SCIENCE NEWS

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NEW SEISMOGRAPH FOR THE NATIONAL ASTROPHYSICAL OBSERVATORY OF MEXICO

EARTHQUAKES and sleeping volcanoes in Mexico will be studied intensively by one of the world's most sensitive seismographs, to be installed in Mexico's National Astrophysical Observatory through the cooperation of American scientific men with the State Government of Puebla, headed by Dr. Gonzales Bautista.

The Mexican Ambassador, Don Francisco Castillo Najera, in Washington, announced the acquisition of the instrument, and Dr. Harlow Shapley and Dr. L. Don Leet, of Harvard University, state that arrangements for the shipping and installation of a Benioff vertical-component seismograph, which has recently been thoroughly tested by Daniel Linehan, of Weston College, have been concluded by the Committee on Geophysical Research of Harvard University. The instrument was provided by the National Research Council in Washington and was originally intended for use in the studies of local earthquakes. Recent events in Mexico have shown that seismographs of this type, located where they will contribute new information about Mexican earthquakes, will contribute also to knowledge of volcanic activity.

The seismograph will soon be installed at Tonantzintla, just east of the famous towering twin mountains, Popocatepetl and Ixtaccihuatl.

This new seismograph is one of the latest models of a type that has proved itself to be among the world's best. It was developed by scientists at the California Institute of Technology. Some of the earliest investigations with Benioff seismographs were made at the Oak Ridge, Mass., station of Harvard University, resulting in the discovery of previously unsuspected minor seismic activity in this area. The great success of Harvard with this instrument has led to its widespread adoption in this country and abroad.

The seismograph produces a record of ground vibrations in the form of lines on photographic paper. It is capable of magnifying ground motions by as much as 250,000 times. At Oak Ridge it records the passing of trains eight miles away as well as earthquakes on the opposite side of the globe.

Mexico is one of the best natural laboratories available for a study of the related problems of earthquakes and volcanoes. There are both active and recently extinct volcanoes and numerous earthquakes. Some of these earthquakes, in fact all that are in the volcanic regions, are unusual in that they occur at distances of around sixty miles below the surface. Just enough information has been accumulated in recent years to cause investigators to be considerably puzzled and extremely curious about the connection between these earthquakes and the volcanoes. This curiosity was sharpened recently by the reported appearance in Mexico of a new volcano in a region where such earthquakes have been occurring over a period of years.

These investigations into the relationship of volcanoes and earthquakes mark an interesting cycle in seismological thought. The earliest theories of the origin of earthquakes held that all earthquakes were caused by volcanoes. Subsequent opinions, based on new facts, held that all earthquakes were caused by crust-distorting forces, and that any relationship to volcanoes is purely coincidental. It now appears that the forces which produce earthquakes in certain areas may also cause volcanic eruptions.

The installation of a high-sensitivity instrument in Puebla will provide an ideal opportunity, one of the few in the world, to study the day-by-day minor manifestations of the forces causing earthquakes and volcanic eruption, contributing perhaps ultimately to the solution of the larger problem of the origin of mountains.

THE SPEED OF CHEMICAL REACTIONS

How the methods by which a chemist determines the speed of a chemical reaction can be effectively used in the fields of physics and biology was described by Dr. Henry Eyring, professor of chemistry at Princeton University, at the University of Louisiana in a lecture which is also to be delivered before local chapters of the honor society of Sigma Xi throughout the country.

Dr. Eyring has developed improved formulas for predicting reaction rates by use of thermodynamics, statistical mechanics and the quantum theory. These formulas can be applied, he pointed out, to such apparently unrelated subjects as the flow of fluids, the velocity of sound and of nerve impulses, the light of luminous bacteria, the action of drugs and of enzymes. They bring a new and illuminating method of investigation into these fields.

The flow of fluids can be pictured as arising from individual molecules jumping from one equilibrium position to an adjacent empty one, just as in a chemical reaction the molecules jump from one position of equilibrium to another one, forming a new compound. The formulas for reaction rate successfully predict the velocity of flow of a liquid. When a liquid is compressed, some of the holes are squeezed out of it. The flow becomes more difficult. The liquid becomes thick—viscous. The picture thus explains this well-known fact.

When a sound wave travels in air, it must be passed on from molecule to molecule. Its speed is the average speed of the heat motion of the molecules. In water, the heat motion of the molecules is the same, but they are closer together. They bump each other more often, so that the sound impulse is passed along about eight times as rapidly as in air.

A nerve impulse travels about one fifteenth as fast as sound travels in water. This is interpreted by Dr. Eyring as meaning that each molecule must make about fifteen tries to get the message over to the next molecule. The light emitted by luminescent bacteria is due to the catalytic action of an enzyme. The catalyzing molecule, after bringing about the oxidation of the luciferin molecule, finds itself in an excited state and emits a quantum of

blue light. Temperature and pressure affect the intensity of the light in the same way they affect chemical reaction rates. Sulfanilamide reduces the light intensity and so does urethane. But the two together reduce the light less than does sulfanilamide alone, indicating that these two drugs are antagonistic and form a combination.

From these studies of luminescence, Dr. Eyring expects a more detailed understanding of the action of drugs and of biological enzymes in general.

VITAMINS

VITAMIN or other dietary means of preventing and curing now uncontrollable diseases, as we now control scurvy, pellagra and rickets, was predicted for the future in a Sigma Xi lecture at Purdue University by Professor C. A. Elvehjem, of the University of Wisconsin.

Recent studies in his own and other research laboratories of the twelve or more B vitamins furnish the basis for Professor Elvehjem's forecast for the future of nutritional research.

Lack of one of the newest B vitamins, folic acid, may be the cause of a blood disorder, a sort of white blood cell anemia, that develops occasionally in patients getting sulfa drug treatment and also sometimes without such treatment. The same condition develops in rats following treatment with certain sulfa drugs, and it also develops in monkeys deprived of the vitamin. The reason the rats get the condition seems to be that the sulfa drugs stop the growth of microorganisms in the rat intestinal tract which normally manufacture some of the B vitamins.

In both monkeys and rats the white blood cell anemia, though induced by diet in the one case and by sulfa drugs in the other, can be prevented by folic acid. The condition may develop following twenty days of sulfa drug treatment because the patients had been on short rations of folic acid and could not stand further depletion by the drug of their reserve supply of this vitamin. "We can only speculate as to the importance of the other factors in human nutrition," Professor Elvehjem concluded, "but I am willing to wager that equally important relationships will develop. As research continues we may learn from it nutritional means of handling diseases which are uncontrollable today as readily as we now control scurvy, rickets and pellagra."

Biotin, inositol and p-aminobenzoic acid are other new B vitamins which the latest studies show may have significance in human nutrition, besides those with which biochemists, nutritionists and even lay persons are now familiar: thiamin, riboflavin, niacin, pantothenic acid, pyridoxine and choline. Two chemically unknown factors needed by the chick for growth and feather production and one or more factors of significance in guinea pig nutrition complete the tally of now known B vitamins.

ITEMS

QUININE content of newly discovered cinchona stands can now be analyzed on the spot by a new portable device instead of sending bark samples to remote laboratories. The first four units have been shipped to South America to speed development of quinine sources and for inaugural tests under field conditions. Knowing that quinine fluoresces or glows under ultraviolet light, Martin S. Ulan, of Rutgers University, consultant to the BEW Office of Imports, went to work with his associates to develop a machine that would make laboratory testing of cinchona bark unnecessary. Starting with an instrument used to test fluorescent minerals, the galvanometer was dispensed with and a set of tubes each containing a different strength of quinine solution substituted; each with a different degree of fluorescence. By comparing these with an unknown sample the quinine content can be calculated. This test, conducted in a few minutes in the heart of the jungle, is expected to be nearly as accurate as more complicated laboratory procedures. Simple instructions included with the new device can be followed by a layman without technical training.

"STRIKING clinical improvement" in nine out of ten patients suffering with "shipyard eye" has been achieved by injections into the veins of blood serum from other patients already recovering from the eye condition, is reported by Dr. Alson E. Braley and Dr. Murray Sanders, of New York, in the *Journal* of the American Medical Association. The group of cases treated is small and further studies with control cases are needed before convalescent serum can be accepted as a cure for the condition. However, since this ailment is occurring in epidemics in industrial areas in many parts of the country, and since no other treatment has materially shortened the course of the disease, it is felt that attention should be called to the possibilities of convalescent serum treatment. Seven of the ten patients were "clinically cured," six of them in forty-eight hours. In two others the normal course of the disease was shortened and corneal changes possibly aborted. One case is classed as a failure because adequate information following treatment could not be obtained.

PLASTIC lithographic printing plates, made from polyvinyl alcohol resin, are reported to be in use in the Army for printing colored maps and other military documents, and in mobile field printing units. Their use saves from three to eight times their weight in critical aluminum and zinc. The development came about through the use of polyvinyl alcohol as a coating on zinc to improve the printing quality of the metal. It became apparent that the actual printing was from the plastic and not the metal, and that other material could as well be used for the base as zinc and aluminum. In the new plate the base is paper impregnated with the polyvinyl alcohol resin which gives it the required strength and stability. It is waterproofed with a coating of another resin. Two sheets are then laminated to form the base, and the printing surface coated with the polyvinyl alcohol resin. Creation of the printing image is the same as with metal. The resin plastic is sensitized with bichromate of ammonia. It is exposed to light, treated with the developing ink, developed in water and etched, and is then ready for use in the press. The development of this plastic for lithograph printing plates was carried out in the laboratories of the du Pont Company, and the plates are made by a Boston company. The Army at present has preempted the entire output, but it is expected will be available at a later date to the printing trade.