SCIENCE NEWS

Science Service, Washington, D. C.

ISOTOPES OF HYDROGEN

THE recently heralded discovery of a new and heavier kind of hydrogen atom was anticipated by Professor Fred Allison, of the Alabama Polytechnic Institute, one of the contestants for the honor of discovering the missing chemical elements 85 and 87.

The discovery was reported to the American Chemical Society in September prior to the announcement last week of the spectroscopic detection of the new kind of hydrogen by Professor Harold C. Urey and Dr. G. M. Murphy, of Columbia University, and Dr. F. G. Brickwedde, of the U. S. Bureau of Standards. Details of Professor Allison's work will be published in a forthcoming issue of *Industrial and Engineering Chemistry.*

No separation of the two kinds of hydrogen was made by Professor Allison. Dr. Brickwedde, however, concentrated the heavier constituent of the gas five-fold. Professor Urey's measurements on the hydrogen spectrum agree with the estimate of Professor Allison in giving the proportion of the new double-weight hydrogen as about one atom to 4,000 of ordinary hydrogen.

The new and still disputed magneto-optic method of chemical analysis, on which Professor Allison bases his claims to the discovery of the missing elements, was also used in detecting hydrogen of atomic weight two. This method can detect as little as one part of a substance in a hundred million, and also it will separately identify isotopes, the atoms of different weight which make up many of the common elements. Tests show that, with one or two exceptions, the number of isotopes, revealed by Professor Allison's new method, is identical with that found by other means. This establishes the value of the method.

Professor Edna R. Bishop and Margaret Lawrenz, of the Alabama Experiment Station, have also shown by a study of uranium and thorium leads by the Allison method that the different isotopes are singled out in the order of their abundance.

Last year Professor Allison announced that seven heavy, metallic elements, including gold and platinum, are actually mixtures of isotopes previously undetected. This claim, like the other fruits of his magneto-optic method, has still to be verified by other investigators.

Professor Allison's paper giving his proof of the hydrogen isotopes will read in part as follows: "These results would be in accord with those of other metals if two isotopes of hydrogen are postulated. Quantitative experiments recently carried out on . . . acids and water, interpreted upon this postulate, indicate without exception that the lighter isotope is far more abundant, very roughly in the ratio of several thousand to one, and further that, . . . the mass of the heavier isotope is probably two, though the evidence as to the exact mass is not conclusive. We are unable to suggest any explanation of these doublets unless it be upon the hypothesis of two isotopic components of hydrogen."

LIGHT FROM RECEDING NEBULAE

THOUGH it is apparently receding from the earth at the speed of 11,700 kilometers (nearly 7,300 miles) a second, the light from the group of faint nebulae in the constellation of Ursa Major, the great bear, reaches us at the usual rate of about 186,000 miles a second. This has been ascertained by Dr. Gustaf Strömberg, of the Mount Wilson Observatory, by measurements of what is called the aberration constant.

The aberration of a star is its apparent displacement due to the earth's motion. The earth is moving around in its orbit at a speed of about 18 miles a second, which is a small, but appreciable, fraction of the speed of light. When the earth is moving at right angles to the direction of the star, which is when the star is on the meridian at midnight, the telescope itself, being carried along with the earth, moves a few feet while the light is passing from one end of the telescope to the other.

The result is that the telescope must be pointed slightly in advance of the star's real position. An analogous condition occurs when walking through the rain with an umbrella. If the rain is falling vertically, and one is standing still, the umbrella is held directly overhead. But if one is walking along, even though the rain is still falling vertically, the umbrella must be tilted forward, for then, after the rain drops have fallen below the level of the umbrella, the person advances forward to meet them.

By means of photographs of these faint nebulae, which are supposed to be at the vast distance of 70 million light years, Dr. Strömberg measured their aberration. He found that it is practically the same as with stars, so that the fact that these nebulae are receding from us does not affect the speed of their light through space. This is what was expected, for ever since the famous Michelson-Morley experiment, which started the groundwork of the relativity theory, it has been supposed that light has the same velocity anywhere, regardless of the motion of its source, or of the observer.

A MARTYR TO TYPHUS FEVER RESEARCH

BECAUSE he found that a bit of chiffon laid over the end of a glass tube made it possible for experimental fleas to bite typhus fever-infected guinea-pigs, Dr. Elmer T. Ceder, 26-year-old research assistant at the U. S. National Institute of Health, is now lying on a hospital bed fighting the disease in his own body.

Fortunately this latest martyr to science is not critically ill and is expected to recover. The American typhus fever, from which he suffers, is not so fatal as the European form of the disease. Most of the fatal cases of supposed typhus fever in this part of the world have turned out to be Rocky Mountain spotted fever, according to investigations made by Drs. R. E. Dyer, L. F. Badger and A. S. Rumreich, of the National Institute of Health. It was in part of this very research that Dr.

Ceder was assisting when he fell a victim to typhus fever.

Dr. Dyer, investigating the two diseases as they occurred in the city of Washington and near-by states, found among other things that fleas apparently transmitted one of the diseases which was presumably typhus fever. To prove this, it was necessary that he have uncontaminated fleas feed on animals infected with typhus fever and then have the same fleas feed on uninfected animals. If the animals caught the disease, he could prove that the fleas had transmitted it. However, he struck a snag in his investigations when he tried to get the fleas in their sterile glass tubes to bite the guinea-pigs.

When young Dr. Ceder joined the staff of the National Institute of Health he was set at this task which became one of his main jobs. Dr. Ceder discovered that the fleas in the glass tube could not bite because the slippery sides of the tube gave them no foothold for their legs. So he ingeniously covered the ends of the tube with a piece of chiffon which gave the fleas a good surface to anchor themselves to while they bit and sucked the pigs' blood.

In the course of his work, one of the infected fleas bit Dr. Ceder instead of the pigs, it is thought, thus giving him the disease. This young research worker has thus contributed in two ways to science's knowledge of typhus fever. First, he advanced the laboratory research on the transmission of typhus fever in animals and second, he has given conclusive, if unintentional, proof that it is also transmitted to man by fleas.

Dr. Ceder was born in Minneapolis in 1905 and received his medical degree from the University of Minnesota in 1929. He served his internship in one of the U. S. Public Health Service hospitals and was assigned to duty in Pittsburgh as an officer of the service. He was transferred to the National Institute of Health early in 1931 because he gave promise of developing into a valuable research worker.

THE TUBERCULOSIS GERM

DR. RALPH MELLON, of Western Pennsylvania Hospital's Institute of Pathology, Pittsburgh, announced to the Society of American Bacteriologists, meeting in Baltimore, that the tuberculosis germ has a double life and can shrink itself into a dwarf form beyond the visibility of ordinary microscopes.

This new chapter in the life cycle of the microscopic bearer of the great "white plague" may explain the disputed action of BCG, the living vaccine against tuberculosis developed in France, and it may throw light on ills similar to tuberculosis, such as Hodgkin's disease.

Dr. Mellon found that ordinary tubercle bacilli, which are slender rod-like organisms, may develop under suitable living conditions into granules which have much less ability to produce the disease. These granules are ultramicroscopic and pass through the finest filters but may be brought back to a visible form when fed proper food. The ordinary germs are called acid-fast because they retain a red stain even when washed in acid, and the granules are also acid-fast. The granules in turn may develop into the ordinary acid-fast, virulent tubercle bacilli, or they may develop into other bacilli which are not acid-fast and not virulent and which Dr. Mellon finds look like the bacilli that cause diphtheria.

The existence of such a minute, filterable form of the tuberculosis germ has been the subject of scientific controversy for nearly a decade. No one until this time has succeeded in cultivating it from a growth of a single bacterial species.

Dr. Mellon warned that even though the familiar form of the tubercle bacillus may disappear from the tissues of the body, danger still threatens the patient from the possible unsuspected presence of one of the variant forms of the germ which may at any time develop disease-producing powers.

ARTIFACTS OF SINANTHROPUS

SINANTHROPUS, or "Peking Man," knew the use of fire. Specimens of apparently charred animal bones have been recovered from the limestone deposits at Choukoutien, the locality about forty miles southwest of Peiping where the Sinanthropus remains were found. The physical appearance of these specimens made it fairly evident that they had been subject to the action of fire, but the origin of the fire was not known. It remained a question whether the bones had been burned within the Choukoutien Caves while the latter were occupied by Sinanthropus or whether they were burned in a surface fire from natural causes and had subsequently been washed into the deposit.

Several of the charred bones were sent to Paris for comparison with similar specimens which have been found in abundance in many of the prehistoric sites in Europe, and Dr. Gaubert, of the laboratory of mineralogy of the Paris Museum, subjected some of these fragments to chemical analysis. These results of his experiments, taken in conjunction with an analysis of soil samples from the Choukoutien Caves, have now made it plain that it was Sinanthropus who carried the fire into his subterranean dwelling.

Last spring W. C. Pei, the young Chinese geologist who found the famous Sinanthropus skull in 1929, collected from the Choukoutien deposits more than 2,000 quartz artifacts. These corresponded to the pre-Chellean type of implement found in Europe, but in technique they resembled the Mousterian culture in that they were made from quartz flakes rather than from cores. As these implements were found in association with Sinanthropus remains, consisting of a skull fragment and two additional jaw specimens, besides numerous animal fossils, it is considered certain that they represent the handiwork of the Peking Man.

Discussing the Choukoutien culture in a paper before the Chinese Geological Society, Abbé Henri Breuil, director of research in the Institute of Human Paleontology in Paris, who recently visited Peiping, pointed out that Sinanthropus must have made a considerable use of fire, as superimposed layers of charcoal débris extending to a depth of seven yards were found, while many

stones were seen to be black with soot. It was evident that he used the stone implements for fashioning weapons from animal bones. Deer antlers with sharpened points, which had been found on the site, might well have been used as daggers, while the frontal portion of a deer skull looked as though it might have been used as a drinking vessel.

Among the artifacts Abbé Breuil was able to identify side scrapers, points, piercers and borers, all testifying to "a very systematic industry." Larger fragments resembled choppers or anvils. The quartz from which the implements had been made was a very imperfect material, Abbé Breuil pointed out, but Sinanthropus seemed to have done about as well with it as any one could be expected to do. At any rate it was clear that Sinanthropus was already man and that he was able to organize his life so as to select intelligently the elements useful for burning, for cutting and for working. Probably he was able to work in wood as well as in bone, but this is difficult to prove. Unquestionably, too, he was a successful hunter of animals.

OCEAN BOTTOM TO GUIDE NAVIGATION

THE ocean bottom replaces the heavens as guide to the navigator over Georges Bank, which lies off the New England coast, with the issuing by the U. S. Coast and Geodetic Survey of a new chart describing the floor of the ocean in this region.

Instead of "shooting the stars" to keep their ships on a true course, captains of transatlantic liners during the most dangerous part of their voyage will compare readings of their echo depth-finder with a map of the bottom of the sea. So well does the map describe the hills and valleys beneath the water and so accurately can the depth-finder report their size that the navigator will be able to determine his position by speedy soundings and so keep on the right course.

With this method of navigating the frequent fogs over Georges Bank will no longer make dangerous the many hills on the ocean bottom that rise close enough to the surface to ground ships.

The new chart is the result of surveys of the past two summers which have covered two thirds of the 30,000-square-mile submerged continental shelf. Work on the chart was speeded up following insistent requests from shipping men. The Coast and Geodetic Survey expects to complete the survey next year.

A large submarine valley, longer and deeper than Corsair Gorge discovered during 1930, was found by surveys of the past summer and is shown on the chart. The new valley, which has not been named, cuts back into the southern edge of the Bank about eleven miles and is roughly two and a half miles wide and 2,000 feet deep. The tops of its ridges are only 600 feet below the surface of the ocean, while at its mouth on the edge of the shelf the depth drops off abruptly to 6,000 feet. Two small indentations were also found.

ITEMS

THE kind of phonograph recording used by Edison in his original work promises to return to practical use and produce the most faithful reproductions of music. Mr. Halsey A. Frederick, of the Bell Telephone Laboratories, demonstrated to the Society of Motion Picture Engineers and the Institute of Radio Engineers new disc records cut by the vertical method instead of the lateral method used in ordinary phonographs. The new system of music reproduction is claimed to eliminate needle scratch. The material of the new disc records is cellulose acetate, the same substance that is used in making cellophane, rayon and other new products of synthetic chemistry.

Fogs are colorless in Rochester, New York, whatever they may appear to be in London, according to experiments of F. M. E. Holmes and Dr. Brian O'Brien, of the Institute of Optics of the University of Rochester. Many investigators have, since the time of Lord Rayleigh, believed that red or yellow light passed more easily through fog or haze than blue, green or violet. Most of the light scattered by the water droplets of the Rochester fog, however, contains all colors equally. Only a small fraction, that scattered by the air itself in the mile-long path of the light, obeyed the law given by Rayleigh. The blue of the sky is explained by Rayleigh's formula which states that the amount of any color scattered by fine particles is proportional to the fourth power of the vibration frequency of that color. This is true on clear nights, Mr. Holmes and Dr. O'Brien found, when only very faint haze in the air has to be taken into account. For a fog, however, which consisted of droplets 1/500 inch in diameter, only one eightieth of the scattered light showed this behavior. The rest is absorbed by the fog to an extent which is independent of its color.

ALCOHOL made from wood—not wood alcohol—by an improved method in England, is declared commercially practicable where sawdust can be obtained at a dollar a ton or less and a supply of 200 tons a day is available. The process, which will recover from 35 to 40 gallons of alcohol per ton of dry sawdust, was worked out by Dr. Harold A. Auden and Dr. Walter P. Joshua, of the Distillers' Company Research Laboratory at Epsom. The process consists in forcing acidulated water, containing two parts of sulphuric acid per thousand, at a temperature of 180 degrees Centigrade and a pressure of twelve atmospheres, through sawdust packed in lead-lined vessels. Under these conditions nearly half of the sawdust is changed into fermentable sugars. The molasses thus obtained is fermented with yeast in the usual way to obtain the alcohol.

LONDON'S huge rubbish heap which has been accumulating near Dagenham for many years will be used as fuel instead of coal in boilers of a new Ford motor plant, Dr. Ernest W. Smith, English combustion engineer, states. Sixteen cells for burning the refuse are being built, which will consume 300 tons of waste a day to produce steam at 1,200 pounds per square inch pressure and 1,100 degrees Centigrade, which can be used for heating, for producing electricity or in manufacturing processes. The refuse is claimed to have a heat value of 3,000 British thermal units in summer and 4,000 in winter compared with values ranging from 12,000 to 15,000 units for the best coals.