SCIENCE NEWS

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SCIENCE IN 1924

SCARLET fever conquered, mercury turned into gold, the world circled by airplanes, photographs sent by radio and wire, stars given thirty trillion years of life, new stellar universes a million light years away discovered, vitamins isolated, ultra-violet light found to influence life processes.

These were some of the signal triumphs of science during 1924.

The discovery of the cause and the devising of a cure and susceptibility test for scarlet fever was the most important development of the year. Drs. George F. Dick and Gladys Henry Dick, husband and wife, working at the John McCormick Institute of Infectious Diseases, Chicago, demonstrated that hemolytic streptococci caused scarlet fever, that the use of a filtrate from a culture of this organism injected under the skin would produce a reaction if the person were not immune to scarlet fever, and that a preventive serum could be produced. Dr. A. R. Dochez, of New York, and Dr. F. G. Blake, of the Yale Medical School, also made contributions to the conquest of scarlet fever. A gradual but successful campaign against this disease will be the result of the development of these new weapons.

From Germany came reports that the age-old dream of the alchemists, the transmutation of a base metal into gold, has been accomplished. Professor Miethe, of Berlin, found minute amounts of gold in the mercury of a mercury vapor lamp that had been used in experimental work. Although other laboratories have not yet checked the results, and the quantities of gold are far too small to be commercially interesting, it is admitted that production of gold from mercury is theoretically possible and may have been accomplished.

As a consequence of the new physics, J. H. Jeans and A. S. Eddington, English astronomers, have determined that the life of a typical star must be at least thirty trillions of years. To match this immense figure, American astronomers have measured outposts in the heavens and determined that they are so far away that it would take light travelling at 186,000 miles a second a million years to come from them to the earth. The spiral nebulae, universes consisting of uncountable hosts of stars, are as far as this from the earth. This was the discovery of Dr. Edwin Hubble, of the Mt. Wilson Observatory. Dr. Harlow Shapley, of the Harvard College Observatory, also determined that the nebula N. G. C. 6822 is outside the Galaxy and is also a million light years away from our part of space.

As the culmination of many years of research and the perfection of instruments for communication, photographs were transmitted over telephone wires and radio within this country and from London to New York by radio across the Atlantic.

U. S. Army airmen circumnavigated the earth by air, thus becoming the Magellans of a new era.

One or more of the elusive food factors, the vitamins, have at last been isolated, and the relation between the antirachitic vitamin and ultra-violet light explained through biological researches at the University of Wisconsin and Columbia and Yale Universities.

THE GEOLOGICAL RECORD AND THE AMERICAN CONTINENT

IMAGINE an earthquake 200 miles wide, and stretching from one end of North America to the other! This is what happened on the west coast of this continent on at least two successive occasions, before the gigantic forces which folded and wrinkled the earth's crust were finally spent. Why geologists think these holocausts must have taken place was the story unfolded to the American Association on December 31, by Dr. Charles D. Walcott, secretary of the Smithsonian Institution and retiring president of the association, who has just completed a study of the record of this period in geology as it is written in the fossils and formations of the Rocky Mountains. Both oceans, and a great inland sea, washed up and down and in and out of the trough which was formed as a result of the first of these "quakes." The second exposed fossils through which can be traced the evolution of plants and animals.

Dr. Walcott said: "Many millions of years ago the downward pressure of the rocks beneath the Pacific ocean forced the lighter rocks of the western Americas to fold, crumple, break and often slide in great masses over one another. A great feature was the formation of a trough from 100 miles to 200 miles in width, extending from the Arctic Ocean to southern California, and lying 100 to 300 miles inland from the Pacific margin of the continent.

"In this trough the waters of the Arctic and Pacific passed freely and the animal life of both oceans migrated north and south and often mingled. The rivers entering the great 'Cordilleran Trough,' as it is called, brought pebbles, sand, clay and mineral matter in solution and the tidal currents and waves spread the sediments along the shores and far out over the bottom of the inland sea. This went on for countless ages, until 60,000 feet or more in thickness of sediments gathered in the deeper sections of the trough. All through the ages the marine life gradually changed as its evolution went slowly forward in the waters of the great Pacific area. Large groups of life came in, flourished for a few centuries, and disappeared, to be replaced by other and later faunas. Occasionally other forms came in from the Arctic, the interior continental seas and rarely the Atlantic province. Great continental seas sometimes crossed the eastern barriers of the trough and swept over the area, bringing new sedimentary conditions and new life. The transgressing seas often wore away the rocks of

previous ages and left a graphic story of their advance.

"After the close of the many-million-year old Paleozoic epoch the pressure came again from the Pacific and the sandstones, shales and limestone formations of the Cordilleran Trough were folded, broken and often pushed up into mountain ridges to form the western shore line of continental marine and fresh water seas, in which are the records of the development of the vegetable and animal life from the tree ferns to the giant sequoia and the cold-blooded fishes and lowly reptiles, to the warm-blooded mammal and finally man."

PLANT FOSSILS

WHAT were the climates of geological periods millions of years ago? Can there be a science of "paleoclimatology"? It looks difficult, for clouds and sunshine and lightning flashes do not leave bones or shells behind them. But Dr. David White, chairman of the division of geology and geography of the National Research Council, has an answer. He studies the records of ancient climates as they left their mark on the plants of those remote periods, which did leave their fossils behind them. Speaking before the Washington meeting of the American Association for the Advancement of Science, he summarized his studies.

In the most ancient of the rocks that yield any recognizable organic remains, assigned by geologists to Cambrian, Ordovician and early Silurian periods, there were few or no land plants. Remains of primitive blue-green seaweeds, however, indicated an abundance of sunny weather over the warm, shallow seas. Later in the Silurian, types of amphibious plants evolved from the seaweeds; they required immersion part of the time, but were stiffened sufficiently to endure exposure to the world above the waters for considerable periods.

In the next period, the Devonian, the development of land plants had proceeded to a point where they formed extensive swamps, as demonstrated by beds of peat; and huge seaweed-like things with trunks three feet in diameter stood up in the sun. The climate must have been rather even, for the plants did not develop annual rings as trees do now; and there was plenty of dry, sunny weather.

Then came the earlier coal age, the Mississippian. This was, for the most part, warm and rainy, apparently all over the earth, for fossils of subtropical plants are found in the Arctic. The coal age proper, or Pennsylvanian, followed; also with an equable, and apparently warm climate well distributed. The subtropical quality of the climate is indicated by the richness of the plant remains, the great thickness of the coal beds, and by the lace-like delicacy of the leaves of many of the plants. There were extensive swamps, for fossil-tree stumps show thickened bases and "knees" such as are found in swamps to-day. There was considerable wind, for winged seeds were common. Again, in the latter part of this age, the fossils show that harder times had come, for the delicate-leaved plants disappeared, and tougher plants, inured to desert conditions, began to show up.

The early period of geology closed with the Permian, which ended with the dawn of the Mesozoic, or Middle Ages of geology. This Permian age began with a glacial epoch, such as the earth experienced recently, but more severe and longer-enduring. Queer fern-like plants, adapted to severe climates, mark this frosty time. Then came another long season of equable weather, though part of it at least had seasons of cold or drought, for annual rings again appeared in perennial plants. But the great climatic feature of this age was its close, when the whole world apparently was scourged with drought. Plants adapted to desert conditions of life dominated the earth, and the first ancestors of certain modern conifer families appeared.

According to Dr. White, we are living in an abnormal period. "Relative equability and mildness of climate are, geologically speaking, normal," he said. "Great climatic range and variability, both seasonal and geographic, are abnormal, and are, I believe, confined for the most part to periods of diastrophic revolution, such as that in which we live."

APPLICATIONS OF X-RAYS

DOCTORS and detectives, chemists and jewelers, farmers and mechanics; all these and others now apply X-rays to their work, said Professor George L. Clark, of the Department of Chemical Engineering at the Massachusetts Institute of Technology, in a paper read before the American Association for the Advancement of Science.

"We little realize," said Dr. Clark, "in the process of application of X-rays to diagnosis of human ills and to the obliteration or alleviation of suffering, that this same agency is being applied by the botanist, the physicist in his searching of atomic anatomies, the chemist, the metallurgist, the great industrial corporation or even the ordinary mechanic, to the solution of almost innumerable problems."

Dr. Clark divided the applications of X-rays into three classes; first, those depending upon direct utilization of the radiations; second, the determination of the structure of crystals, and, third, the testing of theories of the structure of the atom. As examples of these applications, he cited forty-one different uses to which the Röntgen rays are put. Besides the more familiar ones of medical diagnosis and the treatment of tumors, they are used now, as the result of the invention of a small portable outfit, by plumbers to find the location of pipes in walls, electricians to locate wires and by carpenters to find beams and nails before proceeding on new constructional work.

Botanists have made experiments with them and it has been found that seeds exposed to their action germinate more rapidly. Some chemical reactions are also accelerated by them, while others are retarded. When precious stones, such as diamonds, are exposed to them, they fluoresce, or give off light, and this permits them to be used by jewelers to detect imitation jewels.

In the second group, largely the result of the work of two English scientists, Sir William Bragg and his son, Professor W. H. Bragg, great advances have been made, and it has been found possible to determine just how the

molecules that make up crystalline material are arranged. It has also been found recently, by a Belgian, Dr. Smidt, that the structure of the molecules of liquids may be determined.

The latest developments have been in the third group of applications, and has been found useful as a check on theories of the structure of the atoms themselves. Also this work has led to the prediction and subsequent identification of a new element, hafnium, and some of the conclusions have been found to check with the theory of relativity.

Who would have dreamed in 1895, when the Röntgen rays were discovered, that in 1924 they would have these numerous applications, Dr. Clark concluded, and asked "Whither shall the science of X-rays have led us in another thirty years?"

THE SOURCE OF MUSCULAR ENERGY

WHETHER muscles can secure from fat the energy which they need to contract and relax was the question discussed by Dr. Graham Lusk, of Cornell University Medical School, at the meeting last week of the American Physiological Society, meeting in affiliation with the American Association for the Advancement of Science. Dr. Lusk answers "yes" to this query, which is one of prime importance to students of the human body, since it bears on the particular function in the diet of two of its chief constituents, *viz.*, sugars and fats, and it likewise determines what changes must take place in these two classes of nutriment before they can serve as the source of the body's muscular energy. European physiologists, headed by Dr. A. V. Hill and Dr. Otto Meyerhof, maintain that sugars alone are the source from which the muscles derive their energy, but Dr. Lusk opposes this theory. It requires that all the fuel which supplies the muscle machines must first be converted into the form of lactic acid, which is a carbon-containing acid present in sour milk.

Dr. Lusk cited the case of a dog which had fasted for 13 days. When such an animal ran at the rate of three miles an hour, it consumed fat alone. Supporters of the "lactic acid" theory also contended that sugar is a more efficient food to use than fat, but this claim is not allowed by Dr. Lusk. A fasting dog converted fat into energy just as efficiently as the same animal which had eaten a mixed meal, containing plenty of sugars.

Dr. Lusk stated that the production of fat in the body from carbohydrate, or sugar, is a well-recognized occurrence, but he warned that this observation must not be included as evidence in favor of a theory which requires that sugar must be manufactured out of fat, before the latter becomes available to supply part of the body's muscular energy.

"There is no existing evidence to support the conclusion that fat must first be converted into lactic acid in order to be available for muscular power," asserted Dr. Lusk in throwing aside the deductions of the European scientists.

ITEMS

CHEMICAL and physiological tests, including scientific measurement of the amount of alcohol in the breath, furnish the most accurate method of determining when a man is intoxicated, Dr. H. L. Hollingworth, of Columbia University, told psychologists this week in Washington. He reported experiments in which accurate measurement was compared with the subject's own report on his condition and with observations of the subject's general appearance and conduct made by witnesses. Witnesses, he found, could detect only the largest dose used and its effects. The subjects themselves could identify effects of small doses, but measurement correctly indicated much smaller doses. The poorest of these methods, that of relying on the report of witnesses, might be useful for practical and legislative purposes, but such rough observations should not be confused with the final verdict of science.

THE long, gray festoons of Spanish moss, that form romantic draperies on the trees in the South, must get its food somewhere for all plants must. But since it has no roots and spends its whole life in the air, how does it get the necessary mineral salts? Drs. Edgar T. Wherry and Ruth Buchanan, of the Bureau of Plant Industry, U. S. Department of Agriculture, have been asking themselves this question, and repeated it before the Ecological Society of America. "Analyses of its ash showed it to contain unusually large amounts of sodium, iron, silicon, sulphur and chlorine," said Dr. Wherry. "A sample from near the sea-coast proved to contain more chlorine than one from some miles inland, suggesting that the source of this element is spray from the ocean which the wind carries up to high levels, and is then brought down by the rain. The sodium and sulphur may reach the plant in the same way, but where the silicon and iron come from is a mystery."

EVOLUTION'S queer trick, that took a plant that looked like a fern and turned it into a plant that looks like a palm, though it is neither a fern nor a palm, was brought out in an address by Professor Charles J. Chamberlain, of the University of Chicago, before the botanical section of the American Association for the Advancement of Science. The cycads, sometimes called "cycas palms," have been the life study of Professor Chamberlain, in pursuit of which he has travelled all over the tropics of the world, especially in southern Mexico, Cuba, Australia and South Africa. These plants are of little economic importance to-day, but the fossil remains of their ancestors are of immense importance, for out of the fern-like leaves of the so-called "fern cycads" of the Paleozoic Age was formed most of the coal of the world.

COPPER *hydroxide used as a spray is not only a strong* fungicide, but fifteen times more active than the more common spray, Bordeaux, Dr. Henry D. Hooker, of the University of Missouri, reported to the American Society for Horticultural Science. He believes that the active ingredient of Bordeaux mixture is copper hydroxide. An advantage of copper hydroxide is that it leaves no stain on the trees.