SCIENCE NEWS

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LEAD AND THE EARTH'S HISTORY

RECENT experiments at Harvard University indicate that the metal lead, already used in scientific estimates of the age of the earth, may also yield important clues to the earth's history back farther than ever before into the ages following the earth's birth from the sun. Studies made by Dr. Alfred O. Nier, national research fellow in the Harvard physics laboratories, indicate that atoms of the metal may hold locked within them at least a partial record of chemical and physical developments when the earth was young.

His studies concern the ordinary variety of lead. A second type of lead, derived as the end product of the decomposition of uranium, a radioactive element, has already won wide fame as a measure of the earth's age. Essentially, Dr. Nier's discovery is that the relative proportions of the isotopes of this metal, ordinary lead, vary considerably from sample to sample. Ordinary lead, for example, has four isotopes, weighing 204, 206, 207 and 208 atomic units. According to Dr. Nier's experiments, the relative abundance of these isotopes may vary as much as 15 per cent. It has heretofore been believed that the isotopes of lead had a certain, fixed ratio. This peculiar isotope distribution dates back millions of years and was probably caused, according to Dr. Nier, by the early contamination of ordinary lead in its primitive forms by the lead formed from the radioactive elements, thorium and uranium.

Further study of this variation and its significance may indicate that the ordinary lead atom carries within it a partial record of physical and chemical developments when the earth was young. They also expect to secure important new clues to the mechanism of the formation of lead ores. The key instrument in the research is a special mass spectrometer, believed to be the most delicate "atom sifter" known to science. Not only can the apparatus detect the presence of rare isotopic forms, heretofore a fairly difficult procedure, but it can also yield the most accurate measurements ever made of the abundance of different isotopes present in an element.

Dr. Nier has also studied sixteen other elements as the start of a comprehensive research program which will eventually put every one of the ninety-odd known elements through his spectrometer. His studies are also providing a check on the use of the other type of lead in the "radioactive clock" estimates of the earth's age.

INCOMING COSMIC RAYS

INVESTIGATORS believe that they have an answer to the fact that the piercing, incoming cosmic ray electrons are charged with positive electricity. The annihilation of the cores of atoms, containing only positive charges, and their conversion into cosmic rays is suggested as the cause, in a report of Professors Robert A. Millikan and I. S. Bowen and Dr. H. Victor Neher, of the California Institute of Technology. At the recent meeting of the National Academy of Sciences in Washington, they reported how their high-flying balloon ascensions in India, Texas, Nebraska and in Canada indicated bands of cosmic ray energies which can best be explained by the annihilation of common atoms like oxygen, nitrogen, carbon, alumninum and so on.

In their new report, published in *The Physical Review*, they state: "If there is, in fact, the possibility of the complete transformation of the mass of a nucleus into cosmic radiation, *i.e.*, into oppositely ejected electrons (or less frequently into two oppositely ejected photons), since only positive charges exist inside the nucleus, the hitherto strange fact that the incoming electrons are certainly predominantly positive, quite possibly exclusively so, would perhaps be less surprising than it is at present."

The balloon research, they add, shows that the observed cosmic rays have never previously encountered matter as dense as the vaporous atmosphere of the earth in their age-long journeys through inter-stellar space. This rules out the possibility that cosmic rays originate in the interior of stars.

THE STUDY OF THE IONOSPHERE

AFTER a four-year shut-down, the ionosphere observatory at Harvard University has this spring resumed its radio study of the little-understood blankets of atomic particles which surround the earth like a shell a hundred miles or so up.

Long-distance wireless communications would be impossible without the ionosphere and it is believed that continuous records of changes in it will be a great aid in improving radio communication. A further study of its peculiarities may also yield important information concerning the sun, the nature of the upper atmosphere and the weather. It is important that the records be continuous, for the ion layers unceasingly shift back and forth, sometimes very rapidly, throughout the day and night, chiefly as a result of changes in the intensity of the sun's radiation. The observatory is now making automatic observations twenty-four hours a day, of the heights of the ion layers over Cambridge. The importance of the research is accentuated by the fact that the Harvard laboratory is believed to be the only station in the United States now making these valuable continuous observations of the upper air on a fixed frequency.

Harvard expects to supplement its Cambridge observations within a few weeks with a program for continuous short-wave radio transmission and reception between the Harvard laboratories and a station at Rensselaer Polytechnic Institute at Troy, N. Y. In addition to observations by automatic equipment at the two stations a specially equipped radio truck will make field observations at in-between points.

Related research is being conducted by the Department of Terrestrial Magnetism of the Carnegie Institution of Washington, which operates stations in Peru, Australia and Alaska, and by the National Bureau of Standards.

Research workers in this field hope eventually to have at least thirty observatories all over the globe to conduct studies of variations of activity of the layers at different points above the earth's surface.

Observation of the ionized layers, which extend from about 30 to 150 miles above the ground, is possible because the electric character of these blankets is such that they reflect radio waves back to earth. This reflection makes it possible to send radio messages beyond the horizon, that is, around the curve of the earth. The effective heights of the layers can be determined by measuring how long it takes radio waves, traveling with the speed of light, to reach the layers and be echoed back to earth again.

Harvard's ionosphere observatory, directed by Professor Harry R. Mimno, was established in 1932, but had to be discontinued in accordance with the Federal Communications Act of 1934, which prohibited the operation of any radio station without continuous attendance of an operator. The act was amended last spring to permit scientific research by automatic transmission, and after a year's preparation the work has been recently resumed. Two devices which automatically transmit and record signals on fixed wave-lengths of about 80 meters and 150 meters and another automatic transmitter and receiver sending signals of regularly varied wave-lengths are now in use.

ABNORMAL BRAIN WAVE PATTERNS

PEOPLE who have "queer ideas" show it in their brain wave patterns as well as in other more obvious ways. This and many other facts that are being discovered about the characteristic patterns made on paper by electrical hook-up with a person's brain were discussed at the recent meeting of the American Psychiatric Association in San Francisco.

The queer or abnormal brain wave patterns found in persons who have "queer ideas," and in others who have phobias, or who show signs of paranoia or other mental disturbances, were described by Drs. Frederic A. Gibbs, and William G. Lennox and Mrs. Erna L. Gibbs, of Boston.

The brain wave patterns consist of rhythmic wavy or spiked lines traced on paper. They constitute a record of the electrical impulses that accompany brain cell activity. These patterns are so characteristic that the Boston scientists consider them as individualistic as a person's handwriting. On this point they stated: "That we are dealing with a fundamental constitutional mechanism which reflects the essential working of the individual brain is suggested by the following facts. Each individual has his own pattern of electrical activity which, like his handwriting, can be distinguished from that of other individuals and which under standard conditions maintain its individuality from day to day. Furthermore, normal persons who are related have records which bear a resemblance to one another, and the records of normal identical twins are closely similar."

Brain wave patterns will, it is hoped, help solve some problems of mental disease, just as similar patterns of electrical impulses from the heart, called electrocardiograms, are helping doctors to learn more about heart diseases. At the meeting Dr. and Mrs. Gibbs and Dr. Lennox reported that brain wave patterns in the widespread mental ailment, schizophrenia, are similar to those in patients with epilepsy. This is considered significant in view of the current theory that epilepsy and schizophrenia are antagonistic conditions. The three main types of epilepsy, grand mal, petit mal and psychomotor epilepsy, are each accompanied by a distinct pattern of brain waves having abnormal rhythm. The brain wave record of patients having psychomotor epilepsy is similar to that of patients suffering from schizopherenia and closely similar to those seen in the majority of children with psychopathic personalities, schizophrenia and certain abnormal behavior like epilepsy.—JANE STAFFORD.

CAROTENE-IN-OIL TO EASE EYESTRAIN

EYESTRAIN and fatigue, common complaints among those doing work that requires close attention, have been relieved among color matchers of the Westinghouse Electric and Manufacturing Company by daily doses of carotene-in-oil, a source from which the body manufactures vitamin A, Drs. Ralph C. Wise and O. H. Shettler report in a recent issue of the *Ohio Medical Journal.*

Three capsules of carotene-in-oil daily, they declare, by speeding up the regeneration of visual purple, light-sensitive substance in the eye, have improved the efficiency of color-matching inspectors by 75 per cent. Color inspectors of the company had long complained of severe headaches, burning and smarting eyes. Many of them declared they were unable to read in the evening after work or stated that they actually feared night driving. These conditions have now been changed by use of the new treatment, Dr. Wise, an eye specialist, and Dr. Schettler, of the company's medical department, assert.

The basis for giving the carotene-in-oil is the fact that visual purple, the light-sensitive substance in the retina of the eye, is decomposed in the process of seeing and can be regenerated only in the presence of vitamin A. Dosing with carotene in effect increases the body's supply of the vitamin so essential to proper seeing. Lack of vitamin A is known to be a cause of night blindness, an eye defect held responsible for a large share of the mounting toll of night automobile accidents.

The possibility of applying this same treatment to other industrial workers required to do eye-fatiguing work is held out by the Ohio doctors. An interesting by-product of the tests, which Dr. Wise expects to repeat elsewhere, was an appreciable improvement in the health of the workers treated, particularly in cases where fatigue headaches and eyestrain were chronic. Several workers reported gains in weight.

The eyestrain is produced not only by the close application of the eyes required, but also by the unusually bright light in which the work must be done. This light has a tendency to destroy visual purple and reduce the "light threshold." Measurements conducted with special equipment showed, they state, that the rate of regeneration of visual purple was increased. The new

system is said to be saving the company several thousand dollars a year as well as saving employees' vision.

PREVENTION OF WOOD TICK BITES

THIS year's crop of wood ticks is unusually large, particularly in the East. Vacation haunts have hordes of them. More surprising is the fact that vacant lots in cities are for the first time playing host to the common dog, or wood tick. One in several hundred of these ticks may carry the virus of Rocky Mountain spotted fever. That one tick, which in no way can be distinguished from the rest, may cause a fatal infection in the person it bites.

The forthcoming issue of the *Journal* of the American Medical Association carries a statement on prevention of dangerous wood tick bites. Keep the ticks from gorging on the blood of dogs. Pick the ticks off with a pair of forceps or tweezers. Dust the dog every five days with derris powder. Handle the ticks with care. Wear boots laced over the trouser legs when walking in thick-infested regions. Feel the back of your neck and head, their favorite feeding places. Examine children carefully in these spots twice a day. They will reveal the presence of a tick in time to prevent a fatal bite.

Examination of the whole body is necessary after exposure to ticks. If one is found, pull it off at once. Disinfect the bite and the surrounding tissues by inserting a round toothpick dipped in iodine into the exact spot where the tick was attached and drilling it in slightly. To detick clothing, place it in a vessel that can be tightly covered and set on top of it a pan containing half a teacupful of carbon tetrachloride or carbon disulfide. A few hours of such fumigation kills all ticks. Wood ticks are numerous along the eastern coast from Massachusetts to Florida, especially within a few miles from shore. Texas and Florida have a great many. Parts of Iowa, Minnesota and Wisconsin are infested. Islands off the coast of Massachusetts and South Carolina are heavily infested, especially Martha's Vineyard, Nantucket and Naushon. The Narragansett Bay islands have many. The eastern half of Long Island and along Chesapeake Bay in Maryland are other areas popular with ticks.

ITEMS

ORGANISMS that cause a deadly disease to tent caterpillars are being cultured at the New York State College of Forestry, Syracuse, to be released in an effort to control the forest tent caterpillar, which has developed into a major pest this season. The disease has been known for a long time, but this is the first attempt that has been made to propagate it artificially and use it as a means of forest defense. The orchard tent caterpillar, close relative of the forest tent caterpillar, was very bad in 1937, but seems to be on the decrease just now.

THE Japanese medaka, a small yellow fish, has been enlisted by Brisbane, Australia, in its fight against the mosquito pest. Experiments conducted by W. J. Fehlberg, deputy chief health inspector, have proved them voracious devourers of mosquito larvae. They continue to kill even after their hunger is satisfied. Another point in the medaka technique is that they hunt in packs, so that what one misses another usually gets. Their eyes are focussed all the time, and they delight in killing about an inch from the surface. They are too quick to fall victim to other fish, and are not subject to changes in temperature. Most of the imported mosquito-killers will be liberated in ornamental pools and garden ponds where spraying would kill lilies and other plants. Some will go to waterholes used by farmers for watering their stock and where spraying with oil harms the animals.

BIRDS of Siam have three kinds of mass migration, instead of the one kind that is known to temperate zones. Besides the usual north-and-south seasonal movement in which many Siamese species take part, there are also a water migration and a food migration, reports H. G. Deignan, of the Smithsonian Institution. The water migration consists in the movement of vast numbers of water birds toward higher land areas with the coming of the rainy season and its attendant higher water levels in swamps and shallow lakes. The food migration may be simply the result of scouting activities, in which certain individual birds discover places where mangoes, wild figs, and other fruits are ripe, and are then followed by the millions of members of the main flocks. Food migrations are indulged in only by birds of the pigeon and parrot families. Mr. Deignan, after two years of ornithological exploration in remote parts of Siam, is now at the U. S. National Museum, arranging and identifying more than 3,000 bird specimens which he brought back with him.

COOPERATIVE efforts to untangle a botanical Tower of Babel confusion of names are being made by the U. S. National Herbarium, working with the New York Botanical Garden and Harvard University. The confusion has resulted from the publication of more than 21,000 articles and books on the plants of eastern Asia in many languages. The region is a favorite of botanists because of its tremendous wealth of vegetation, but until now everybody who studied the flora has written about it as he pleased and published where he pleased. Resulting confusion has bogged down research in the plant sciences very seriously. Leaders in the effort to get order out of the present nomenclatural chaos are Dr. E. D. Merrill, of Harvard University, and E. H. Walker, of the National Herbarium. Results of their joint efforts are being published as a bibliography of the flora of eastern Asia.

DR. HELLMUTH RIEGG, Germany, reports that a new preparation, derived by chemists from the spinal fluid of animals, is reported to be effective in stanching minor hemorrhages. "Manetol," injected intramuscularly after first being dissolved in water, stops bleeding of wounds in which the tissue is so injured that blood oozes in a number of places and is difficult to stop by any other means. It is intended for use in hemorrhage cases not serious enough to require surgical treatment, but which are nonetheless troublesome. It is said to be effective in hemorrhages from the lungs, stomach, intestines and kidney, and may be used prophylactically in tonsil operations and in the extraction of teeth.