SCIENCE NEWS

Science Service, Washington, D. C.

ISOTOPES OF OXYGEN

PROFESSOR W. F. GIAUQUE and H. L. Johnston, of the University of California, have discovered that oxygen consists of two kinds of material. What has been styled elemental oxygen gas is a mixture, and possibly a compound, of two elements very closely resembling each other. Similar complications have been observed with several other elements, notably lead. Such small families of similar elements are known as "isotopes."

The second variety of oxygen, of greater density than that of common or mixed atmospheric oxygen, was detected by means of the spectroscope. When light is passed through a very thick stratum of air, as with sunlight in late afternoon, certain frequencies of the radiation are absorbed by the atmospheric oxygen. Calculations of wave-length made by Giauque and Johnston indicate that two kinds of oxygen are taking part in the process.

It has long been known that gaseous oxygen exists in pairs of atoms tied together in a manner suggestive of a dumb-bell. The minute dumb-bell, or gas molecule, normally travels in a queer combination of forward motion, rolling and tumbling. The new investigations indicate that some of the oxygen molecules are virtually lopsided dumb-bells. One end of each is over 12 per cent. heavier than the other. Such pairs are presumably in part one isotope of oxygen and in part the other. The unsymmetrical structure gives rise to unusual absorption of light. No attempt has been made to separate in a pure state the newer heavy oxygen, and none is likely under present methods. It is furthermore probable that the new oxygen would behave chemically much as its older sister.

Inasmuch as chemists by international agreement have based their whole atomic weight system on the oxygen atom as a standard, some concern has been expressed as to the validity of this standard. The new oxygen atom is supposed to have an atomic weight of 18, in contrast to the standard number 16 assigned to common oxygen. It is now presumed that common oxygen, weight 16, is really a mixture of a large part of a light variety of oxygen with atomic weight 15.98, with a small but uniform proportion of the new variety of weight 18. Since the standard mixture prevails uniformly in all parts of the world, it is just as serviceable for weight standard as a pure element.

PREVALENCE OF DIABETES

THE disease, diabetes, is on the increase, in spite of the many lives saved by insulin. And the unprecedented prevalence of this metabolic disorder is attributed by experts of the Metropolitan Life Insurance Company to "the dietary excesses practiced by the American people."

In 1927, shortly after the wide use of insulin became established, medical statisticians were surprised to find an increase in the diabetes death-rate. There was a further rise in 1928, and now 1929 bids fair to reach the highest figure ever recorded. The death-rate for the first three months of this year, 23.8 per 100,000, was the highest ever recorded among the industrial policyholders of the Metropolitan Life Insurance Company, a group wide-spread throughout the United States and comprising a considerable percentage of the total population. The large increase was due in part to a wide prevalence of influenza and pneumonia which hastened the deaths of a number of diabetics. But apart from such deaths, there has been a large increase in the death-rate from diabetes.

Disconcerting as it may seem to the public, physicians and public health workers to find an increase in diabetes following upon the discovery and use of insulin, the experts of the Metropolitan Life Insurance Company in interpreting the statistics declare that but for the increasing use of insulin the death-rate would be still higher.

The fundamental cause of diabetes is unknown. Some change in the pancreas occurs which reduces its output of a secretion which transforms sugar into a form useful for energy and muscle building. Why the pancreas fails, in some cases, to produce a sufficient amount of this ferment is not known, but the resulting condition is diabetes. Insulin, derived from the islands of Langerhans in the pancreas of animals, has this power of converting sugar into usable form. It supplements the reduced amount of pancreatic secretion of the diabetic, but it does not change the diseased condition of the pancreas itself. It is a treatment, but not a cure and not a preventive. It does, however, enable the patient suffering from diabetes to live out his allotted span of life, usually in a fair state of health and comfort.

The use of insulin has increased, a study of fatal cases showed. According to information obtained from physicians insulin was given in over half the cases, or 63 per cent. of the 1,044 for which data were received; but of these, 46 per cent. were given insulin only during the last month before death. The deaths from diabetic coma are showing a small but encouraging decrease, which also testifies to the increasing use of insulin. Patients suffering with diabetes are living to a more advanced age, as shown by the more frequent occurrence at or before death of heart, kidney and circulatory diseases. This is further evidence of the improvement of the treatment of diabetics with insulin.

PYORRHEA IN FOSSIL ANIMALS

DR. ROY L. MOODIE says that if one were to ask what is the most prevalent disease to which the human race is subject, the answer would be pyorrhea. Pyorrhea has attacked the teeth of men almost from the beginning of the race. Undoubted traces of this disease are seen among the most ancient human relics. No continent was free from it. No primitive race was exempt. The

ancient Hawaiians and prehistoric Peruvians were afflicted in full measure. North American Indians, ancient and recent, suffered loss of efficiency and at times total loss of all teeth, because of this disease. The poison from this infection, draining into the systems of individuals, has been of incalculable detriment to the race. Its influence on the development of nations is still unrecognized.

One phase of the subject which has received little attention is the history of this trouble in early times, not only among ancient races of man but among fossil animals.

A distinguishing feature of the disease is the erosion, by chemical action, of the edges of the tooth sockets, and invasion of the socket by disease, loosening and finally causing the loss of the tooth. Among ancient skulls which have borne the vicissitudes of thousands of years one has to use caution in accepting a diagnosis of pyorrhea, because mechanical rubbing or breaking of the thin bone results in very deceptive appearances.

With these cautions in mind paleontologists have accepted evidences of pyorrhea among the mastodons of the Ice Age, as shown by the Cohoes mastodon mounted in the New York State Museum at Albany. Other undoubted evidences are found among the wolves and tigers of the California tar pits preserved in the Los Angeles Museum.

INSECT RESPIRATION

IF we want to tell how fast a man or horse or a cat is breathing, we watch his chest. But a study of an insect's respiratory process must concentrate on the abdomen instead. Not that the insect's thorax is not involved in breathing, but the principal body movements that take in and expel air for an insect are carried on by the abdomen.

This is among the facts set forth in a study of insect respiration by Dr. Milton O. Lee, of Harvard University, which will be published in the forthcoming issue of the *Quarterly Review of Biology*. Insects are the only large class of invertebrate animals that have ever successfully left the ancestral watery environment and learned to live on land and breathe air. In this way they resemble mammals and birds, the most highly successful air-breathing vertebrates.

The mechanism by which insects capture oxygen from the air and distribute it to their body tissues is quite different from the vertebrate lung. The air-breathing vertebrates pump air into and out of their lungs, and their red blood corpuscles carry the oxygen to the tissues. In the insects the breathing-tubes that open through most of their body-segments have many inward branches, reaching to all parts of the body, and indeed filling up all the space not occupied by other vital organs. Thus the air itself travels directly to the parts that need it.

The circulation of air through the insect body is as yet not at all well understood, Dr. Lee states. The part played by the abdominal muscles is obvious in many cases, but the details are obscure. There is evidence in some insects that air is pumped in through openings near the rear end of the abdomen and out farther forward in the body, and arrangements of valves and muscles to actuate them seem to bear out this theory.

LEARNING BY ADULT RATS

AGAIN psychologists are "proving it by rats." Young rats, middle-aged rats and elderly rats have been put through mazes and problem boxes in a laboratory at Stanford University in order to test learning ability at different stages of life.

A report of the experiment has been made in the monographs on genetic psychology by Dr. Calvin P. Stone. In one series of tests, old rats two years of age learned to find their way through a maze to a tempting dinner in about the same number of trials as lively youngsters. In various other tests no very great difference was found between young rats and adults of different ages. In one series of experiments, younger rats at first stumbled on to the trick of escaping from a problem box more quickly than their elders, but in the last trials the old rats made just as good time records as the young. The two-year-olds became especially proficient.

These results from the rat world fit in with recent educational investigations with human beings, which indicated that adults of 35 or 40 years of age can acquire new knowledge more readily than school children. Studies of animals should illuminate many of the obscure phases of human adult education, Dr. Stone points out, "since in animals it is possible to exercise a certain degree of control over the educative factors of the environment throughout the entire life-span of the individuals studied." Further studies with rats and rabbits are to be made.

ITEMS

PREDICTING weather conditions a whole season in advance may be taken out of the realm of guesswork and "goosebone prophecies" by scientific studies of the ocean. At the meeting of the Pacific Division of the American Association, A. F. Gorton, of the Scripps Institution of Oceanography, outlined recent work leading in this direction. In southern California heavy winter rains are usually experienced when cyclonic storms strike the land at low latitudes. The location of a permanent area of high atmospheric pressure, which hovers over the North Pacific, determines the course of these storms, and the scientists are now engaged in an endeavor to learn what factors affect its position and movements.

SMALL amounts of alcohol have been discovered in oranges that have been stored in an atmosphere which contained a high concentration of carbon dioxide, and a low concentration of oxygen. This result has been obtained by Mrs. Onslow and Dr. J. Barker, working at the Low Temperature Station, Cambridge, England. In one experiment the oranges injured by carbon dioxide contained 0.64 grams of alcohol in 100 cubic centimeters of orange juice, while controls kept in the air only contained 0.03 grams per 100 cubic centimeters. Oranges which had been frozen, then thawed and kept in the laboratory, showed practically no increase in alcoholic content. It is hoped that determinations of the alcohol content of oranges may serve to indicate the cause of certain abnormal conditions that are sometimes found commercially.