SCIENCE NEWS

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THE WORLD'S LOW TEMPERATURE RECORD

IN an address before the Pennsylvania State College chapter of the Society of the Sigma Xi, the first of a series of such addresses throughout the nation, Professor Peter Debye, professor and chairman of the department of chemistry at Cornell University, stated that although the world's low temperature record is now within a thousandth of a degree of the unattainable absolute cold, there is a good hope that it will be pushed still farther downward.

This will be done by "attacking the disorder hidden in the nucleus of the atom" by use of the magnetic properties of the inner core of the atom instead of the cloud of electrons about it. The influence of a magnetic field upon the spinning electrons made possible the drop in temperature from about a degree to a mere fraction of a degree.

Cooling is explained as an approach to "a state of highest possible order" and at a degree above absolute zero the disorder connected with the motions of the atoms and molecules has been largely removed. The next step is to bring order within the nucleus of the atom in order to get to an even lower temperature.

The phenomenon of paramagnetism will be used in these experiments, not yet performed, just as it was used in pushing the temperature to its present low level. When a paramagnetic substance, like a piece of soft iron, is demagnetized by taking the magnetic field away from it, it absorbs heat.

This method of getting temperatures lower than are attainable by liquefaction of helium gas was proposed sixteen years ago by Professor Debye, then in Berlin, and independently by Dr. William F. Giauque, of the University of California, and was applied a decade ago in several laboratories here and abroad.

In measuring temperatures just above absolute zero the low temperature gas pressure thermometers used at slightly higher ranges can not be used, but a satisfactory temperature scale can be based on magnetic measurements alone.

Absolute zero is minus 273.1 degrees Centigrade. Helium, the gas that is hardest to liquefy because its molecules have the smallest mutual attraction, boils at 4.2 degrees above absolute zero and by dropping the pressure to 1/200,000th of an atmosphere, a temperature of seven-tenths of a degree above absolute zero can be obtained. For lower temperatures, the magnetic method must be used.

HELICOPTERS

HELICOPTERS are ideal craft for many of the Coast Guard's regular peacetime tasks, is stated by Lieutenant Commander F. A. Erickson, in an article in the *U. S. Coast Guard Magazine*. The uncanny ability of these whirligig flying-machines to slow down and "stand still" in the air, and to climb and descend at very steep angles to blanket-sized landing spots, enables them to carry out such typical Coast Guard missions as close-up inspection of suspicious-looking boats off shore, putting pilots aboard incoming vessels and removing them from out-bound ones, removing crews from stranded or foundering ships and from ice floes and other situations of peril, carrying lines aboard them from surface rescue vessels, and transferring supplies and personnel to and from lighthouses, light-ships and other isolated navigational aids.

As evidence of the helicopter's extreme maneuverability, Commander Erickson lists the series of "impossible" stunts through which a heliocopter pilot student is required to put his machine at twenty-five hours of flight training. A few of them are: Take off sidewise and climb at a 45-degree angle. Come down the same way, but stop and hover awhile before setting the ship down; take off backward and fly tail-first. At 25 or 50 feet altitude, while continuing flight in same direction, swing tail around and go on nose-first; from 200 feet altitude, make 60-degree glide and land on marked area approximately 20 feet on a side; fly around the boundary of a square, stopping in the air at each corner, without deviating more than one foot, either vertically or horizontally, from true flight line.

FARM MACHINERY

RUST-RESISTANT tillage tools, power-operated orchard-pruning shears and saws, tractors with chassis for mounting various harvesting machines, are a few of the new form implements that should be developed for post-war use, according to Professor E. G. McKibben of the Michigan State College in a report made to the American Society of Agricultural Engineers.

Farm tillage tools and machines are constantly surrounded by ideal rusting conditions and farmers are notably careless in protecting them. Professor McKibben suggested that corrosion-resistant metals developed in recent years by metallurgists should replace those now used. "If we really wish to keep tillage elements from rusting it may be easier to change the character of the tillage tool than that of the farmer."

"In round figures there are well over 3,000,000 acres of orchards, groves and vineyards in the United States," he pointed out. "Three million acres of pruning represents a lot of strong-arm work." Power-operated pruning shears and saws appear to Professor McKibben to be a reasonable suggestion to eliminate some of this hand pruning. "Field machines which would operate in their own paths and turn in their own lengths would solve most of the machine problems resulting from small, irregular fields and such soil conservation practices as contour farming and strip cropping." Machines that will operate both in their own paths and to the side are needed for grass-cutting in orchards and use in other places.

The present draft tractor perhaps should be replaced by a tractor which would be primarily a chassis for mounting such machines as balers, forage harvesters, combines for harvesting small grains, and corn harvesters.

Many of these present self-propelled machines are in use only a relatively small number of days in a year. Reliable light gasoline engines, equipment to give better weed control, precision planters for sugar-beet and other crops, conveying and elevating equipment, potato harvesters that will separate the potatoes from stones and clods, and "once-a-season lubrication" for important farm machines—all of these are among other new farm machine developments needed.

BOLIVIAN TIN

BOLIVIA'S tin is a number one war essential to the United States and the United Nations generally. The overturn of the Bolivian government should not decrease the supply of tin ore, since Bolivia recently declared war on Germany, but directly or indirectly it may.

Bolivia is primarily a mining country. In pre-war days it produced about one-sixth of the annual world's supply of tin ore. It produced many other metals; but tin became the all-important metal after sources in British Malaya, the East Netherlands, Thailand, China and other places in the Far East were cut off by the Japs. The large tin smelter constructed as a war measure in Texas by the United States government uses Bolivian ore. Bolivia has no smelters of its own.

Bolivia, located at high elevation on the Andean plateau, has no seaport. Between it and the Pacific Ocean lie Peru and Chile. On its north and east is Brazil, on its southeast and south are Paraguay and Argentina. Some of its drainage is into the Paraguay River (called Parana south of the Paraguayan border) but most of it is by tributaries of the Amazon.

The principal railroad of Bolivia connects its capital, La Paz, which is near the Peruvian boundary, with Arica on the coast of Chile. The road, from 250 to 300 miles in length, runs southwesterly from La Paz without touching Peru. About one third of its mileage is in Chilean territory. Nearly 100 miles of Chile separates Bolivia from the Pacific.

In size Bolivia is nearly as large as Arkansas, Louisiana, Oklahoma and Texas combined. It contains 416,000 square miles, less than 60 per cent. of its area in 1900. Its population in 1940 was approximately 3,500,000, three fourths of which was Indian or mixed bloods.

Bolivia and Paraguay are the only South American countries without seacoasts. Paraguay has river transportation down the Parana to the La Plata and the South Atlantic. Bolivia's desire for a little of northern Chile, or a little of southern Peru, has been the cause of interior trouble in the past and is reported to be one of the factors in the present situation. Wages for miners is another source of dissatisfaction and caused conflicts in 1942 between the miners and the government resulting in bloodshed.

One result of this conflict was an investigation by a special United States commission, as interruption to mining would make impossible the delivery of tin and tungsten ore for which the United States had previously entered into contract with Bolivia. Under this contract the United States agreed to buy 18,000 tons of tin annually for five years, and 3,000 tons of tungsten for three years. In July, 1942, the American government agreed to increase the amount of both tin and tungsten to be purchased. Also it loaned Bolivia $25,000,000 for the construction of four major highways, the establishment of a national sugar industry, the stimulation of petroleum production, and other economic purposes.

Tin ore constitutes over 75 per cent. of Bolivia's export trade. Tungsten, antimony, copper, silver, lead, zinc and bismuth are other important mining products. Prior to the war Bolivia was producing approximately 240,000 barrels of petroleum annually. In 1942 the Bolivian government agreed to pay the Standard Oil Company of New Jersey $1,750,000 for oil property expropriated in 1937.

ITEMS

A MEDAL and a prize of $200 will be awarded each year by the newspaper *El Universal* for the best doctoral thesis in a Mexican university. This Justo Sierra prize is named after the Mexican educator and philosopher who reestablished at the turn of the century the University of Mexico after it had been decentralized for a century.

NINETY per cent. of all dates grown in the United States are produced in the Coachella Valley in California. The date crop this year amounts to nearly 20,000,000 pounds, worth about $5,000,000, according to Dr. Walter T. Swingle, who had much to do with the introduction of date culture in this country. Date growing on a major scale was begun in the Coachella Valley, which lies north of Imperial Valley, about the turn of the present century, and is now the principal industry of the region. Irrigation water comes from deep wells. Cull dates, unmarketable for food purposes, are fermented for the production of industrial alcohol.

A RECORD-BREAKING electric motor, which operates at 120,000 revolutions a minute, has been developed, built and thoroughly tested by the General Electric Company. This new three-horsepower motor weighs only seven pounds and is so small that it will fit into the palm of a man's hand. The motor is water-cooled and is equipped with oil-mist lubricating bearings. Tests, including a continous run of eight hours, are said to have proved its perfection. The ordinary three-horsepower electric motor weighs 105 pounds. The speed of rotation of this new motor is 65 times faster than the conventional motor used in home washing machines and refrigerators. Motors of this type will be used for the grinding and drilling of essential parts of airplanes and other war equipment and will not be available for general use until after the war.

Through an editorial slip on a Science Service typewriter Dr. C. A. Browne was credited with the statement that Humboldt "at the beginning of the nineteenth century set Mexico at the head of all Western Hemisphere nations in cultural attainment." (Science News, Jan. 21, p. 12.) The article should have stated that Humboldt placed Mexico at the head of all Latin American countries.