SCIENCE NEWS

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A SEISMOGRAPH TO RECORD MINOR EARTHQUAKES

A NEW seismograph that records the less violent tremblings of the earth's crust, undetectable by the human senses, is now installed and in operation at Stanford University. As a part of the fundamental plan for an intensive study of the California earthquake situation, this station has been established by the business men of San Francisco and Oakland as one of four, which are so located as to record the local shocks in the vicinity of that metropolitan center. The central station is at the University of California and the auxiliaries at Lick Observatory, Stanford University and the California Academy of Science in Golden Gate Park. The instruments and arrangement are patterned on the plan of observation inaugurated by the Carnegie Institution of Washington for southern California to keep track of the minute earthquakes that are constantly occurring and which indicate the development of strain that leads to the greater ones. Four little shocks were recorded recently at Stanford on the new instruments. There is no occasion for alarm, however, since this is merely the normal activity of the earth's crust, not only in California, but also in any region where earthquakes have occurred. Vibrations of the solid earth are as unknown as were those of the atmosphere before radio showed them up. Protection against earthquakes will not be achieved unless we secure a better understanding of their development during the long periods that elapse between severe shocks.

The seismograph installed at Stanford was placed on a ledge of rock that was selected because of its apparent solidity, but the first records showed an extraordinary number of microscopic vibrations, not exactly like those of earthquakes. They were most continuous on windy days and are attributed to a large oak tree which stands about fifty feet away from the instrument piers. The roots evidently extend into the crevices of the rocks, where they find water during the long dry season, and the swaying of the tree shakes the massive ledge of sandstone. The oak will probably have to be cut, to the regret of those who, because of its beauty, sought to include it in the Seismograph Park which has been set aside in perpetuity.

CORN WASTES

A BILLION dollars of new wealth for the corn belt, through the annual utilization of its two hundred million tons of corn stalks and twenty million tons of cobs, now wasted, is the promise of engineers and chemists to the American farmer.

How the greatest agricultural waste, corn stalks and cobs, can be made into some three hundred useful products is told in a report to the Engineering Foundation by Professor O. R. Sweeney, of Iowa State College. In a decade or two they will be utilized on a large scale, he predicted.

"Before the many products of promising usefulness could be made even on a small scale in the laboratory," Professor Sweeney said, "years had to be spent in patient, ingenious, fundamental researches to determine the exact chemical and physical natures of these raw materials and their constituents. Not only agricultural, but also industrial and economic problems had to be solved with the aid of engineering research, supplementing the work of the scientist. Much remains to be done.

"Iowa State College, in the midst of the corn belt, has been a leader in the attack. Knowledge being gotten in the cornfield will be useful also to growers of other grains, peanuts, flax and cotton, who have similar waste materials. Civilized men will be able to continue to feed and clothe the increasing populace and to supply many of their other wants by successful solution of just these problems.

"What does the laboratory offer to industry from these raw materials now wasted? Paper of several grades, papier maché, wallboard and other substitutes for building lumber, substitutes for hard woods used in furniture and finish, rayon, acetic acid, acetone, a sugar that can be used by diabetics, maple-sugar flavoring to be combined with cane- or beet-sugar to make 'maple-syrup,' oxalic acid, plastic materials, electrical and heat insulation and furfural.

"Furfural was a laboratory chemical not many years ago, scarce at $50 a pound. Now it is produced in large quantities at 14 cents. With increasing production, improved methods and development of co-products, even the latter price may be more than cut in half. Furfural is a fluid heavier than water, having many and various uses in plastics, dyes, paint removers, antiseptics, anesthetics, germicides, embalming fluids and motor fuels. It burns in lamps with a more brilliant flame than kerosene and has not the unpleasant odor of the latter.

"If the chemist and engineer and farmer can solve the economic problems, new industries may dot the prairies. Among these problems one of the foremost has been the cheap collection of the stalks and cobs to a few places where they will be subjected to the first steps toward becoming saleable commodities. Special machines have been devised for gathering up the cornstalks in the field, or for cutting the standing corn, husking the ears and shredding the stalks. Another problem is the safe and inexpensive storage of the raw materials throughout the year, in order that the industrial operations may be continuous.

"As contrasted with forests, which, once cut, are not quickly replaced, and commonly in America are not replaced at all, the corn wastes would be produced year after year in great quantities within the same areas. As nearby forests have been consumed, for example, the

saw mills and pulp mills have had to move to more and more remote locations from their markets.

"Lest the corn production should decrease, the fertility of the soil must be maintained. It has been learned that this can readily be done by growing soya beans as the 'rotation' crop. The soya bean is a strong nitrifier of the soil. After extracting the oil from the bean, the refuse, including the stalks and meal, can be plowed back into the soil. The income from the oil, which has many uses, will partially offset the lack of income from corn in the years of change of crop. Thus the cycle would become complete by the chemistry of nature, and the energy of the sun would be converted perennially to many uses of man.

"Depletion of forests and of mineral resources and advances in chemistry and engineering will have much to do with the measures of success which may be achieved in turning these agricultural wastes into wealth. At best, it will take much time, research and development.

"More than research, engineering, industrial development and financing will be required. Useful and valuable new commodities may be produced, but successful production at a fair price may not bring economic success. As has well been said: The fight for recognition for a new product is almost as hard to wage as is the fight for a new idea."

THE CORN BORER MENACE

THE corn borer, which has swept over the northeastern states and during the past season made its first serious inroads into the great mid-western corn belt, may lose its terror as it spreads westward into the less humid prairie regions. Researches by Professor E. N. Transeau and Professor H. C. Sampson, of the Ohio State University, indicate that the pest tends to accumulate in really destructive numbers mainly in areas of naturally high soil and atmospheric moisture, and that its presence in drier places is less likely to be a serious matter.

Professor Transeau's studies began in Ohio and Ontario, but were carried forward last summer by visits to the principal corn-raising regions of Europe, where the borer has been known for more than a century. In the analysis of the Ohio and Ontario data, it was discovered that the most serious borer infestation occurred in parts that were once covered by swamps and swamp forests. Fields that had been won from the former beech forests were also infested, but less seriously, and the areas that got off most easily were those that had once been covered by oak-hickory timber. The significant thing about this difference, Professor Transeau points out, is that the beech forest was a formation of relatively moist lands, whereas the oak-hickory was a dry type of forest.

In Europe, the Ohio botanist found that conditions bore out his preliminary observations in this country. The heaviest infestations were found in what were once swamp forest regions, while corn growing in drier and better drained hilly areas was much less troubled. In particular, he found that the great corn-growing areas of Rumania and southern Russia, which are naturally open grasslands instead of forests, are not greatly troubled by the borers, in spite of the fact that the farmers of these two countries probably take fewer clean-up precautions than do the corn growers of any other part of Europe.

Since the richest part of the American corn belt, reaching from central Illinois across Iowa into Nebraska, was originally a grassland, it is hoped that conditions here will be as unfavorable to the borer and as favorable to the corn as those of the European grasslands seem to be. It is true that the situation is not exactly parallel, for the long-grass prairies of Illinois and Iowa have no counterpart in southeastern Europe, whose grassy steppes are more like the mixed prairie and short-grass plains of Nebraska and Kansas. The long-grass prairies in part originated from sloughs and swamps, and in part developed on well drained uplands. The swamp prairie lands appear to be favorable to the corn borer. The upland long-grass prairies on the other hand fit into the series between the oak-hickory forest and the short-grass steppes or plains; and the relatively slight borer infestation of both regions gives rise to the hope that when the pest finally reaches the heart of the corn belt it will not everywhere have the disastrous effects on the principal American grain crop that were at first feared from its behavior in the vicinity of Lake Erie.

ULTRA-VIOLET RAYS AND MINERAL SALTS IN PLANTS

ULTRA-VIOLET rays, used to prevent the bone disease, rickets, in young children and animals by raising the calcium and phosphorus content of the blood, have a parallel effect on plants. This is indicated by the results of experiments by Herbert C. Beeskow, a graduate student at the University of Chicago.

Mr. Beeskow grew groups of soy bean plants in solutions of known mineral composition. He subjected different groups to ultra-violet radiation for varying periods of time, keeping other groups away from the rays as "controls." Then he dried the plants and analyzed them for calcium and phosphorus. In each case it was found that the irradiated plants had noticeably higher contents of these important minerals than the corresponding unrayed controls.

The effects of irradiation with ultra-violet light were not all beneficial to the plants. Soy beans grown in the greenhouse and subjected to direct ultra-violet raying for as short a period as one minute every other day showed a distinct reddening in the parts of the stem and leaves struck by the rays. This coloration increased with increases in dosage. In cases where the under side of the leaves was exposed to the rays the reddening action was much more in evidence.

Plants grown in darkness and subjected to the rays showed this red color much more distinctly than plants grown in daylight and permitted to become normally green. Heavy overdoses of the rays simply killed the plants.

THE VOLTAGE OF VACUUM TUBES

USING a radio vacuum tube backwards in order to reduce the voltage and increase the power at the same time is the trick described at the Institute of Radio Engineers.

In a paper by Frederick E. Terman, of Stanford University, California, it was stated that the plate and the grid of a tube could be made to interchange their functions.

In the ordinary vacuum tube, as used in the usual receiving set as an amplifier, the feeble electrical impulses that form the signals are fed into the grid. The electrons that travel across from the filament to the plate produce an electrical current, much larger than the current entering the tube, but varying in conformity with it. However, the outgoing current is also higher in voltage, as well as more powerful, than the incoming.

Mr. Terman has found, however, that the voltage can be reduced by interchanging the plate and grid. He feeds in the current to be amplified to the plate instead of the grid, and takes it out from the grid.

"It is relatively simple," he states, "to construct an inverted vacuum tube with wide clearances between the plate and the rest of the tube, so that potentials of hundreds of thousands of volts can be applied at the plate, while the effect of this high voltage stepped down in almost any desired ratio is obtained in a low potential circuit."

The chief use of the inverted tube, Mr. Terman stated, is in studying the waves formed by high voltage alternating currents, using an oscillograph. In this way, the current variations can be studied without consuming any appreciable amount of the current. No immediate use of the device in ordinary radio sets is foreseen.

RADIO RECEIVERS

SHEETS of metal such as iron, gold or platinum, so thin that ordinary type can be read with ease through them, may find use in radio and phonograph reproducers. Ordinary diaphragms for this purpose are so heavy that they dampen some of the overtones and so coarsen the sounds. These thin metal sheets are the result of research by Dr. Carl Mueller, of the Charlottenburg Laboratory, near Berlin. His method of preparing them is to electroplate the metal on the surface of some soluble substance, such as rocksalt, and then dissolve away the support. A ring of thicker metal can be used to support the films, of which two and a half million would have to be piled to make a stack an inch high.

Such films have been made of iron, nickel, gold, silver and platinum, and it is found that although the nickel is much less transparent to visible light than gold, it readily transmits the shorter ultra-violet rays. The films are very elastic, and will bulge out for as much as a tenth of their diameter without breaking. Another curious thing about them is their high electrical conductivity. Electric current is carried only along the surface of a wire, and as these are practically all surface, a strip of film containing no more metal than in a round wire one hundredth of a millimeter in diameter—scarcely visible to the naked eye—will carry enough current to light several lamps. If the same current were passed through the wire, it would be instantly melted.

ITEMS

SEEDLING trees of a species that represents the vegetation of Florida a hundred thousand years ago, during the glacial epoch, have been added to the collection in the New York Botanical Garden as the result of a scientific tour of the state by Dr. John K. Small. The trees, which are known as Torreya, or locally as Savern, belong to the botanical genus *Tumion*, and occur naturally in a small strip of territory along the east bank of the Appalachicola River, in the Florida Panhandle. They occur nowhere else in the world, though related species are found in California, Japan and China. They resemble yew trees in some ways, and can be cultivated under the same sort of climatic conditions that favor the yew. In addition to the Torreya seedlings, Dr. Small also obtained a collection of native Florida iris species, which are being carried through the winter in the garden of Mrs. A. C. James at Coconut Grove, Florida. A part of this collection will be brought north to the New York Botanical Garden in the spring.

THE largest telescope in Italy, with a mirror 40 inches in diameter, is now in use at the Merate Observatory, in the foothills of the Alps. Ordered in 1923, when the dust and smoke of Milan made it necessary for the observatory to move to a better location, the new instrument embodies all the latest improvements. It is a reflecting telescope, in which the 40-inch concave mirror takes the place of the convex lens in the more familiar type of telescope. The moving parts of the telescope weigh over 18 tons, yet so perfectly are they balanced that a one half horsepower motor is adequate for turning the instrument to follow the stars across the sky. The instrument was built by the Carl Zeiss Optical Works, in Jena, Germany.

"A LOVE of luxury is everywhere in the world tending to produce fewer marriages and fewer births," according to Dr. Charles V. Chapin, who for almost 40 years has supervised the collection of the vital statistics of Providence, R. I. The city's birth rate last year was the lowest since records were first kept. "In most of the advanced countries of Europe for several years the tendency of both marriages and births has been downward. I believe this is generally due to the fact that people don't feel they can afford to either marry or have children. They would rather have fur coats and automobiles." Of the children born here last year, 3,089 were boys and 2,049 girls.

A SELF-WINDING clock, run by what is virtually a glycerin thermometer, has been invented by a Swiss engineer, Karl Heinrich Meier. It utilizes the energy captured by the daily fluctuations in temperature to raise the weights that drive its mechanism, and it is stated that one of the clocks has been kept going for a year on a daily range of not more than eight degrees Fahrenheit. The essential mechanism consists of a long coiled tube filled with glycerin, connected with a cylinder into which a piston is fitted. When the glycerin is warmed and expands, it forces out the piston, which in turn lifts the clock weight. It is expected that this device will be especially useful in operating outdoor clocks in public places. The types now in common use are usually electrically driven and are therefore expensive to install, besides requiring frequent attention.