman now concludes. Doubling of the pressure apparatus, as practised by Dr. Bridgman, makes it possible to reach pressure considerably more than double because of the increase in intrinsic strength under hydrostatic pressure.

A striking effect of the extreme high pressures on Carboloy was that, although under normal conditions it is highly brittle and breaks with practically no plastic deformation, under the confining pressures used by Dr. Bridgman the piston of this tough material was plastically and permanently shortened by 5.5 per cent. with no perceptible cracks.

SOME PAPERS READ AT THE NEW YORK MEETING OF THE AMERICAN PHYSICAL SOCIETY

A NEW suggestion that the sun's corona is formed by the motion of matter driven out under the action of the sun's intense light was presented at the New York meeting of the American Physical Society by Professor Felix Ehrenhaft, now of New York City and formerly head of the department of physics at the University of Vienna. Professor Ehrenhaft reported experiments in which material particles were allowed to fall slowly in a magnetic field. When bright light was shone on these particles they moved quickly sideways along the magnetic lines of force in the field. When the direction of the magnetic field was reversed, the motion was reversed. When either the light or the magnetic field was shut off the sideward motion stopped and only the pure motion of fall remained. These experiments, Professor Ehrenhaft said, explain the sun's corona by indicating that particles in the sun move outward along magnetic lines of force due to the action of the sun's own light. He pointed out that the late Dr. George Ellery Hale, distinguished astronomer of Mount Wilson Observatory, long ago called attention, without explanation, to the similarity between the solar corona and the lines of force of a magnetized sphere.

PROFESSOR EHRENHAFT also discussed measurements which cast doubt on the long-held postulate of physics that the charge on the electron is the smallest unit in which electricity occurs. Still a third research announcement by Professor Ehrenhaft was that light can, under certain conditions, exert an attractive force on matter in contrast to its commonly-recognized repulsive effect. This effect may have applications in explaining phototropism, that property of plants to lean and turn so that they face the light.

A NEW means of measuring accurately the voltage generated by the new, giant electrostatic atom smashers was described by Drs. W. H. Wells, R. O. Haxby, W. E. Shoupp and W. E. Stephens, of the Westinghouse Electric and Manufacturing Company. The new calibration point is at 2,010,000 electron-volts of energy at which beryllium begins to give off neutrons when it is bombarded with protons (cores of hydrogen atoms). The work extends and makes more accurate previous studies at the University of Rochester. Similar success with proton bombardment of boron carbide, lithium and carbon atoms was also reported by Dr. Wells and his colleagues. "All of these reactions, or thresholds, occur at a very sharp and definite voltage," Dr. Wells explained, "and will consequently serve as a good interlaboratory voltage standardization table." The new results fit in with many other observations made at the Carnegie Institution of Washington and at the University of Wisconsin on the gamma rays emitted from lithium and from fluorine. These findings, too, serve as valuable calibration points for the giant electrostatic generators with which scientists smash atoms in these laboratories.

A NEW check on the enormous amount of atomic energy released when uranium atoms are split by neutrons was described at the closing meeting by M. H. Kanner and H. H. Barschall, of Princeton University. As heavy uranium splits it gives off two fragments. The energy of these splitter products has been measured at Princeton and found to be equivalent to 159,000,000 units of atomic energy. Units of atomic energy are expressed in electron-volts. This value is in good agreement with measurements made by Dr. Malcolm Henderson, also of Princeton, on the heating effect of uranium's fission. Dr. Henderson has previously reported 175,000,000 energy units liberated. Other reports to the physicists' meeting concerned uranium fission; one of the most intriguing of all problems in science to-day because it offers at least the remote possibility that some day and somehow it may be possible to utilize the vast amount of atomic energy thus liberated in some practical way. Dr. Herbert L. Anderson, of Columbia University, described measurements on the resonance capture of neutrons by uranium. This is an important matter because the ease with which a neutron can be captured by a uranium atom determines how easily a splitting of uranium atoms can be secured. His studies show that neutrons having only 5 electron-volts energy are involved in liberating energies which, for each uranium fission, amount to over 150,000,000 electron-volts.

THREE new forms of artificially radioactive indium, created by bombarding the rare metal with high-voltage x-rays, have been manufactured by a research group at the Massachusetts Institute of Technology. The discovery, reported to the American Physical Society, confirmed the findings of Notre Dame physicists that high-voltage x-rays would produce radioactivity. The artificially activated indium made in that experiment had a half-life of four hours, but a whole range of activities have been uncovered from one with a half-life of 4 hours to one with a half-life period of only 12 seconds. Substances with short half-life periods are expected to be very valuable in the medical applications of these substances. The report was a supplement to a scientific paper on the high-voltage production of positive ion and electron beams with the giant electrostatic generator of the Massachusetts Institute of of Technology. The research was done by Dr. Robert J. Van de Graaff, Dr. Lester C. Van Atta, Dr. Chester M. Van Atta and Doyle L. Northrup. Evidence of the new activities was detected with the generator operating at a little under 1,000,000 volts, considerably lower than had been expected, and the yield mounted rapidly as the voltage was increased. Indium is a rare metal with properties similar to aluminum. It is silver-white in color, softer than lead and about the same weight as tin. It is found chiefly in zinc sulphide or zinc blende ores.—ROBERT D. POTTER.

THE FIRST EXPLORING EXPEDITION TO ANTARCTIC CONTINENT

A CENTURY of American leadership in Antarctic exploration was celebrated on February 23, at the hall of the American Philosophical Society. The expedition was that led by Lieutenant Charles Wilkes, of the U. S. Navy, who gathered geographic, meteorological and other scientific data along 1,500 miles of Antarctica's desolate shores during the years 1838–1840.

Captain G. S. Bryan, U. S. N., stated that the expedition was authorized by the Congress, largely in response to demands from whaling industry for better maps and navigational information. There was Congressional opposition, then as now, to spending money for scientific research. Funds were cut, unsuitable ships had to be used, clothing and other stores were inadequate. Fortunately, however, the scientific instruments carried were excellent, and the nine scientists who constituted the technical personnel of the expedition did their work well, so that most of the results obtained are still valid.

Worthy of note also is the fact that the government sought the advice of the then existing scientific organizations in planning the expedition. Particularly active were the American Philosophical Society, which had been founded by Benjamin Franklin in pre-Revolutionary days, and the Academy of Natural Sciences of Philadelphia. An account of this phase of the expedition was given by Dr. Edwin G. Conklin, vice-president and executive officer of the American Philosophical Society, and by Dr. James A. G. Rehn, corresponding secretary of the Philadelphia Academy.

Although the Wilkes expedition was the first to conduct long exploration in the Antarctic region, and to prove the continental nature of the South Polar land mass, it was not the first to find land in the region. Honors for that accomplishment go to another American, Nathaniel Brown Palmer, a Connecticut sealer, who found that part of Antarctica nearest South America on November 18, 1820, and explored some 450 miles of the frozen coast during the following January. The work of this "Columbus of Antarctica" was described by Colonel Lawrence Martin, chief of the division of maps, Library of Congress.

Although it was long before the era of daily weather reports, the meteorology of Antarctica was intensively studied and minutely reported by Lieutenant Wilkes, declared Commander F. W. Reichelderfer, chief of the U. S. Weather Bureau. Commander Reichelderfer also told of the expedition's permanent contributions to science, in the form of geomagnetic and gravitational data.

The expedition did not confine its work entirely to the Far South. After the work along the coats of Antarctica was completed, Lieutenant Wilkes took his ships far up into the Pacific, as far as the Puget Sound region and the coasts of British Columbia. Various phases of this part of the long voyage are the subjects of papers by Mary E. Cooley, of Mount Holyoke College; Henry W. Fowler, of the Academy of Natural Sciences of Philadelphia, and Professor John E. Hoffmeister, of the University of Rochester. The fishes brought back by the expedition are still preserved in the U. S. National Museum.

Continuation of the program was devoted principally to accounts of later polar expeditions, Arctic as well as Antarctic. A special feature was an address on "Glaciers of the Antarctic," given by Professor Laurence M. Gould, of Carleton College, who was senior scientist and second-in-command of the First Byrd Antarctic Expedition.

THE FISSION OF URANIUM AS A SOURCE OF ATOMIC POWER

A POWER house for potent neutron particles—a laboratory piece of equipment for the generation of these neutral atomic particles that are perhaps the best of all weapons with which to bombard the elements and produce artificial radiocativity and transmutations—is what Professor Enrico Fermi, of Columbia University, sees in the new atomic process of uranium splitting.

Discussing for the American Society of Mechanical Engineers the fission of uranium and its possible application as a source of atomic power, Professor Fermi said that "The large release of energy by the reaction . . . is probably only one and very likely not the most important aspect of the problem. Far more important might eventually prove the production of radioactive materials and of neutrons in practically unlimited amounts, for medical, biological and physical investigations. . . . Although there is only a chance of success on these lines the stake appears large enough to justify some gambling on the part of scientists.''

The ''gamble'' of which Professor Fermi speaks is the success or failure of experiments testing whether uranium, in its splitting, gives off other neutrons which can split other uranium atoms and so on in a chain reaction. If this self-perpetuating kind of chain-reaction can be created and kept under control in scientific laboratories, then one may expect all top-flight physical laboratories of the future to have uranium-fission neutron sources. All that would be needed would be a small supply of radium placed in a mixture of beryllium. This radium-beryllium source would supply the initial neutrons for starting the uranium fission just as the pilot flame on a gas stove starts the gas to burning.

Surrounding the radium-beryllium neutron source would be water or paraffin to slow the neutrons and also the ''fuel'' of the process, cheap uranium oxide ore. To start the neutron generator one would place the radium-beryllium source at the center of a container of the uranium. Once the chain reaction started this original source would be removed. The uranium would undergo splitting with the liberation of the desired neutrons. To stop the process would require only the insertion, by mechanical means, of sheets of cadmium metal which has the ability to capture and stop the low-energy neutrons strongly.—ROBERT D. POTTER.

THE PROTECTION FROM FROST OF SMALL VEGETABLES

A TRANSPARENT ''hotcap'' for the protection of tender young vegetable plants in northern latitudes has been developed by Professor Albert E. Wilkinson, extension specialist in vegetable and landscape gardening at the University of Connecticut. He tried them experimentally in his own garden last year and now is urging their use by commercial and home gardners.

The miniature hothouses are made from cellulose acetate sheeting which can be purchased commercially. It is also the material from which the base of amateur moving picture film is made. A triangular piece of the material is fashioned into a simple cone. The apex of the cone is snipped off to provide ventilation. A piece of wire bent into a hook is then thrust into the ground through this aperture and holds the cone in place. The hotcaps can be made at home with no tools but shears, wire, wire cutters and paper clips to hold the edges of the material together in the cone shape. The edges can be cemented together with liquid cellulose acetate instead of using paper clips.

Hotcaps are used to cover small plants of cabbage, broccoli, tomatoes or other vegetables that are susceptible to frost. They may also be used over seedlings of melons, cucumbers, sweet corn or early squash, and make it possible to plant these vegetables much earlier than would otherwise be possible.

Paper has been used extensively for this purpose in the past and serves adequately to protect the plants from cold temperature. The advantages of the cellulose acetate hotcap are: It admits the sun's rays, hastening growth. It permits the gardener to see whether the plant is developing without removing the hotcap. With reasonable care it can be used for several seasons.

ITEMS

SURPRISING numbers of slow mesotrons, atomic particles found in cosmic rays, were found during an airplane flight that rose to 29,300 feet in order to take cloud-chamber photographs of cosmic rays, Gerhard Herzog and Wiston Bostick, Ryerson Physical Laboratory of the University of Chicago, report in *The Physical Review* issued recently. Hint of other particles being present in the cosmic rays at these high altitudes is contained in pictures that show stronger ionizing particles which may be protons, alpha particles or still heavier nuclei.

A CHEMICAL related to sulfanilamide, known as phenothiazine, has been found highly effective in the treatment of several species of parasitic worms in livestock by investigators at the U. S. Department of Agriculture. As soon as manufacturers make suitable application to the secretary of argiculture, it will be released as an accepted veterinary medicine. Phenothiazine first came into scientific notice half a dozen years ago when it was found to be highly toxic to insects and very slightly so to warm-blooded animals. This original research was carried out by L. E. Smith, of the Bureau of Entomology and Plant Quarantine. Investigations since then indicate that it is one of the most versatile chemicals brought to light in recent years. In addition to its effectiveness against insects, worms and other cold-blooded forms of life, phenothiazine has been found to have marked fungicidal and bactericidal properties. In the latter field, it has been used as an internal antiseptic in human medicine, in the treatment of cystitis, pyelitis and allied diseases. Researches on the use of phenothiazine in human medicine have been conducted by Dr. Floyd DeEds, of the Stanford University School of Medicine, to whom a public service patent on this phase of its applications has been granted.

MIMOSA trees, whose bright flowers and delicate, feathery, gray-green foliage are a delight to winter sojourners in southern resorts, are menaced by a new disease, appar-parently caused by a soil-dwelling fungus. Little is known about the disease, except that it kills the trees very quickly and spreads rapidly. Its center of distribution, reports Dr. George H. Hepting, of the U. S. Department of Agriculture, is at Tryon, N. C., and dead trees have been found as far north as Richmond, Va., and as far south as LaGrange, Ga. Diseases that may be early stages in tree-killing epidemics are also being studied in willows, oaks, shortleaf pines, Monterey cypress and Douglas fir. Two diseases menace the American elm, and the London plane tree, favorite in cities because of its resistance to smoke, are under attack in centers along the Atlantic seaboard. Millions of dollars are being spent to save white pines from blister rust. The persimmon, whose wood is unequaled for golf club heads, will probably soon join the already extinct native chestnut. America's trees are in greater danger than most Americans realize.