SCIENCE NEWS

Science Service, Washington, D. C.

RESEARCH ON EARTHQUAKES

EARTHQUAKE prediction promises shortly to find a solid scientific basis, according to the plans of Dr. John P. Buwalda, head of the new department of geology of the California Institute of Technology. The institute, in co-operation with the Carnegie Institution of Washington, is embarking on an extensive program of laboratory and field research on earthquakes. The plan, which involves large financial outlay, will cover southern California. While there has never been extensive damage from earthquakes in this end of the state, it is hoped that definite scientific data may be secured in order to determine whether or not a major quake is in the making, and if so where.

Dr. Buwalda tentatively rejects the old idea that a great rock mass may rest silently and immovably under great pressure until some fateful hour when it suddenly cracks and precipitates a disastrous quake. Instead he takes the position that any really dangerous line of rock slippage would already show a crack or "fault" line, in which the two abutting rock masses, temporarily stuck together, would gradually be deformed under a shearing pressure during the period of years prior to a serious earthquake. The situation might be likened to an attempt to slide one piece of stiff taffy past another. As long as the two cohesive masses stuck together a slight distortion or semi-liquid flow would occur along the crack between them while the sliding pressure was being applied.

Dr. Buwalda plans to set a number of monuments in a very precise straight line directly across a suspected earthquake fault. Provided the original survey is highly accurate, the geologist may determine within five or ten years whether the row of monuments has been twisted out of line. The distortion would have to show an S-pattern, and not a direct break from line if the geologist is to regard the situation as dangerous. If no actual curves are observed, no great earthquake is in prospect; if there is distortion, then it is time for the city council to revise the building code and begin to brace old buildings. The actual disaster would be analogous to the sudden release of a distorted spring and its potential energy.

Other apparatus is being designed to record upward tilt of rock as well as the side thrust. Improved seismographic records will be kept not only at the central laboratories at Pasadena, but at widely scattered stations all over southern California. Eventually telegraphic communication is to be effected between these stations so as to afford trustworthy information on earthquake velocity.

This research program is of considerable interest to insurance companies now being solicited for large amounts of earthquake protection. Under present conditions such companies are totally at a loss to estimate hazards, and a single disaster could easily wipe out a hundred years of ordinary premiums or bankrupt the concerns.

VITAMIN D

SCIENTISTS here and in Europe, working in more or less collaboration on the problem, have come to the same conclusion, according to Dr. Alfred F. Hess, of the College of Physicians and Surgeons at Columbia University, that the anti-rachitic vitamin D is formed when certain sterols, a group of substances similar to fats, widely distributed in the lower plants, are exposed to ultra-violet light. Both Dr. Hess and Drs. O. Rosenheim and T. A. Webster, of the National Institute for Medical Research in London, have collaborated with Professor A. Windaus, of Göttingen University, in Germany, who has been engaged in research on the chemical problems involved in the isolation of the anti-rachitic vitamin, for several years.

About two years ago, Dr. Hess reported that cholesterol, occurring in all animal fats and oils, and its counterpart, phytosterol in vegetable foods, after irradiation with ultra-violet light, was the substance actually responsible for preventing rickets. Irradiated cholesterol in very much smaller doses would produce the same results as cod liver oil, only one millionth of a gram being necessary to protect a rat from rickets.

Now, however, another step in the pursuit of the vitamin has been accomplished. The English workers, Dr. Hess and Professor Windaus, of Göttingen, all believe that it is only a small portion of the cholesterol which is activated by ultra-violet light. This is an allied substance called ergosterol. This compound is widely distributed in lower plant forms and only very minute quantities are needed to protect laboratory animals from rickets.

"It was found," says Dr. Hess, "to bring about a healing process of the bones when even as little as .0003 mg. per capita daily was given. In tests in which irradiated cholesterol is fed, it has been found that approximately 1 mg. is needed to initiate healing. Other experiments will be undertaken to ascertain the relationship of ergosterol to cholesterol and the extent of its distribution in the animal body."

The practical value of the discovery of this concentrated form lies in the fact that it will be possible now to dispense with the cod liver oil. Hitherto it has been the practice to resort to such general remedies as sunlight and a diet of foods known to contain anti-rachitic elements. A German authority has suggested that one of the consequences of this research will be to put oleomargarine products on an equal basis with butter and cream, for the irradiated oleo will have the same anti-rachitic constituents as real butter.

MEASUREMENT OF THE INTELLIGENCE OF POLICEMEN

ONE California town, at least, has a police force with intelligence averaging higher than that of college freshmen and army officers. This announcement, following on

the heels of statements that policemen in American cities are unintelligent, is the result of an investigation made by Maud A. Merrill, of the department of psychology of Stanford University.

The investigation was designed to find out whether men of comparatively high intelligence and ability make good policemen and are satisfied with the work, Miss Merrill reports in the number of *The Journal of Personnel Research* to be issued in April.

For two years, each applicant for the Palo Alto force has been given the Alpha intelligence test used to grade the mentality of United States soldiers during the war. Out of 113 applicants, 30 were chosen on the basis of their intelligence together with the impression they made on the examiners.

"The average Alpha intelligence score of men who have remained on the Palo Alto police force for two years is 143.5, a score higher than the average for army officers and higher than that reported as the freshman average at many colleges."

"The median score of men who have been discharged for inefficiency or for conduct unbecoming an officer is 137. Men who left voluntarily for better jobs have a median score of 171.5. One of these men left the police force to go into grand opera." The median Alpha score made by white drafted soldiers was about 60.

Previous investigations have indicated that bright, capable young men do not remain in the police service as a career, the average mentality of patrolmen being higher in some cities than the mentality of sergeants and lieutenants.

Salaries in Palo Alto are not larger than in other towns. Miss Merrill's explanation as to why policemen of intelligence seem content to enter the force and stay there is that the force is directed by a chief who is progressive and capable and that possibly perhaps the organization itself under capable leadership offers an incentive to capable, intelligent men in police work.

THE ELECTRIC MOULDING OF RUBBER

INNER tubes, water bags and other articles of pure rubber, stronger and more durable than rubber obtained by any other process, are now being made by electric moulding, essentially the same process that is used in electroplating silverware and in making cuts for newspaper pictures, according to the Engineering Research Foundation. The process was worked out by two groups of research workers, one in America and one in Hungary, neither of whom knew that the other was engaged in the problem. The American workers were S. E. Sheppard and L. W. Eberlin, of the Eastman Kodak Company, and the Hungarian group was led by Paul Klein and A. Szegvari.

Both groups were practically interested in improvement of the quality of rubber goods, according to a statement made by an officer of the Engineering Research Foundation. They knew that when the solid dried crude rubber is worked upon a mixing mill in the rubber factory, the rubber substance was made softer and weaker. They knew that the less rubber was heated or worked, the better was its quality. They also knew that research of chemists in recent years had shown how vulcanization may be carried on at lower temperatures than formerly and the necessary sulphur combined with rubber with minimum of loss of quality. Certain substances known as accelerators possess the property of permitting vulcanization to be accomplished at relatively low temperatures. However, if these accelerators were incorporated on the usual mixing mill, the temperature would be sufficiently high to cause vulcanization during mixing and spoil the goods.

These men conceived the plan of so depositing rubber on forms, from latex, that the rubber particle itself was not altered, and made the astonishing discovery that electro-deposited rubber had the highest quality ever observed. There were many problems to be solved before this was made practical. It was necessary to incorporate other substances to be deposited simultaneously, such as sulphur, zinc oxide and carbon black. These latter two substances are necessary in rubber goods to give toughness. A long investigation was carried out to find means to disperse them in water, mixed with the latex particles, without coagulating the latex. A noteworthy achievement has been the discovery of means by which these rubber layers may be free from bubbles, for when an electric current is passed through a solution, bubbles of gas are formed on anode and cathode. So they hit upon the scheme of surrounding the anode with a porous clay diaphragm. The anode is therefore immersed in electrolyte inside a porous clay cell or dish and the rubber particles, together with those of zinc oxide, sulphur, etc., are deposited upon this porous so-called anode diaphragm. Thus the rubber as it collects forms a continuous homogenous, tough covering of uniform thickness. Any thickness up to an inch or more is practicable. Rubber thus formed is stronger than rubber prepared by the old methods, and is free from gas or air holes.

Industrial development is already well advanced. Continuous, automatic production of certain kinds of articles is feasible. Manufacture of inner tubes for automobile tires is the most important application, if quantity be the criterion. Bathing caps, stationers' plastic bands, tobacco pouches and hot-water bottles are other examples. Insulation for wires and other things electrical is another application. No high temperatures are used. For impregnating textiles the rubber can be more intimately applied to the fibers.

AGRICULTURE AND SCIENTIFIC RESEARCH

THE benefits derived by agriculture from the applications of science were outlined by Secretary of Agriculture W. M. Jardine in an address, on March 29, before the American Institute of Chemists meeting in New Haven.

Science began its work for modern agriculture over a century ago, Secretary Jardine stated, with the classical work of Boussingault, de Saussure and Liebig on fertilizers, a field in which research still continues on an ever-increasing scale. The Babcock test for the butterfat content of milk, Sabatier's process for hydrogenating

vegetable fats, Biot's influence on the increase of sugar in beets, and the work of Osborn and Mendel, of Yale, in accurately measuring the food requirements of cattle, were among the special accomplishments cited by the speaker.

In conclusion, Dr. Jardine made a plea for greater attention to, and increased support for, fundamental research in pure science. He said in part:

"American science, I am convinced, needs to concern itself more with fundamental research than it has done heretofore. No country in the world has made such progress in applied science, but our record in pure science is not so flattering. Since 1900, when the Nobel prizes in physics, chemistry and medicine were inaugurated, 76 awards have been made. Of these, 24 went to Germany, 11 to England, 10 to France, 6 to the Netherlands, 5 to Sweden, 4 to the United States, 3 to Denmark, 3 to Switzerland, 2 each to Austria, Canada, Italy and Russia, and 1 each to Belgium and Spain. On the basis of population, the Netherlands, Denmark, Sweden and Switzerland received one to every million inhabitants; Germany one to every two and one half million; Austria one to every three million; England one to every three and a quarter million; France one to every four million; the United States, one to every twenty-nine million. This is the situation despite the fact that we have vastly more students in colleges and universities in proportion to the population than has any other country in the world. The difficulty seems to me twofold: We are not laying enough emphasis on pure science in proportion to our emphasis on the applications of science; and we are not stimulating and training an adequate personnel in scientific research."

ITEMS

VOLCANIC activity of more than unusual intensity has been noted recently by Dr. T. A. Jaggar, government volcanologist, at Halemaumau pit, the liveliest spot in the crater of Kilauea, the world's largest living volcano. "There was a fresh reddening of the whole northwest wall of the pit where a large shell of the wall had fallen," according to Dr. Jaggar. "The débris slopes below were seen to be covered with reddish rocks and dust, and the dusting of the bottom of the pit extended clear across to the south taluses. Most of this had been accompanied by small slides from the decomposed rock of the northwest wall. But there had been at least one big avalanche, which had carried away the greater part of a pronounced bench at the west end of the big intrusive sill which forms the lower part of the northeastern wall. The dusting of the bottom of the pit was further evidence of a big avalanche, and the middle talus of the northeast wall showed more fresh débris. The yellowing of the southern solfataras continued to be conspicuous.

STUDYING the light given off by ash of tumors burned in an arc light is the latest method of attacking the cancer problem, one which has been applied at the Hahnemann Medical College by a trio of biologists and a physicist, Donald C. A. Butts, Thomas E. Huff and Frederick Palmer, Jr. By means of a spectroscope, which analyzes the light, and reveals the elements that cause it, they have found that the yellow lines due to sodium, and which appear only momentarily when the ash of normal animal tissue is placed in the arc, persist until it has all been consumed when the ash from tumors is analyzed. This shows the presence of the element sodium in cancerous tissue.

THE remains of a complete Indian village perhaps a thousand years old have just recently been uncovered near Alamo, Contra Costa County, California, by Glenn Fisher and Raymond Kraft, of Concord, Calif. The discovery was made on the rim of Mt. Diablo, where Bret Harte first taught school and where he was inspired to write his fascinating tale, "The Legend of Monte Diablo." A quantity of skeletal material, ornaments, weapons, utensils, shell, ashes, firestones and bone material have already been removed from the ruins. Further excavations, however, are now being held up pending legal action by the Alamo Chamber of Commerce, who are opposed to the transfer of these relics to a museum. "An Indian burial ground is its own best museum," according to Lyman K. Stoddard, president of the Alamo Chamber of Commerce, who further states that his community has one of the few intact Indian buried villages and they "are not going to let souvenir hunters carry off valuable historical material."

FURTHER evidence that plants must have something in addition to their regular diet of the seven chemical elements classically supposed to be all-sufficient for the support of plant life is produced in the forthcoming issue of *The Botanical Gazette* by Dr. A. R. C. Haas and Dr. H. S. Reed, of the Citrus Experiment Station at Riverside, Calif. The two experimenters were growing young orange trees in pots, watering them with a solution supposed to contain everything a reasonable young plant might require, when they found their specimens getting decidedly sick. The leaves curled and became discolored, and in general the seedlings looked very much distressed. A very minute addition of a number of elements which have always been considered useless to plants, including aluminum, titanium, bromine, strontium, lithium and boron, was found to be the proper medicine to restore the ailing trees to full health.

SALTING asparagus beds as a part of the regular fertilizer program, long a traditional practice among gardeners, has received the sanction of science, according to a report by Dr. William Rudolfs, of the New Jersey Agricultural Experiment Station, which will be published in the forthcoming issue of *The Botanical Gazette*. One hundred and fifty pounds of salt per acre is not enough, Dr. Rudolfs's experiments disclosed, for plants on plots treated with this amount showed no increase in numbers of stalks over plants on unsalted plots. But doubling the amount of salt resulted in an increase in average number of stalks per plant from six to nearly seven; and a salt dose of 500 pounds per acre brought the yield per plant up to about seven and one half stalks.