SCIENCE NEWS

THE SEPARATION OF ISOTOPES

Science Service

PROFESSOR JAMES KENDALL, of Columbia University, reports a new and ingenious method for separating atoms of the same elements having different weights. It used to be supposed that all the atoms of the same element had exactly the same atomic weight. But it has recently been discovered that this is not always true. Many of the elements are known to exist in more than one form; "isotopes" is the name given them.

Since the isotopes of an element have the same chemical properties it is not possible to separate them by chemical means, so they have hitherto escaped detection. What was known as the atomic weight was an average of the natural mixture of two or more atoms of different weights. Chlorine, for instance, was a puzzle, for its atomic weight figured out very close to 35.5, whereas it should have been a whole number, a multiple of the unit, hydrogen. But now we know that the chlorine atoms are of two sorts, one weighing 35 and the other 37, the two being mixed in minerals to average 35.5. But in order to separate them some physical means must be adopted.

One of Professor Kendall's methods is to fill a long tube with a jelly made of agar-agar containing salts in solution. In the middle is a short section containing chloride. When an electrical current is passed through the tube the chlorine moves slowly toward the anode. But since the chlorine atoms have different weights they may be expected to move with different speeds, and after they have traveled a hundred feet or so through the tubes the heavier should lag behind the lighter, so the front part of the chlorine section of the jelly will contain entirely one isotope and the back part entirely the other. This method may also be used for the separation of the rare earths which are so near alike in atomic weights and chemical behavior that it is a long laborious process to sort them out.

The practicability of the method has already been proved by running off preliminary heats with mixtures of two common substances, one of which was known to make slightly better time under the action of the electric current than the other. After the race had progressed only a few feet, chemical tests showed that a perfect separation had been effected. Unless, therefore, the heavy-weight chlorine atoms are capable of running a dead-heat with the light-weight chlorine atoms in spite of their handicap of avoirdupois (a possibility which is scarcely to be anticipated), a complete separation of isotopes will, for the first time in history, be accomplished.

THE ORIGIN OF COMETS

Science Service

ALL known comets are members of the solar system and are not vagrant wanderers from interstellar space, according to mathematical investigations made by Professor Stroemgren, the royal astronomer of Denmark. After twenty-two years of research on this problem Stroemgren refutes the older belief that some comets drift in from the vicinity of other stars.

Until the time of Tycho Brahe, three hundred and fifty years ago, comets were believed to be phenomena of the earth's atmosphere. Tycho Brahe succeeded in proving that they are celestial bodies, and mathematical astronomers later were able to compute the orbits around the sun. Comets were shown by Newton, Halley and their successors to be governed by the universal law of gravitation.

The movements of comets, like those of the planets, are controlled by the sun. The gravitating power of the great amount of matter concentrated in the sun dominates this region of space. Jupiter, Mars, Earth and the other planets, however, seriously disturb the cometary motions. Astronomical calculations show that the orbits or paths of comets around the sun are elliptical, parabolic or hyperbolic. Elliptical paths are closed; comets that travel in such orbits return from time to time to the neighborhood of the sun, where they become more luminous and may be observed. The parabolic and hyperbolic orbits are not closed, and comets traveling along those paths do not return to the solar system.

The new theory maintains, however, that all comets originally traveled in elliptical or closed orbits, periodically coming closer to the sun from the outer regions of the planetary system. It maintains that the material composing comets is a part of the original nebula out of which the sun and his family are thought to have formed. According to this theory, the disturbing influences of the planets have changed the orbits of some comets from the closed paths to the open form. That is, the perturbations by the planets have resulted in throwing some of the original material of the solar system off of its beaten track and out into the emptiness of interstellar space, never to return.

The planets have no difficulty in disturbing greatly the motion of a comet, as the amount of

matter in a comet is extremely small. Although there is but little material in a comet's head, we frequently find it expanded, because of its great rarity, to enormous dimensions. Recent photographs made at the Harvard College Observatory show that Baade's comet has a volume nearly ten times that of the earth.

This faint comet is now outside the orbit of Mars, slowly receding from the sun.

THE CAVE MEN OF EUROPE

Science Service

WITHIN fifty years, according to Dr. Aleš Hrdlička, of the Smithsonian Institution, great discoveries bearing on man's development from his ape-like ancestors will be made. Just back from an examination of the known sites of ancient man in Europe, Dr. Hrdlička stated that the deposits of early skeletal remains are vast and emphasized the importance of organized, systematic research in bringing their precious contents to light.

"The surface has hardly been scratched," he said, "by discoveries of early man so far made in west central and south Europe, while nothing has been done to explore the tropics for evidence of early man and his predecessors which are probably present there. Expensive expeditions are constantly being fitted out to dig up pottery and other recent relics of man, but the development of man himself from more primitive forms, the very essence of man's history, is largely neglected, or carried on in a haphazard manner or by amateurs.

"At Ehringsdorf near Weimar and Obecassel, Germany, at La Quina, France, at Predmost, Moravia, and elsewhere, primitive cave-dwellers of the Neanderthal or later type lived 150,000 or more years ago and the accumulation of various cultural remains left by them is very striking.

"At La Quina the talus containing remains of ancient man extends along the low cliff bounding the valley for nearly two miles, with a strong probability that there are caves in the cliff in which man of a hundred thousand years ago found shelter; and of these accumulations not one fiftieth has yet been examined. They abound in worked stones and bones of long extinct animals hunted by the ancient human beings who here and there have left the remains of their own skeletons in these refuse heaps and clays."

The skulls of these early inhabitants of Europe, though probably ancestral to those of man of today, are distinctly different from those of any modern races. They are heavy and low browed, heavy-jawed, and the lower jaw has as yet no chin prominence, the chin in fact is often markedly receding as in the great apes. While we speak of these people as cave-men, several of the specimens recovered are probably women, while recently a complete skull of a cave-child was found, the first so far revealed.

In the ten to hundred thousands of years represented by these remains, there are noticeable differences in the earlier and later skulls. There is a gradual progression toward the modern type, but all the stages are not yet known by well preserved specimens.

"These people represent various links in the chain of man's evolution from early apes. Man did not develop from any of the present day apes, but represents a separate line of descent from the pre-human form which in turn arose from long extinct simian forms."

Systematic explorations of caves in the Malay peninsula, India and Africa, Dr. Hrdlička thinks, is an urgently growing need and would in all probability yield most important evidence on the problem of man's rise in the world. There is a great opportunity for America to lead in these explorations, he believes. But he says that in this country there is no prospect of finding any of these early men or ape-men, as the earliest Americans came to this continent from Asia already as true men.

EARTHQUAKES

By Dr. Bailey Willis, professor of geology, Stanford University.

Science Service

EARTHQUAKES are a natural occurrence in certain regions of the world where the mountains are alive. There are districts, like the Atlantic Coast, where they are dead, but around the Pacific and in a great belt which reaches across Asia and the Mediterranean the mountains are growing. In their growth large masses comprising many thousand cubic miles of rock are pressed against each other but are held by friction until the strain becomes too great. They then slip and an earthquake occurs.

This is the modern theory of earthquakes. It was developed through the studies of the great earthquake of 1906 which caused the fire that destroyed San Francisco, and it has been demonstrated since by observation of many minor earthquakes and by a study of the lines along which they occur.

We often speak of an earthquake plane as a fracture, but it is not really a break. It is the surface between two great masses which never have been united, but which for ages have been slipping past each other; and where this plane comes out to the surface of the earth we have a

line which is sometimes called an earthquake rift. The greatest of these rifts, so far as it is known, in the United States extends through the coast ranges of California for a distance of six hundred miles. It passes just west of San Francisco, to the east of Los Angeles, and disappears in the Gulf of California. Along the San Andreas rift, as it is called, earthquakes have occurred at different times in different sections; the most recent was the quake of 1906, which covered a stretch of one hundred and fifty miles with San Francisco near the center. South of that stretch for some three hundred miles there has been no movement since 1857 when there was a severe shock, the mark of which may be traced across the desert plains like an irrigation ditch. Still further south there have been several recent shocks, but none of great violence, although there is evidence of considerable activity in the section east and south of Los Angeles.

In view of the fact that we can thus locate certain lines along which earthquakes have occurred, we are able to speak of live earthquake rifts as we speak of live volcanoes. We know by the form of the volcano or by the occurrence of eruptions within historical time that it is potentially or actually active, and much the same may be said of earthquake rifts. They are lines of special danger on which no dam or schoolhouse or skyscraper should be located. They should also be avoided, as far as possible, by railroad lines, bridges, aqueducts and other public works, and yet it happens that they often run through valleys where such work is suggested by the conditions of the ground. As long as we remain ignorant of their position, we run the risk of inviting destruction, but it is not difficult by proper studies to locate the lines of danger on a map and to make the information public for the benefit of engineers and others.

Thus it happens that a map of California, showing the lines of active earthquake rifts and also of faults that are believed to be inactive, is about to be published by the Seismological Society of America as a result of work carried out in cooperation with the Advisory Committee in Seismology of the Carnegie Institution of Washington. It is, however, but one item in the program of that committee, which embraces plans for the investigations of earthquakes in many relations.

It may perhaps be asked of what use is it to study a phenomenon which is as sure and as inevitable as an eclipse of the sun. Since we can not stop it and probably can not predict it with certainty, what practical benefit can we hope to derive from an investigation of it? There is, of course, the answer that we wish to know; we wish to understand our earth and all its manifestations; but apart from that, as has already been pointed out, the lines along which earthquakes are likely to occur and are most dangerous may be determined and it seems not impossible that if we can perfect our knowledge we may be able to devise methods of forestalling their disastrous effects by the selection of safer locations or by appropriate methods of construction. It is clearly recognized, for instance, that the destruction of San Francisco was in large measure due to the fact that its principal aqueduct followed the earthquake rift for many miles, whereas now it has been located along a mountain range which, if it moves, will move as a block and will not dislocate the pipe line.

STUDY OF CHILEAN EARTHQUAKE

Science Service

WITH the avowed purpose of capturing and embalming the recent Chilean earthquake, Dr. Bailey Willis, professor of geology at Stanford University, will sail for South America on January 11, as the representative of the Carnegie Institution of Washington.

For four or more months, Dr. Willis plans to search for and study the great slipping of the earth that has left its mark on the landscape and rocks of Chile. Traveling in the old fashioned way on horseback and with pack mules in a country with few roads and inhabitants, Dr. Willis will work under conditions similar to those that existed in the American Far West before the Ford became omnipresent. It will be necessary to survey along a stretch of coast extending about one thousand miles north of Valparaiso, he believes, although the details of cooperation with Chilean scientists have not yet been fully worked out. For four years, Dr. Willis has been consulting geologist to the Argentine government and he is acquainted with South American conditions.

The similarity between the earthquake conditions in Chile and California is one of the reasons for American interest in the earth movements along the Pacific coast of South America. Since the California earthquake of 1906, scientists have been studying the causes of that disaster and other quakes in that region. The investigations of Dr. Willis in Chile are expected to throw light on California conditions, and the work done in America will aid him in interpreting Chilean conditions.

Chile possesses a seismological bureau at the head of which is Dr. Montessus de Ballore, one of the most eminent earthquake specialists in the world. The Chilean scientists will cooperate with Dr. Willis in his investigations. Señor Don

Baltram Mathieu, the ambassador from Chile, is greatly interested in this cooperation between the geologists of America and Chile.

OUR FORESTS

The New York State College of Forestry

THE wood supply of the future must be obtained chiefly from land that has been denuded of trees and which is now producing little or no merchantable timber. This is inevitable. Our wood supply can not be obtained from the forests that are left for more than one generation. We have already cut or burned over about five sixths of our original timbered area. Timber in the United States is being cut and destroyed nearly six times faster than it is growing. The demand is increasing. As the demand increases the consumption of the remaining timber will increase proportionately. We have enough left to keep us going at the present rate of cutting from twenty-five to thirty years. That is all. After that, timber for commercial purposes will be of inferior quality and of great scarcity. A timber famine will confront us. Our industries and the people at large will feel this stringency of wood supply severely. Civilization can not progress without forests.

It requires about fifty years to grow a merchantable white pine tree. It requires from thirty to forty years to grow a spruce tree for pulpwood. It requires from sixty to seventy years to grow a spruce for merchantable lumber size. Fires each year burn over many times more land than all the tree nurseries in the United States could supply with plants. In the Adirondacks and Catskills since 1903 approximately 1,200,000 acres have been burned over, but only 70,000 acres have been reforested on public and private land in the entire state during that period.

It takes time, labor and money to plant trees. It would mean many years of reforesting before an adequate area could be planted. The federal government, the states and private owners should put into effect a comprehensive planting program commensurate with our rapidly increasing needs. It is up to the people to see that this is done. Preceding generations have "passed the buck" to us. We are going to be the ones to pay. The longer we delay reforesting, the higher will be the price. How much we pay depends on how long we wait.

THE NEW "INFLUENZA"

London Times

A SHORT time ago a distinguished physician expressed the view that "the face of disease" is changing. He said that practitioners in many parts of the country told him that they could no longer easily recognize the text-book descriptions of the various maladies.

This statement has met with no contradiction. It seems to derive added weight from the rather unusual character of the mild epidemic now prevalent in London and elsewhere, to which reference has already been made in these columns. This epidemic seems to be regarded as "influenza," yet it scarcely conforms to the usual picture of that disease. Nor is there, as yet, any appreciable rise in the mortality from influenza, which, in London at any rate, remains very low.

The most conspicuous feature of the present trouble is a tendency to sickness or loss of appetite accompanied by various nervous disorders ranging from neuralgia to profound depression. Loss of spirits seems to be almost invariable; this, however, occurs so insidiously that the patient tends to take a "mental" as opposed to a physical view of his condition. Recovery is not very rapid and some patients appear to remain unwell for several weeks.

There is no doubt of the epidemic character of the complaint, for large numbers of people are affected. On the other hand, it is difficult to use the title "influenza," because there is lacking the usual cold, or coryza, of that complaint and because the ordinary complications of influenza have not appeared. Nevertheless, we may note that the temperature this winter has not been so low as that experienced in December of last year, when influenza developed on a big scale.

There is certainly need at the moment for a careful study of the new features of disease. If, as seems probable, our text-books are obsolete in certain directions, it is time that the necessary emendations were made. Names such as "influenza" have been overworked; their too ready use is apt to obscure ignorance and so retard study.

ITEMS

Science Service

FREE medical advice by radio is furnished to ships at sea by the U. S. Public Health Service.

THE city of Calais, France, has started a municipal dairy and dairy farm, the milk from which is to be tested by health officers and the cows fed scientifically to keep the quality up to that prescribed for young babies.

DUTCH threshing machines are designed to preserve, as far as possible, the length of the straw, which is used in making strawboard.

AN international committee appointed by the League of Nations is working to standardize serums for the treatment of pneumonia, meningitis, diphtheria and other diseases.