SCIENCE NEWS

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THE EARTH'S MAGNETISM

SPEAKING at Philadelphia at a two-day meeting of the American Philosophical Society commemorating the centenary of the first American magnetic observatory, established by Alexander Dallas Bache, Dr. J. H. Dellinger, chief of the Radio Section of the National Bureau of Standards, told of ways in which the earth's magnetism affects wireless transmission.

"It has long been known," he stated, "that radio transmission on the high radio frequencies is markedly poorer between North America and Europe than over other transmission paths. A possible relation of the radio anomaly to the propinquity of the magnetic pole was suspected, but there were no data on which to base a positive conclusion. Following a discovery that this disparity existed at the broadcast frequencies also, a systematic study was begun in 1935 and is still in progress. Measurements have been made in Europe and in North and South America of the received intensities of broadcast stations in the other continents, each (northern) winter since 1935."

Disturbances in the ionosphere, the complicated layer more than fifty miles high from which radio waves are reflected back to earth, are associated with the magnetic storms at lower levels. These, Dr. Dellinger stated, "increase the variability of radio transmission between North America and Europe much more than between South America and either North America or Europe. The ionospheric and magnetic storminess, moreover, is prevalent much more of the time in the more northerly regions traversed by the radio waves between North America and Europe. Thus this transmission path is far more subject to the disturbing effects than the paths more remote from the polar regions."

Magnetic disturbances on the earth are closely connected with the activity of the sun. In addition to the effect of the general magnetic storminess, there is another. Dr. Dellinger described this as "a very sudden, relatively brief perturbation occurring simultaneously throughout the day hemisphere, the effect being a maximum at the subpolar point and a minimum in the polar regions; it is directly caused by a solar eruption."

Dr. L. V. Berkner, of the Department of Terrestrial Magnetism of the Carnegie Institution of Washington, explained how the various layers of the ionosphere are measured by sending up radio waves and catching their echoes. There are three main layers, namely: the E-layer, 62 miles high; the F-1 layer at 140 miles and the F-2 layer at 220 miles. At night, or when the sun is low, the last two merge to form a single F-layer at a level of 155 miles. Apparently corpuscles shot out from the sun disturb the F-layers in which, he stated, occur the chief ionospheric effects associated with magnetic storms.

A NEW HIGH VOLTAGE POWER LINE

DEFENSE construction in and around Chicago will be less likely to suffer from electric failure on account of a new high voltage power line just completed. Details of the line, which is 147 miles long, and brings more than 200,000 horsepower of electrical energy from coal fields in southern Illinois, were given at the Philadelphia meeting of the American Institute of Electrical Engineers by M. S. Oldacre and F. O. Wollaston, of the Commonwealth Edison Company.

Special consideration, they reported, was given in designing and building this line to obtain reliable service and eliminate outages caused by the two worst enemies of transmission lines—sleet and lightning—both of which are quite prevalent and severe along this route. As a result of study by engineers connected with the operation of existing transmission lines and also those of the electrical manufacturing companies, it is believed that the solution of these two major troubles of transmission lines has been obtained.

It has been found that when wind of sufficient force strikes sleet-covered wires, the wires will be lifted momentarily in the same way as a kite or airplane, and the alternate rising and falling and the swinging of the wires causes them to appear to "gallop" and sometimes come in contact with one another. This will at least interrupt power service over the line if it does not cause actual burning or breaking apart of the wires. Common practice on important smaller lines is to put extra electric current through the sleet-covered wires to melt the sleet away before it becomes dangerous. The wire or cable required for this line was so large—one and one sixth inches in diameter—that it could not be heated sufficiently. Instead, extra-strong supports were provided and the wires placed farther apart than usual so that there is no chance of the wires "galloping" or swinging together.

The elimination of lightning troubles on existing transmission lines has been obtained by using sufficient insulators for the electric wires and by placing additional wires above the electric power wires to intercept the lightning currents and direct them into the earth over paths of very low resistance. On this new line the latest type of high-strength insulators, nearly ten feet long, have been used and the intercepting wires, known as "ground" wires, have been installed so that there is practically no chance of a lightning flash to the electric wires.

At the same meeting, two other Commonwealth Edison Company engineers, H. E. Wulfing and T. G. Le Clair, told of some of the operating details of the new line. Though carrying 220,000 volts it is so arranged that, should a short circuit occur anywhere on the line or its terminals, the switches at both ends will open automatically and disconnect the line in one sixth of a second. One interesting feature in the operation of the line is the use of radio waves on the transmission wires to perform many essential functions. Radio as used in this manner is known as carrier current and differs from space radio, commonly used in broadcasting, in that it is con-

fined to the transmission wires and is actually superposed on the 220,000 volt power current and does not radiate into space. This carrier current radio has three distinct bands and is modulated to provide eight channels over which many diversified operations are performed. It is essential that the carrier current radio be in continuous operation because it is the watchdog of this important transmission line. It is therefore arranged so that it is self-checking and, should the radio stop, an alarm is given to the operators in the stations.

NATIONAL DEFENSE USES OF NATURAL RESOURCES

DR. IRA N. GABRIELSON, chief of the U. S. Fish and Wildlife Service, at the opening session of the Sixth North American Wildlife Conference at Memphis, pointed out that national defense uses of irreplaceable natural resources must be guided by discretion, lest harm rather than good result.

Our very zeal for strengthening America can lead us into errors that have an exactly opposite effect, pointing out as past examples the ill effects of over-fishing of our waters and over-cutting of our timber lands during the emergency of 1917–18. The country is still suffering the consequences of the mistakes made by honest but over-enthusiastic patriots in those tumultuous days.

Even worse may be done to us by cold-bloodedly selfish persons who place self-interest ahead of patriotism, and advance the plea of defense promotion only as a Trojan horse for selfish schemes of their own. Watch out for such things as efforts to cut priceless virgin timber out of national park areas, under the excuse that it is to be used for "defense." Dr. Gabrielson pointed out that "If this country is to continue to be a good place to live in, or to be one worth fighting for, we must use intelligently the resources of soil and water, and the products of soil and water, not only in good times but in bad times, and in national emergencies as well as in normal times."

In the course of his address, Dr. Gabrielson reviewed the progress of the wildlife restoration program during the past five years. Land acquisition and refuge creation have gone forward very well though much still remains to be done. The same is true in the arrangements for cooperation with state anl local agencies, especially in basic ecological research. Costs of these programs are defrayed mainly by persons and groups most interested, through sale of "duck stamps" and sales taxes on sporting arms and ammunition.

Somewhat slower progress, though still fairly satisfactory, was noted by the speaker in such fields as educating the public in the recognition of wildlife values, and in the promotion of specific research programs where present knowledge is weakest, especially in the study of the ecology of water areas. Much more needs to be done, too, toward the restoration of fish and of fur-bearing animals. Both of these were once among America's greatest natural resources, and intelligent action can do much to restore them to a large degree of their former importance.

By far the least satisfactory situation, Dr. Gabrielson said, exists with regard to river and lake pollution. Good progress in the setting up of municipal sewage disposal plants during the past few years is contrasted with virtually no progress at all in getting rid of pollution due to industrial wastes. Most industrialists, the speaker said, have proved stubbornly uncooperative, and he challenged sharply the right of any man to misuse publicly owned waters as his private sewers.—FRANK THONE.

SULFANILAMIDE AND RHEUMATIC FEVER

INCREASED hope that sulfanilamide may prove the means of preventing attacks of rheumatic fever appears in a report to the current issue of the *Journal* of the American Medical Association and in editorial comment on that report.

A record of no attack of rheumatic fever among 55 patients while taking continuous sulfanilamide treatment from November through June of each year between 1936 and 1940 is announced by Dr. Caroline Bedell Thomas, Dr. Richard France and Dr. Franjo Reichsman, of the Johns Hopkins Hospital and University. During the same four years, fifteen major attacks of acute rheumatic fever occurred among 150 patients not taking sulfanilamide during the control period.

Rheumatic fever is a wide-spread disease which seriously damages the heart and leads frequently to early death. More than 900,000 persons in the United States are said to suffer from rheumatic heart disease. It is the chief cause of death among school children and is responsible for at least 30,000 deaths annually in the United States.

The exact cause of rheumatic fever has not been discovered. Infection with the beta hemolytic streptococcus usually precedes attacks and this germ is thought to play a significant rôle in starting the disease. This germ is the one over which sulfanilamide accomplished its earliest triumphs, saving mothers whose lives were threatened by this streptococcus during childbirth.

Because of these facts, sulfanilamide was tried as a treatment for patients suffering attacks of rheumatic fever. It was not successful in these cases and there was some evidence that it might be dangerous. The Baltimore doctors, however, and Dr. A. F. Coburn and Dr. Lucile V. Moore, of New York City, decided to try it, not as treatment, but as a preventive of recurring attacks of the disease. Authorities generally agree that the patient who survives his first attack of rheumatic fever would have a good chance of living out a normal life span if he could be protected from these repeat attacks with their added injury to the heart.

As early as 1939, doctors reported in Baltimore and New York that major attacks of rheumatic fever did not occur, or occurred in only one per cent. of patients given sulfanilamide prophylaxis during the winter and spring months when streptococcus infections are most numerous. The present report of experience over four years adds to the hope that sulfanilamide prophylaxis of rheumatic fever will prove successful.

The drug is given twice daily in doses smaller than those used for treatment of disease. No serious toxic effects were observed. The editor of the *Journal* of the American Medical Association comments on the "hopeful picture" the report gives and adds: "The final evaluation

of this method of prevention awaits results obtained in large, carefully controlled series of young rheumatic subjects. In view of the wide-spread occurrence and the crippling effects of rheumatic fever, it is to be hoped that interest in and support for such projects will be sufficient to permit a final evaluation of this promising lead in the prevention of rheumatic fever.''

THE EXTRACTION OF ANTIGENS BY SOUND WAVES

SQUEEZING and shaking substances valuable in medicine out of cultures of disease germs by means of intense sound waves is the biological feat that has been accomplished by Dr. Leslie A. Chambers and Dr. Earl W. Flosdorf, of the University of Pennsylvania.

The substances they obtain belong to the class known as antigens. They are poisons secreted within the germs' bodies. Injected into the human body in suitably small quantities, they may be used in provoking the formation, by our own tissues, of opposing substances known as antibodies, which defeat the germs if they attack later on. Or the antigens may be injected into the bodies of animals, from which blood is later withdrawn for making immune serums for medical use.

Present methods of obtaining antigens involve heating, addition of chemicals, or other treatments that injure or destroy certain of the more sensitively composed antigens. This is what the new method of Drs. Chambers and Flosdorf is designed to avoid. Its treatment of the germs is strictly physical or mechanical, and it can be conducted at a low temperature.

The foundation of their apparatus is a magnetized metal tube, usually made of nickel, which is caused to vibrate extremely rapidly by flowing an alternating electrical current around it in coils. The sound waves thus set up may be either exceedingly shrill, or even so high-pitched as to be in the ultrasonic range, beyond reach of the human ear. In either case, they are made highly intense.

Over the upper end of the metal tube a glass tube is fitted, with a leak-tight rubber joint. Into the chamber thus formed a culture fluid containing billions of germs is poured. Then the current is turned on and the vibrations started. After the treatment has been continued long enough to get out most of the antigens (and incidentally, to shatter most of the germs), the process is stopped, and the liquid is first centrifuged and then passed through a fine porcelain filter, to remove all débris and any of the germs that may have survived the treatment.

The antigens are in the clear, germ-free liquid that has passed through the filters. Some types of these antigens are so sensitive and unstable that they will spoil if kept for only a couple of hours at temperatures a little above freezing. However, if the liquid is frozen at once and the water evaporated out of the ice, the solid, dried residue, now consisting of concentrated antigens, can be kept for a year or more.

Drs. Chambers and Flosdorf have obtained U. S. patent (No. 2,230,997) on their apparatus and process, on which they have assigned their rights to the University of Pennsylvania.

ITEMS

FISH in hatcheries, no less than infants in nurseries and grown-ups at table, need a certain amount of bulk and roughage in their food. Experiments at Cornell University have demonstrated the virtues of what is perhaps the purest form of roughage known, for it must be completely indigestible. Cellophane, cut into fine shreds, is fed to the fish along with their other food. They eat it readily, and seem to thrive on it.

HUNGARIANS are now eating ersatz meat, concocted cheaply from ''twelve garden plants and vegetables,'' and Germany may borrow the idea for large-scale production, according to the *Foreign Commerce Weekly*. Put up as a powder, the meat invention is made edible by adding water, salt and bread, and can be cooked in hamburger or sausage-cake style by adding butter, cream and spices. About 2.2 pounds of artificial meat are said to contain 3,727 calories, and to consist of 40 per cent. carbohydrate and 22.3 per cent. white albumen. The cost of four portions is said to be less than 20 cents.

WRAPPING oranges and other citrus fruits in paper treated with diphenyl, a method originated by Dr. Adalbert Farkas, of the Hebrew University, Jerusalem, has been used with marked success by citrus growers in New South Wales. Losses of fruit in the treated wrappers were from two thirds to three fourths less than losses in control lots of similar fruit kept in ordinary untreated wrappers. Dr. Farkas was fromerly a member of the faculties of the Technical College in Vienna and the University of Frankfurt-am-Main. After leaving Germany, he was for a time at the University of Cambridge, England.

THAT starch may soon be made commercially from kafir, a grain-yielding sorghum, is indicated by research work by J. W. Greene, assistant professor of chemical engineering at Kansas State College. It may be possible to start this new industry within a few months if proper progress is made. The fact that kafir possesses starch as a component part has been known for years, but chemists have had difficulty separating it from the rest of the grain on a profitable scale for commercial use. Professor Greene and his research assistants have been interested mainly in processing the starch and finding new uses and commercial application. Professor H. N. Barham, of the department of chemistry, has been studying the properties of the starch.

THOUGH chemically the same as plaster of Paris, a new gypsum plaster, described at the meeting of the American Institute of Chemical Engineers, is about twice as strong as the old-fashioned article. In fact, it approaches Portland cement in strength. The new product was announced by E. P. Schoch and William A. Cunningham, of the University of Texas. It is prepared by heating gypsum in a magnesium sulfate solution, whereas plaster of Paris and ordinary wall plaster are made by the dry calcination or burning of gypsum. Experiments in a small pilot plant indicate, they stated, that it can be made at a cost of $8.82 per ton, a figure that may be reduced by large-scale production. Probably the magnesium sulfate plaster will find its chief application in wall board, tile and other factory cast products.