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THE RESPIRATION FERMENT

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THE respiration ferment, described as ruling the organic world, has been made artificially in the laboratory by Professor Hans Fischer, of the University of Munich, who has thus made one of the most important contributions ever made in biochemistry. This achievement is far-reaching and may lead to isolation of the vitamins themselves.

Professor Fischer's work confirms the research of Dr. Otto Warburg, who last year demonstrated the nature and rôle of this important ferment. The respiration ferment is a hemin compound and its synthesis makes possible the artificial production of hemoglobin, the red coloring matter of the blood. In the higher animals, hemoglobin is a transport agency for oxygen, carrying it from one place in the body to another. But the respiration ferment is a substance which takes up the atmospheric oxygen, which was transported by the hemoglobin, and transfers it to certain organic substances which in turn become oxidized. The respiration ferment or enzyme rules the organic world, because in everything that happens in living matter, respiration furnishes the driving force. It is found in all living cells.

The synthesis of this compound is a good example of how optical instruments can aid in the solution of biochemical problems. Measurements of transmission or absorption of light assisted in the solution of this problem.

Dr. Warburg, seeking a method to prove whether or not the respiration ferment was a hemin, measured the absorption spectra of a model pigment, hemonicotin, and determined its action curve. He then obtained the action curve of the respiration ferment, using yeast cells in which it is contained. Similarity between the action curve of the respiration ferment and of a true hemin compound showed that the ferment was a hemin compound also.

It is this compound that Professor Fischer has synthesized. This respiration ferment may become therapeutically important. It is a question whether it is more or less important than the four pyrrol nuclei with which Professor Fischer started its synthesis. Hemin and chlorophyl, the green coloring matter of plants, both contain these four pyrrol nuclei. It is possible that the vitamins may be found in these very pyrrol nuclei. In that case, organic chemists have vitamins by the pound in their laboratories and do not even know it.

THE PRESERVATION OF FORESTS

THE outcry of a generation ago against a threatened famine of forest products has been justified, even though the famine did not materialize, according to a statement made by E. A. Sherman, of the U. S. Forest Service, before the joint meeting of the American Forestry Association and the Florida Forestry Association. The failure of the famine to make itself felt is in fact due to the effectiveness of the warning in inducing owners and public custodians of timber to take steps unthought of in the old "flush" days, especially in the matter of fire prevention, waste elimination and the seeking of timber substitutes.

The new task of the forest conservationist, Mr. Sherman continued, is to cooperate in the solution of the problem of soil exhaustion and erosion, which has now assumed alarming proportions. "Our fields have been robbed of their fertility almost beyond human comprehension," he said. "Millions of acres have through our ignorance been rendered relatively worthless. Not for one moment would the citizens of any county or state under our flag permit one of its number to transfer a single acre of our territory to a foreign jurisdiction. The time is not ten years distant when public opinion will just as relentlessly oppose permitting the economic value of a single acre to be buried in the Gulf of Mexico.

"The far-sighted thrift upon which was founded that part of the common law which places a taboo upon waste is still sufficiently inherent in our people to assure us that it will be applied as soon as the man in the street realizes the presence of that waste and its extent. He will insist upon prohibiting forms of agriculture that result in a permanent shrinkage in our total agricultural domain. Economic pressure and the pressure of public opinion will combine to exclude certain classes of land from cultivation until such time as such use justifies the investment necessary to adapt them for permanent tillage. Meanwhile such lands may serve a useful and very valuable purpose as forests. Forestry use not only safeguards the fertility of the soil from destruction, but actually contributes to its upbuilding."

RUBBER-PRODUCING PLANTS

THERE are easily 1,200 species of plants in the world that have rubber in their veins, as Thomas Edison said in his recent birthday message. There are probably nearer 12,000 such species, if we take into consideration all that have even a little rubber. The problem is to make any of these plants that are hardy in temperate climates into paying sources of the gum that bounces.

If Edison's hopes of establishing rubber plantations in the United States are to be realized, either hardy forms of the present rubber-yielding plants of the tropics will have to be evolved, or certain rubber-yielding plants native to the temperate zones will have to be bred up to a point where their rubber content will pay for its extraction.

All the present rubber trees and vines are warm-climate plants. The Para rubber tree, Hevea, which now produces by far the larger part of the world's crop on the East Indian plantations, is decidedly a tropical form. It will grow in southern Florida, but will only thrive

when grown near the equator. It is out of the question for the United States proper, though it would grow in the Canal Zone and the Philippines.

The original "India rubber" of the Orient was the product of a species of fig, the same tree used as an ornamental in thousands of apartments, and in larger size as a display piece in many greenhouses. This tree is slightly hardier than the Hevea, but is still very sensitive to frost, and could hardly be expected to pay its way even in the South unless new varieties better adapted to our climate can be produced.

Perhaps third in present importance as a rubber producer is the Madagascar rubber vine, related to our milkweeds, which Mr. Edison is now trying out in the South. Even in the tropics, it now produces only a small fraction of the world's rubber, but it might be exploited more advantageously by plantation methods and with more modern means of extraction than those now practiced in its native home.

In our own semi-arid Southwest, and more extensively in the adjacent states of Mexico, there is a native bush, the guayule, which contains rubber in paying quantities. It has the distinction also of yielding its rubber as tiny bits of the pure substance, not as a milky juice or latex which has to be given complicated and expensive treatments before it can be used. Guayule is now being cultivated by a corporation which has a large plantation in southern California, but even this native rubber plant requires the desert heat for profitable growth and holds out little hope of becoming adapted to the colder North.

There remain native plants like the milkweeds and dogbanes, which yield a milky juice containing a little rubber or rubber-like material. These are perfectly hardy in the North, and very prolific—frequently too prolific from the point of view of the farmer. But their content of resilient gums is so low that it would be a bold undertaking to try to make them into commercial sources of rubber, even with the best methods now at the disposal of the plant breeder.

THE ERUPTION OF KILAUEA

"KILAUEA flashed into magnificent eruption at 1:00 A. M., Hawaii time (6:30 A. M. Eastern Standard Time), this morning." (February 20.)

This radiogram, received by the U. S. National Park Service, fulfils in spectacular fashion the prediction of Dr. T. A. Jaggar, of Volcano House, Hawaii, government volcanologist, that an eruption might be expected this year. The prediction was published by *Science Service* on January 23, and has been made good in less than a month's time by the volcano on whose rim Dr. Jaggar has lived, watching, for more than half a generation. The volcano forms part of Hawaii National Park.

Washington specialists in volcano science received the news with great interest. "It has been a long time since the last major eruption of Kilauea," said Dr. A. L. Day, director of the geophysical laboratory of the Carnegie Institution of Washington. "We all felt that something was due, and even over-due, to happen."

No report of any damage or loss of life was reported in the first news of the eruption, and it was not anticipated that any serious harm will be caused. Kilauea enjoys the reputation of being a spectacular but on the whole a well-behaved volcano, whose eruptions are not of the dangerously explosive type such as wiped out Pompeii in the early days of the Christian era, and devastated Martinique less than a generation ago. Such explosions are caused by the penning up of the steam and other gases in the vent until they reach bursting pressure.

Kilauea has a huge safety valve, known as Halemaumau Pit, in the southwestern end of its huge oval crater, nearly three miles across at its greatest diameter. The constantly boiling lava in this pit gives off vast quantities of steam and hot gases, and vents some of the superfluous energy of the volcano, which might otherwise make Kilauea a menace to all life in Hawaii. Only when the lava on the lake becomes partially "frozen" is there any possibility of explosive eruption.

There are two major eruptions on record which displayed explosive phases. One of these occurred in 1825, when the noted English writer, Lord Byron, was visiting the islands. He was awed by the thunderous cloud of steam that rose from the volcano and by the great showers of falling stones and ashes.

The other explosive eruption occurred in 1789 and 1790, while the islands were still under the rule of native monarchs. A division of King Keoua's army, bivouacked indiscreetly close to Kilauea, was annihilated. Native eye-witnesses reported that the eruption was preceded by violent earthquake shocks, terrific thunder and lightning, and a dense cloud of darkness that rose from the crater and enveloped the entire region.

But during the past century there has been no eruption of this type. Kilauea is almost ceaselessly active, but its activity consists mainly in the rise and fall of lava within the crater. It seldom overflows the rim, and as a matter of fact does not often climb out of the deeper pit of Halemaumau itself on to the floor of the crater. When the lava does rise high enough to overflow the crater it usually courses quietly down the mountainside, burning its way through forests and plantations that may happen to lie across its path, but not causing widespread devastation. The same relatively quiet lava flows are characteristic of Kilauea's sister volcano, Mauna Loa. Mauna Loa has a smaller crater than Kilauea, but is more than 10,000 feet higher, reaching an altitude of more than 12,000 feet.

The studies of Dr. Jaggar have shown a periodicity in the activity of both volcanoes. A crisis in the affairs of Mauna Loa comes about every four and one half years, and Kilauea's lava rises highest at intervals of about nine.

REFRIGERATION FOR THE COOLING OF MINES

REFRIGERATION, which has entered the kitchens of thousands of homes in the past few years, is now about to penetrate the depths of metal mines to make working

conditions a mile or more below the earth's surface more bearable for those who extract valuable ore from the rocks.

R. W. Waterfill, ventilating engineer of Newark, N. J., reported to the American Institute of Mining and Metallurgical Engineers, meeting in New York City, that at present mines that are deeper than 7,000 to 8,000 feet can not be successfully worked because at those elevations workable atmospheric conditions can not be maintained by circulation of the air alone. Air circulated from the surface to the deep workings is heated by compression and by the heat of the rocks, which is given off in increasing quantity as the depth increases.

By placing a specially designed refrigerating and air-treating unit underground near the workings to cool the air and rob it of its humidity, mining can be carried on at greater depths, Mr. Waterfill predicted.

Tests have shown that when the temperature is over 94 degrees Fahrenheit the wearing of clothing is beneficial as it promotes cooling through greater evaporation. Moreover, when the temperature is 100 degrees and the air is saturated with moisture, moving the air with a fan gives no relief. Under conditions of 100 degrees temperature and 100 per cent. humidity, the work that can be accomplished is only 40 per cent. that when the air is 90 degrees and completely saturated and only 30 per cent. that when the air is 100 degrees and only 60 per cent. saturated with moisture.

THE CALIFORNIA EYE GNAT

FIFTEEN HUNDRED children in the Coachella Valley Union High School, at Thermal, California, suffering with serious conjunctivitis, or pink eye, due to the ravages of the California eye gnat, have caused the House Appropriations Committee to insert an item of $12,000 in the second deficiency bill, for the purpose of allowing experts from the U. S. Bureau of Entomology to go to California to see if they can destroy this pest.

A letter to Dr. C. L. Marlatt, chief of the Bureau of Entomology, from E. P. Carr, president of the Coachella Valley Mosquito Abatement District, was read into the record, according to hearings before the committee, just issued.

The gnat, known scientifically as *Hippelates pujio,* is said to have increased to an alarming extent in the Coachella Valley in the last five years. It hovers in swarms about the eyes, noses and mouths of persons and stock. Small children are especially helpless against it. Over one half the school children in this region now have serious eye trouble caused by the gnat, and 10 per cent. of them have contracted chronic trachoma.

The district and the state of California have both done all that they can do, but have not been able to locate the breeding places of the gnat. The president of the district stated: "Basic and preliminary scientific problems of life history must be worked out, we believe. Such pioneer research work is of national importance and is more than our local organization can compass."

Representative Phil D. Swing, Republican, of California, reported to the committee that these were no ordinary gnats. "My people are a hard, sturdy type of pioneers and are able to resist any ordinary inconvenience such as would come from ordinary flies, gnats or mosquitoes," he said. "This thing is entirely new. The belief exists that these gnats came from some foreign country through the importation of date palms. Unless it is controlled it will render that part of the country uninhabitable."

Common house flies, according to Dr. Marlatt, act in Egypt somewhat in the manner of this Coachella Valley gnat. They will swarm about the eyes, causing all sorts of eye troubles, and sometimes blindness. Florida is also having some trouble with eye gnats.

ITEMS

PROFESSOR THIENEMANN, of Rossitten, East Prussia, gives the following as the established speeds of certain birds during migration: the sparrow develops a speed of 25 miles per hour; the gray gull, the black-back gull and the Norway crow have the same speed, 31 miles per hour. The rook and the finches reach 32 miles per hour. The speediest flier is the starling with approximately 43 miles per hour.

THE marvelous local sense of wild geese was tested by the Swedish naturalist and writer Bengt Berg, according to Dr. Theodor G. Ahrens, well-known Berlin naturalist. He had succeeded in accustoming these shy birds to himself at his home, situated on a remote and uninhabited coast region of Sweden. The wild geese here finally ate from his hands, until they departed upon their southern migration in the autumn. While Dr. Berg was sojourning at his home on the coast in the following spring he noticed one day sixteen wild geese high in the sky, approaching from the south. While he was watching, they descended and came up to him to feed from his hands as formerly. Without apparent difficulty they had found their way from distant Africa to this spot, where they had a friend whom they remembered in spite of the separation of time and space.

AN attempt to have the influenza vaccine prepared by Dr. Edward C. Rosenow, of the Mayo Clinic, used by the U. S. Army, Navy or Public Health Service has so far been unsuccessful. At the recent conference on influenza held in Washington by the Public Health Service, the Rosenow vaccine was discussed. The majority of physicians and health officers present did not view Dr. Rosenow's vaccine favorably. The vaccine is made from organisms or germs associated with influenza, but as no one knows what organism causes flu, the use of this vaccine is considered by many to be a hit in the dark. The organisms of which the vaccine is made may or may not include the one which causes influenza. Dr. James J. Hogan, who himself presented at the conference a method of treating influenza, is supporting the Rosenow vaccine and is at present trying to get some organization to give it a trial. If some investigator working independently with the vaccine had successful results it would be evidence in favor of the vaccine's potency.