

SCIENCE NEWS

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THE DISCOVERY OF X-RAYS FROM THE SUN

X-RAYS generated in the sun bombard the earth incessantly, according to a report made by Dr. Ernst A. W. Müller, of the Siemens and Halske Company of Berlin, as the result of a study of the electrified radio "roofs" of the earth's atmosphere. Unlike the sun's light and heat, the solar x-rays of Röntgen radiations do not reach the solid crust of the earth. They are absorbed by the upper atmosphere down to a height of about sixty-five miles, where they electrify the air and create what is known as the Kennelly-Heaviside layer. This E layer, as it is also called, is the lowest of a number of the earth's electrified roofs which keep radio waves from being lost in interplanetary space. It reflects the longer radio waves.

The solar x-rays are thought by Dr. Müller to be more penetrating or softer than the ultra-violet radiations known also to come from the sun. They are "soft" x-rays, having a wave-length around one hundred millionth or one billionth of an inch. His report is based on deductions from many experimental results from England, America and elsewhere. Radio observations during the 1932 solar eclipse and at other times indicated that the agent causing the electrification of radio roof E comes from the sun. At first it was thought that the radiation responsible might be great streams of sun-born neutrons or electrically neutral particles, and later ultra-violet sunlight was blamed. Calculations show that ultra-violet radiation is easily absorbed by the air and that an amount sufficient to create the radio layer would not plumb the depths of the earth's enveloping ocean of air. Following the suggestion of Dr. W. F. G. Swann, of the Franklin Institute, Philadelphia—that fast electrons are produced in sun-spots—most of them, it is explained by Dr. Müller, must lose their energy in the outer layers of the sun and in so doing generate x-rays. This generation also takes place in the unspotted part of the sun.

THE PREVENTION OF SILICOSIS

METHODS by which a combination of engineering and medical sciences are winning their fight against silicosis, once widely prevalent in dust-laden coal mines, was described at a symposium on the health of miners at the recent meeting in New York City of the American Institute of Mining and Metallurgical Engineers. Silicosis is the disease of the respiratory organs caused by breathing rock dust.

Dr. Donald E. Cummings, of the Saranac Laboratory for the Study of Tuberculosis, said that better mine ventilation, spraying with water of air passages and exposed surfaces, delaying of dust-producing blasts until the end of the working shift, all have combined to lower the incidence of silicosis in coal-mine workers. Water curtains, wall-like sprays which keep back dust, have made it possible to reduce dust concentration by 65 per cent.

A new way of preventing dust with a hollow rock drill was described by Theodore Hatch, instructor in industrial sanitation at the Harvard Engineering School. Down the hollow drills flows swift-moving air, which blows the dust out through the bore hole into a dust hood connected with the mine exhaust system. Seldom appreciated, Mr. Hatch indicated, is the fact that in drilling one hundred feet of two-inch bore some 237 pounds of dust will be liberated. In volume it totals three cubic feet.

Dr. R. R. Sayers, of the U. S. Public Health Service, authority on industrial dust, reported studies of what constitutes dangerous dust concentrations in mines. The human system, he said, can tolerate 50,000,000 dust particles for each cubic foot of air if the quartz dust in it is not more than five per cent. If there is 35 per cent. quartz present, however, a concentration of only 10,000,000 dust particles per cubic foot must be avoided.

RESEARCH GAINS IN AVIATION

PEERING into aviation's future, the National Advisory Committee for Aeronautics in its annual report issued recently foresees the following developments:

Large aircraft of greater range and weight-carrying power, because aerodynamic efficiency increases with the size of airplane; engines of larger horsepower, made possible by the committee's research on the fuel injection principle; greater speed, through refinements in design, reduction in drag and increased engine power, and greater use of wing devices that give high lift in order to allow modern high-speed airplanes to land at safe and slow speeds.

Some researches at Langley Field on ways for converting a high-speed airplane wing into one with adequate lifting ability at low speeds are already being incorporated into new designs of American airplanes. The increased speed of modern aircraft, resulting from increased propulsive and aerodynamic efficiency, has been attended by undesirable and in some cases dangerous increase in speed.

Experiments upon the location of engines in multi-engine planes and upon cowling for engines to reduce their wind resistance have greatly increased speed and engine power output without increasing fuel consumed. This research is largely responsible for the sensational increase in air transport speeds in the last two and three years. Engine research results justify the early development of the compression-ignition type of aircraft engine, using Diesel-type fuel, which is heavier, cheaper and less dangerous than gasoline. The building of an engine using spark ignition and hydrogenated gasoline is also foreseen.

With the development of large airplanes and large liquid-cooled engines, there will come a need to house the engines inside the wings. This will call for different types and shapes of engines. Air-cooled engines are expected, however, to be built in sizes up to 1,000 and 1,200 horsepower.

In response to an inquiry by the Federal Aviation Commission, the building of two rigid airships for intercontinental service and the encouragement by the government of the private development and operation of large seaplanes across oceans were urged by the committee. Airships and large seaplanes will compete economically with Europe's new high-speed superships. The problem of promoting private flying on a large scale calls for a combination of improved economics and greater safety.

STONE AGE OCCUPANCY IN GERMANY

THE Ilsen Cave in Thuringia, a deep cleft in a massive mineral-bearing rock formation, has recently been investigated from top to bottom by Dr. Werner Hülle, of the Institute for Prehistory in Halle, Saxony. His excavations have disclosed evidences of not less than five different extended periods of Stone Age occupancy. From century to century litter appears to have accumulated on the floor, so that studious dustmen can now burrow downward through the mess and read history from the present time back to the remotest yesterday in mislaid stone tools and lost bone needles.

It was possible to differentiate five distinct layers of debris, each from six to ten feet thick. The top layer was "modern"; it bore evidence of the work of miners during the Middle Ages and broken pottery recognizable as belonging to the Iron and Bronze ages. Then came a layer correlated with the Late Magdalenian culture period in France. This was the latest of the several Old Stone Age civilizations. In the Ilsen cave were found flint implements and the teeth of wild boar, fox and other animals, the latter pierced as though for ornament.

The lower part of the same layer showed a long gap in human occupancy, which probably coincided with a temporary return by the retreating glaciers of the Ice Age, for this part of the stratum is thick with the bones of rodents and small birds such as are now found along the northern coast of Siberia. Below this was another layer containing human culture remains. These again could be correlated with a French Stone Age type, this time the Aurignacian. There were relatively few flints, and the bones of game animals included those of the musk-ox, horse and wild cattle. A single human bone, the lower jaw of a small child, was also found.

The lowermost tool-containing layer was also the richest in culture evidences. It was a multiple layer, showing occupancy by three different kinds of people. Uppermost were many patches of powdery charcoal, with flints and bone needles belonging to the Ehringsdorf culture type. Preceding the Ehringsdorf "family" the cave was occupied by people as yet not identified. But litter they left when they moved out showed that they hunted animals now extinct, including the cave bear, cave hyena and a species of rhinoceros. Below this great wealth of tell-tale rubbish was a lesser deposit, left by the first "family" that occupied the cave. They must have been Stone Age "poor folks," because their flint tools were but few, and of quartz and quartzite more than of flint, and their bone tools were small and not particularly good.

There is still a tremendous mass of these ancient family heirlooms left in the unexcavated parts of the cave,

which Dr. Hülle plans to investigate in the near future. Dr. Hülle has reported the results of his investigations to date to the German science publication, *Forschungen und Fortschritte*.

ELASTIC AND MAGNETIC PROPERTIES OF METALS

EXTENSIVE developments on the theoretical explanation of the relationship between the elastic and magnetic properties of metals, involving the orientation of egg-shaped atoms and changes in the atomic lattice work of metals under strain and magnetization, have been made by Professor Francis Bitter, of the Massachusetts Institute of Technology. The use of oriented strains to assist in magnetization and in the creation of permanent magnets is expected to be an important commercial development of this research.

Assuming the tiny atoms of a metal to be egg-shaped and free to turn, the first result of tension applied to the metal, according to Professor Bitter, is that all these atoms line up with their long axes pointing in the same direction as the applied force. After a certain point, when the atoms are all aligned in this manner, the force is used to widen the atomic spacing, which can proceed until the breaking point of the metal is reached.

By magnetizing the metal before applying the force, it has been found that a change in length of the metal is more easily obtained, since the magnetization has already done the preparatory work of lining up the atoms along their long axes. There is an energy loss in hysteresis which is expended turning the atoms into position. Also if a metal is stretched first, it will be much easier to magnetize, since stretching prepares the metal for further alterations, again by lining up the atoms.

The results of the leading experiment on this problem, first performed in Berlin by Dr. R. Becker, correlate closely with Professor Bitter's explanations. In that experiment, a wire with a weight attached to its end was twisted, after which it oscillated for ten seconds before the vibrations ceased. A magnetic field, placed around the wire and parallel to it, so successfully lined up the atoms and overcame the internal friction that the oscillations did not damp out for more than one hundred seconds.

GENIUSES FROM MIDDLE CLASSES

GENIUSES in largest numbers spring from the middle classes of our population, not just from the professional classes, studies of 3,000 school children by the Harvard Psycho-Educational Clinic indicate. In the opinion of Professor Edward A. Lincoln, of the clinic, "We need not expect complete social disaster as a result of the declining birth rate in the professional classes."

Nothing about the physical or mental status of the individual child can be predicted from the occupation of the parent. Professor Lincoln also states that the bulk of our superior children do not come from parents who are in the highest occupational classification, although this group contributes more superior children in proportion to its numbers.

Individual children differ more frequently and in more

important ways than has been supposed. The child not only differs from other children, but he grows different from himself as time passes.

No one trait from the measurement of another can be estimated, nor can a series of measurements be taken early in a child's career, to be used unmodified as a basis for prediction of his status at a remote date. The study of each individual child must be genetic. Measurements must begin early, and must be continued from time to time, keeping full and complete records of everything that can be found out about him.

Beginning in 1921, those at the Harvard Clinic have examined 3,000 children and re-examined them each year to make note of their individual development. The study was conducted under the direction of Professor Walter F. Dearborn.

LYSATES AND INCREASED PRODUCTIVITY

INCREASE in weight and productivity of farm animals may be accomplished by injecting lysates into the muscles of the animals, experiments of Soviet scientists have shown. Lysates are, they explain, medicinal preparations obtained from various organs of animals by means of artificial digestive processes.

Young pigs, after receiving injections of a special lysate, have shown a weight increase of 20 per cent. or more as compared to control animals. Three injections of the same material have increased the weight of adult pigs 24 per cent. The same preparation when introduced into the muscles of horses strengthens these and increases the endurance of the horses themselves.

Lysates have also been used to increase the milk production of goats and cows. The treatment has resulted not only in increase in actual quantity of milk, but also in an increase of the period of lactation itself. Special ovarian lysates have increased significantly the number of eggs laid by hens, and the fat deposits in the hens themselves have also been increased by suitable materials. Of twenty-four cows which had been sterile for from one to three years, nineteen produced offspring after treatment of this sort in another experiment.

At the present time, attempts are being made, by certain Soviet investigators, to apply lysate preparations in combatting epizootic diseases in stock-breeding. The fundamentals have been laid in experiments carried out in Leningrad, at the All-Union Institute of Experimental Medicine, where a lysate-vaccine against typhoid fever was obtained, in combination with a splenic lysate. One injection of this preparation alone was sufficient to render immune all the mice receiving a double mortal dose of typhus-culture.

ITEMS

ULTRA-VIOLET rays, at appropriate wave-lengths and strength of dose, are fatal to the eggs of certain parasitic worms, experiments at the Smithsonian Institution have demonstrated. The total energy of the light applied was equivalent to that of twelve days of average July sunlight, though the actual raying usually occupied only

a few hours. Previous observers of the killing effects of sunlight on these eggs had ascribed them simply to heating and drying out. But the present experimenters, W. H. Wright, of the U. S. Department of Agriculture, and Dr. E. D. McAlister, of the Smithsonian Institution, feel that they have demonstrated a direct lethal effect due to the ultra-violet radiation itself.

A SIMPLIFIED and speedy method of studying atom layers in metal crystals has been developed by Alden B. Greninger, of the graduate school of engineering, Harvard University. This is a variation of the scheme of the German, Max Laue, for "fingerprinting" atoms in a crystal by making the atoms diffract x-rays and having them fall on photographic plates in characteristic spotty patterns. From these x-ray patterns science has been able to tell what type of crystal structure produced them. Such knowledge is vital for studies of metal weaknesses. Instead of making x-rays pass through the crystal, which had to be cut in fairly thin sections in the former Laue method, Mr. Greninger cuts a hole in the photographic plate, passes x-rays through it, lets them fall on the surface of the crystal being studied and finally catches them on the plate as they are diffracted backward. From the characteristic pattern thus obtained the arrangement of atom layers in the crystal can be calculated with relative simplicity.

GIRL college students make less noise but complain more about it than men students. A survey of campus and dormitory noises made by Dr. Donald A. Laird, director of the Colgate University psychological laboratory, announced at Vassar College, one of the colleges studied, attributes the noise irritation of the woman student to "the better discrimination and use women make of their senses." While the volume of noise in the women's colleges records fewer decibels on the measuring audiometers, higher-pitched voices of the girls make the noise problem more acute even though they are softer in volume than the bass and baritone voices of the men.

THUNDERSTORMS and asthma have baffled a group of scientific men at the University of Illinois Medical College. These investigators, Dr. Tell Nelson, Dr. B. Z. Rappaport, Dr. William H. Welker and Dr. A. G. Canar, know they can relieve asthma sufferers by putting them in an air-conditioned ward or room, but they are up against a blank wall as to why the thunderstorm sets the patients back. They believe some factor other than pollen, temperature, humidity and ozone must play a part in bringing on asthma attacks. Filtering out the offending pollens helps the asthma sufferers materially. Keeping the humidity low and the temperature relatively constant helps even more, they now report to the American Gas Association. But even patients who were free of symptoms developed attacks of asthma while in the air-conditioned ward shortly after a severe thunderstorm. Patients in the air-conditioned ward, however, suffered less severe attacks after the thunderstorm and recovered more quickly than patients who had been in a room with filtered but not conditioned air.