SCIENCE NEWS

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THE ATOMIC BOMBARDMENT OF CHLORINE

A NEW transmutation of the elements in which the chlorine atoms are changed first to potassium and then into the inert gas argon has been reported at Princeton University. The transmutation is one of the first achieved with the new cyclotron apparatus now in operation after a year's construction period. Ionized helium atoms are the bombarding source of energy which brings about the elemental change.

Professor Henry D. Smyth, chairman of the physics department, made the announcement of the work of Dr. Milton G. White, Drs. Malcolm C. and William J. Henderson and Dr. Louis N. Ridenour. The form of potassium created lacks one neutron and exists for a brief interval. Its average life is 10.8 minutes. One feature of the cyclotron is that it employs the heavy, electrically-charged helium atoms as bullets to bombard the element chosen as target. Helium gas is passed into a special vacuum chamber, where it collides with a strong electron beam. In the collision the helium atoms lose their outer electrons and become helium ions.

These helium ions, known as alpha particles, are inserted into the intense magnetic field of the cyclotron at its center and go round and round in ever-widening circles for 100 revolutions. At each trip they are accelerated faster and faster by an electric field until they attain velocities of about 15,000 miles a second (about $\frac{1}{10}$ the speed of light) just before they are shot at a target. Bombarding atoms involves a considerable amount of chance, for about 1,000,000 helium bullets must be driven at a chlorine atom before one hit is made. The new form of potassium, created as an intermediate step in the chlorine-argon transmutation, is an isotope of natural potassium. In passing over by spontaneous disintegration into argon it liberates, in the form of fast-moving positrons, energy equivalent to 3,000,000 electron-volts.

Further work on the cyclotron involves the future installation of a 90-kilowatt rectifier which will increase possibly six- or ten-fold the number of alpha particles available and will, it is expected, double their present energy of 8,000,000 electron-volts.

THE PHYSIOLOGICAL ROLE OF ACETYLOCHOLINE

SIR HENRY DALE, director of the British National Institute for Medical Research, in his first interview in this country since sharing the Nobel Prize award for this discovery reported that millions of charges of a chemical, acetylcholine, spurt from nerve endings every time a thought commands a muscle to move. He described research leading to the discovery at a medical meeting in Washington which was later reported to the New York Academy of Medicine on May 20.

"When I talk to you," Sir Henry said, "millions of charges of acetylcholine are released to move my tongue and lips." This same chemical is what causes sweat to stand out on a man's face when he has had a bad fright or other shock. It was formerly thought that this effect was caused by adrenalin, product of the adrenal glands. With the exception of the sweat glands, acteylcholine is concerned only with the nerves that control voluntary muscles and is probably formed at the endings of these nerves. Only an infinitesimal amount is released at each discharge.

Acetylcholine has been known for at least fifty years before its important rôle in the body was discovered. The research leading to this discovery was carried out partly by Sir Henry and partly by Professor Otto Loewi at Graz, Austria, who shared with Sir Henry the Nobel Prize in medicine and physiology for 1936.

Practical application of the discovery is already being made in the case of a serious disease of muscle weakness, myasthenia gravis. The defect in this condition is due either to too little acetylcholine or a too rapid destruction of it, resulting in the inability to use the voluntary muscles. Patients suffering from this disease are now being helped by a medicine which preserves the acetylcholine from too rapid destruction. It is normally broken down into other chemicals after it has performed its function of nerve messenger.

THE ACOUSTIC ALTIMETER

THE acoustic altimeter, an instrument long needed by aircraft, is about ready to leave the research laboratory and go into the hands of manufacturers' designing engineers, according to the opinion of Lieutenant Leo P. Delsasso, U. S. National Reserve.

Lieutenant Delsasso, who is physicist in the University of California at Los Angeles, has been a pioneer in the development of devices for marine depth-sounding and for measuring the height of aircraft from the earth. The several disastrous accidents of recent months have drawn attention to the need of such measurement. While these mishaps are related to different causes they have only too often occurred at moments when the pilots were flying blind, and did not know actual clearances.

Altimeters as now used by airplanes are of the barometric type, and show more or less accurately elevation above sea-level. Unfortunately the distance down to sea-level is of slight importance to a pilot flying through fog over land of unknown altitude. The altimeter of acoustic type as developed by Lieutenant Delsasso depends upon the time taken by sound to travel from a plane to earth and back. Early models tried out in both the Los Angeles and eastern laboratories required such nuisances as earphones, great concentration of attention to signals by the pilot, timing and other computations.

The improved model now being tested has an automatic mechanism which translates the complex echo phenomena into a simple movable point of illumination on a dial. Altitude is thus directly and constantly shown. Even the angle of terrain can be determined by a simple mea-

surement of change of pitch during the round trip of the sound.

The equipment is by no means perfected, however. The present weight of the outfit, about forty pounds, is displeasing to operators of aircraft interested in maximum revenue from cargo transportation. Undoubtedly this figure can be cut to twenty pounds or less. Furthermore, airplanes are so noisy that the acoustic altimeter at present is unable to distinguish differences in height above 700 feet.

New devices for production of special sounds of very high intensity should raise this limit considerably. For low levels, however, the instrument is extremely accurate. This accuracy should be of value to a pilot who is approaching the ground in a dense fog. For example, exact knowledge that the plane is fifty instead of one hundred feet from the ground would facilitate a smooth landing.

SCARCITY OF SALMON IN THE ATLANTIC

SCARCITY of salmon in the Atlantic is probable this year and the next, according to Dr. A. G. Huntsman, of the Biological Board of Canada, who spoke before the Royal Society of Canada at its annual meeting at the University of Toronto.

Dryness and wetness of the summers is linked by Dr. Huntsman to the abundance and scarcity of not only salmon but other forms of wild life as well. There is a periodic recurrence of scarcity every 9.6 years shown in the records of both animals and fish.

Studying salmon statistics Dr. Huntsman came to the conclusion in 1931 that the unknown influence which caused these fish to be scarce every 9 or 10 years must have been acting upon them while they were still small and living in the rivers before going to the sea. The reason for this conclusion is the fact that, in localities where the salmon were the fewest years in the sea before being caught, the scarcity came correspondingly earlier, and where the salmon were longest in the sea, there the scarcity came last.

On a salmon river in Cape Breton, the Margaree, the young salmon were found to be the chief food of the fish-eating birds, kingfishers and mergansers, when rearing their young along the river during the summer. In rainy weather, with the river high and murky, the young salmon are comparatively safe, but in dry summers, with the water low and clear, the birds can remove them very thoroughly. Dry summers should thus be followed by a scarcity of salmon as many years later as the salmon remain in the sea before being caught. If dry summers were responsible for the periodic scarcity of salmon on the average every 9.6 years, they would have to occur the proper number of years before each periodic scarcity.

The last one of these for the Margaree was worst in 1928 and the daily records of river height showed that the summers from 1923 to 1925 were dry, as would be expected from the theory. Records of rainfall, if numerous enough, would give proof of dryness of the summers. Such records as are available do show comparative dryness in the proper years, even back to the seventies of the last century, to explain the most pronounced scarcity of salmon that has been recorded, that centered in the year 1880.

There are indications that the wet summers that alternate with the dry ones are likely to be the cause of the periodic scarcity of the animals of the interior of the continent, such as rabbits and grouse, by making them more liable to disease. The Hudson's Bay Company has kept records of the furs it has taken from the Northwest for more than a hundred years and these show that such animals as the rabbit, the lynx, the marten, the fox and others, have been scarce on the average every 9.6 years. Statistics of Canada's fisheries, which have been collected since the Confederation, also show that the salmon of the Maritime Provinces have been more or less scarce on the average every 9.6 years.

THE CALIFORNIA CONDOR

AMERICA'S largest bird, the California condor, is not in as immediate danger of extinction as has been thought, in the opinion of Arthur Cleveland Bent, ornithologist of Taunton, Mass. Mr. Bent tells the life histories of this and other North American birds of prey in a new publication of the U. S. National Museum.

The California condor lives in mountain fastnesses so remote from the destructive influences of civilization that it may long continue to exist. There is no doubt, however, that its range, and therefore probably its numbers, have been considerably reduced. It used to be seen northward to the mouth of the Columbia River and eastward into Nevada and New Mexico. Now it is found only in southern California, with a slight eastern extension across the boundary, and in the northern part of Lower California.

The only effective enemy the California condor has ever had is man. In gold-rush days, miners used to shoot them for their big, hollow quills, which were excellent containers for gold dust. Far larger numbers were killed for no reason at all except the "fun" of shooting something. Now, however, there is a state law protecting them, which seems to have the support of public opinion. They are occasionally still killed, however, when they eat poisoned carcasses that have been set out for coyotes or other predatory mammals.

The California condor is a carrion-eater, being in fact a giant vulture. Its nesting sites are clean, and it bathes in running water. Like many other birds and mammals, the condors are fond of play. Often this takes the form of swooping at each other in the air, with the "attacked" bird trying to dodge—a kind of aerial game of tag. Mated birds display much affection, and spend a good deal of time nibbling at each other and in other kinds of love-making. Captive birds, especially those taken young, nibble at their keeper's coat-buttons and demanding to be petted.

PRESIDENT COMPTON'S ADDRESS AT THE THIRD DEARBORN CONFERENCE OF AGRICULTURE, INDUSTRY AND SCIENCE

SCIENCE has made possible a "new thing under the sun"—the more abundant life generally distributed, with-

out one man's having to make his gains off another man's losses. Research in pure science must receive public support if this happy state of things is to be stabilized and extended.

These were the main theses of Dr. Karl T. Compton, president of Massachusetts Institute of Technology, in his address given at the opening session on May 25 of the third Dearborn Conference of Agriculture, Industry and Science.

In pre-scientific ages, Dr. Compton pointed out, advanced cultures arose, but their brilliant accomplishments were always based on the exploitation of others. The Israelites gained their Promised Land only by exterminating the Canaanite nations already in possession there. The Greeks and Romans accomplished their miracles of art and learning, soldiership and law, only because they had slaves in the back of the house to do the hard work.

"But there is something new under the sun," Dr. Compton continued, "in that modern science has given mankind, for the first time in the history of the human race, a way of securing a more abundant life which does not simply consist in taking it away from someone else. Science really creates wealth and opportunity where they did not exist before. Whereas the old order was based on competition, the new order of science makes possible, for the first time, a cooperative creative effort in which everyone is the gainer, and no one the loser."

The speaker took government to task for spending so much time and money on regulatory and restrictive efforts in the field of existing technology and knowledge, and giving so little support, relatively speaking, to much-needed research for the new. He said: "I have frequently felt discouraged by the apathy, and sometimes almost antagonism which has appeared to exist in high places in respect to this scientific program. To be sure, I realize full well that the distress of unemployment must be relieved, that wealth must be properly regulated and distributed, and that curtailment of production of crops, oil and other commodities may need to be regulated in the public interest. My dissatisfaction is not because these things are being done, but because the other things, so pregnant with possibilities for the future, are neglected to the extent of only half of one per cent. of the budget of our Federal Government, and probably not more than this percentage of the active interest of our national leaders. But doubtless I am too impatient and critical. After all, it generally takes a long time and much mental effort to reach conclusions which, after reaching, seem so obvious that we wonder why there was ever any hesitation. So I believe it will be in this case, for I am perfectly confident that in time the public will really put faith in science as the intelligent basis of adjustment and control of the environment in which we live."

ITEMS

BITUMINOUS coal mines that have long been flooded with water are being rescued by the use of deep well turbine pumps. A. B. Kelly, of Greensburg, Pa., reported recently to the American Mining Congress the first successful freeing of an abandoned coal field by this method. In 46 days, the turbines caused 2,500,000 tons of water to gush out of flooded mines in Westmoreland County, Pa. This was 53,800 tons a day or 37.5 tons per minute. Similar pumps are about to raise 4,000,000,000 gallons (some 16,000,000 tons) of water from a maximum depth of 450 feet in a submerged field in Fayette County, Pa.

DR. PAUL W. MERRILL, of the Mount Wilson Observatory of the Carnegie Institution of Washington, announced at the Syracuse meeting of the American Association of Variable Star Observers, the discovery of a dozen new spectral lines of the element iron in the light from the variable star R Hydrae. The positions of the observed lines can be calculated on the basis of the supposed structure of the iron atom. Asked how astronomers can accept the assurance that the lines really come from iron, Dr. Merrill said: "Suppose you discover lying in the street a pile of small boards of odd shapes. Taking them into a near-by house, you find that every one fits snugly into a hole in the floor, and that no holes are left over. You would conclude that you knew where the boards came from." In the same way the new-found spectral lines fit into the positions predicted by the theory of the iron atom's structure.

AN effort to approach the tremendous pressures that obtain in the deeper levels of the earth's crust has been made in the physics laboratories of Harvard University. Professor P. W. Bridgman reported to the recent meeting of the American Physical Society on some of the results obtained with metals, minerals and other substances. The pressures used ranged up to 50,000 kilograms per square centimeter—711,166 pounds per square inch. Most materials tested did not break but flowed. They were reduced to a plastic, quasi-liquid condition. Those possessing a crystalline structure, even a very fine crystalline structure, had the crystals broken down and made even smaller. Some materials, however, refuse to flow. These include both crystalline substances like graphite and non-crystallines like quartz glass; these held out against the pressure as solids to a certain critical point, then broke. An opposite result was obtained with some other substances which were put in as fine powder and came out as transparent glass-like masses. It was a case of complete welding without an external source of heat.

FOSSIL sea-creatures that have always been regarded as sharks were demoted to the lower position of missing links between the true fishes and more primitive forms like lampreys, by Professor David M. S. Watson, of University College, London, in an address recently given before the New York Academy of Sciences. The extinct shark-like animals, known as acanthodians, were always taken to be primitive sharks because of their general body outline and because such remains of their skeletons as were found appeared to be in general shark-like. However, Professor Watson has found such marked differences in braincase, jaws, gill arches and other structural elements that in his opinion it is evident that they belong to a grade of structure more primitive than, and in a wide sense antecedent to, that of the true fish. He therefore considers them to be a special and separate group of vertebrates, lower than the fishes and intermediate between them and the more primitive lamprey group.