

## SCIENCE NEWS

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## SOME PAPERS READ AT THE ROCHESTER MEETING OF THE AMERICAN ASSOCIATION AND ASSOCIATED SOCIETIES

FLOOD control problems motivated a three-cornered scientific get-together at the summer meeting of the Ecological Society of America, where three lines of scientific activity—forestry, soil conservation and engineering—pooled ideas and suggested ways and means for combating the national menace of great waters broken loose. Participants in the symposium were Ferdinand Silcox, chief of the U. S. Forest Service; Dr. W. C. Lowdermilk, associate chief of the Soil Conservation Service, and Dr. Morris L. Cooke, head of the Rural Electrification Administration. The speakers were unanimous in the opinion that flood problems in the great stream valleys can not be met wholly on the spot, but that the ultimate effective efforts must be put forth far upstream, where the “little waters” are. To achieve flood control, said Mr. Silcox, we must “lift up our eyes unto the hills”; in them lies the danger, and from them must come the help. For there our little waters rise; there man may restore and protect that vegetative cover which forms nature’s own great reservoirs and settling basins, dams, revetments and levees. And there, he points out, are the National Forests. Flanking the Appalachians from New Hampshire to Georgia; abutting the Great Lakes and dotting headwaters of the Mississippi; blanketing the Rockies from Canada to Mexico, the Cascade, Sierra and Coast Range mountains from north to south, they offer an opportunity and a challenge to ecologists, foresters and engineers alike. Maintenance of their forest, forage and other vegetative cover is vital to flood control. Foresters believe that if each drop of water is held for a time in the soil where it falls, there will be lesser volumes of water than now pile up in lower reaches of our rivers; that man’s mighty engineering works alone can not wholly prevent death from stalking through the lowlands; that to do this, conditions which serve to hold back rains at the headwaters must be restored, improved and maintained. Flood control must start, not with raging torrents of the lower Mississippi, but with raindrops and rivulets in places far from the haunts of man.

FROM single falling raindrops man can learn the beginnings of wisdom regarding soil conservation, Dr. Lowdermilk told his audience. When a drop falls, it splashes into a spray of clear water if it strikes a leaf or grass-blade or anything else than bare, unprotected earth. The spray settles upon the soil and is absorbed, with little or no surface runoff. But if the drop falls on bare earth, it splashes up not clean but muddy. The fine particles in the muddy spray, as it falls back to earth, “filter out at the surface to form a thin film which chokes up the surface pores of the soil. Only a part of the drop goes into the soil, another part flows over the surface, and by the accumulation of infinite drops, superficial flow is formed. As streamlets enlarge, the waters are released from surface frictional forces; the velocity of flow rapidly

accelerates and generates erosive power. The rampant waters become gully-washers, to coalesce into raging torrential flows.” Another thing that prevents the soil from absorbing its proper quota of water is the presence of imprisoned air. In the aggregate these air bubbles imprison tremendous quantities of soil and keep it dry, when plenty of water is available. Roots, stems of plants and other organic objects act as innumerable air-shafts to let this trapped air escape and permit down-soaking water to seep in behind it. Very little attention has as yet been paid to this function of roots and stems and a great deal of careful study is therefore needed to understand it and take practical advantage of it.

ENGINEERS no less than biologists and earth scientists must look upstream, in the opinion of Dr. Cooke, himself an engineer. Largely because of immediate business demands, but partly through lack of vision, engineers have always concentrated on enormous works on the big waters and they have let the little waters go unheeded and untamed. This policy, quite understandable but none the less dangerous, has contributed to historic flood disasters. Engineers have frantically thrown up higher and higher levees—and the great rivers have eventually met and broken all their challenges. Now engineers are realizing more and more the necessity of taming the little waters before they become too great to tame. Engineering begins to look upstream. Such wide-spread attack on the origins of the problem that masters all human effort if permitted to concentrate in the great valleys must involve a different economic outlook from that which has always governed engineers and their private employers, Dr. Cooke pointed out. Business men say they are “not in business for their health,” and they are justified in saying so. But the community at large it not in business for anything else but its health, and for this reason intangible values must be taken into account when the cost of a given large-scale project in control engineering is being reckoned. Engineers must become accustomed to looking out over a terrain that is nation-wide, and to seeing things in the large. Piecemeal engineering is doomed to be beaten piecemeal by the unbridled forces of nature. But engineering conceived and executed in regional and national terms has a chance to conquer.

DR. C. G. ABBOT, secretary of the Smithsonian Institution, Washington, known for his studies on solar variations, reported that more accurate and more continuous day-to-day observations of solar radiation will allow forecasting of some features of the weather two weeks in advance. For the new method of weather forecasting an extension of the present solar radiation observations of the Smithsonian Institution will be needed. At present, there are three observatories on high mountain peaks

in desert regions. If financial support can be obtained for adding seven observatories to those now operating, the necessary weather forecasting information will be obtained. Another way of obtaining the information would be to use balloons that sail above 100,000 feet (about 20 miles) carrying with them extremely lightweight instruments that record the sun's radiation and flash their findings *via* short-wave radio to the earth.

As the use of unmanned robot radio balloons becomes more common in weather services and upper air it should actually be cheaper than airplane flight at less than one fifth the height, Dr. Karl O. Lange, of Harvard Observatory, told the American Meteorological Society. The secret of the new system of air-mass analysis weather forecasting, Dr. Lange indicated, hinges on daily information of air temperature, pressure and humidity at very high altitudes. The use of airplanes carrying aloft instruments on special "weather" flights is now practiced, but investigators are turning to the tiny, light radio balloons to reach still greater heights at less cost. At present the radio-balloon flights going up twenty miles cost only 50 per cent. more than an airplane flight to 17,000 feet. Quantity production of the radio balloon equipment will decrease the cost below airplane flight.

SPRAYS of electrified particles shoot out, now and then, from all kinds of matter. Rocks, metals, even our own bodies, are subject to this effect which physicists say is due to the unceasing cosmic-ray bombardment. But it now seems more likely that the atoms remain intact during the collision and that the cosmic rays suffer the major damage. According to Dr. and Mrs. Carol G. Montgomery, of the Bartol Research Foundation of the Franklin Institute, the spray particles are pairs of positive and negative electrons created in that intense electric field which surrounds the nucleus of every atom. The raw material for the process is the energy of the cosmic-ray photons. Speaking before a meeting of the American Physical Society, Dr. Montgomery described experiments which he and Mrs. Montgomery performed with a device called an "ionization chamber." Different kinds of material—lead, tin, iron, magnesium—were piled about the chamber and their electrical effects recorded on yards and yards of photographic film. The heavier the material surrounding their chamber, the larger was the number of particles shot out in every spray. Heavier atoms have stronger electric fields about them; have greater power to rip cosmic-ray photons apart, as it were, and convert the pieces into pairs of electrons.

THE red blood cells of man and animals as carriers of electricity are being studied at the Biological Laboratory, Cold Spring Harbor, Long Island. Dr. Laurence S. Moyer and Dr. Harold A. Abramson reported that red blood cells of man, among the animals studied, have the highest effective electrical charge at their surface, equivalent to 15,000,000 electrons. Studies of the amount of electricity carried by the blood cells have important relationship to such basic human problems as the coagulation properties of the blood and problems connected with the anemias. For example, it has been found that in certain

cases of anemia in human beings, the abnormal cells apparently possess a mechanism which is capable of preserving the normal surface charge of the cell in spite of wide variations in the surface area during the course of the disease. Of all the animals studied in the tests, Drs. Moyer and Abramson found that the rabbit had the lowest electric charge density—only 1,890 electrostatic units. Man and the rhesus monkey (used in experimental studies of infantile paralysis) had about the same charge density, 4,500 units. The dog had the highest charge density, 5,600 electrostatic units.

EXPERIMENTS on the effect of the new neutron rays of science to produce biological changes in living organisms show that they are much more efficient than x-rays, according to Dr. Raymond E. Zirkle, Johnson Foundation for Medical Physics at the University of Pennsylvania. Ultimate hope of the investigators, Dr. Zirkle revealed, is that the neutron rays will be more destructive to tumorous tissue than to normal body tissue and that medical science will thereby have a more potent radiation with which to attack cancer. He stated that "the results to date do not yet justify the prediction of such an extremely fortunate outcome, but are nevertheless distinctly encouraging." The neutron—one of the fundamental building blocks out of which atoms are built—was only discovered in 1932. Even yet the sources for creating neutron beams for biological study are so weak that only beams of low intensity can be used. But the encouraging thing is that the effectiveness of neutrons in ionizing tissue (which is the way all rays act on biological material) is always greater than x-rays for equal incident intensities. The relative effectiveness has been found to be from three to ten times in favor of the neutrons. Moreover, and still more encouraging, the neutron-x-ray ratio of effectiveness is not the same for all living tissue. "This is of tremendous importance," according to Dr. Zirkle.

IN the Maiben lecture before the American Association for the Advancement of Science Dr. Charles Camsell, deputy minister of mines of Canada, described an airplane expedition that covered 4,000 miles. He tried, without success, to find the so-called "tropical valley" of northwestern Canada. Although the legend had persisted for many years, it was found to be pure fiction. There are, however, unexplored areas still awaiting the adventurous geographer. The Mackenzie Mountains, the greatest single mountain group in the whole of Canada, are, to a large extent, unexplored and their structure and history are unknown.

THE first scientific proof that magnetism has an effect on living things was presented by Dr. Grace Kimball, of Cornell University. Young yeast cells were exposed to the magnetic field of a permanent horseshoe or bar magnet for a short period of time. The weakest field used for the work was 25 times stronger than the earth's magnetic field. "A noticeable inhibition of budding" was observed as a result of the magnetic force. The number of buds produced by the yeast cells under the magnet was 20 to 30 per cent. less than the number put

forth by yeast cells farther away from the magnet. When the magnet was shielded by substances which do not affect the magnetic field, such as glass, zinc or paraffin, the inhibiting effect remained, but when the magnetic field was cut off by iron, there was no inhibition and the yeast cells continued to bud at the normal rate.

NEW advances in studying the tuberculosis germ were reported by Professor R. J. Anderson, of Yale University. By analyzing these germs, Professor Anderson is learning what chemicals they use to produce disease in man and other animals. In wax obtained from the germ he has found complex sugars, fatty acids and a new alcohol which are peculiar to the human tuberculosis germ and are not found in waxes from any other bacteria. The part these different tuberculosis germ chemicals play in producing the disease has not been completely established, but Dr. Florence Sabin, of the Rockefeller Institute for Medical Research, has found that the new acids and the optically active alcohols of the wax from the tuberculosis germs are remarkable stimulants to cells, especially the type of cells that form fibrous tissue and tendons in the body, the white blood cells known as monocytes and foreign body giant cells.

DR. GEORGE PACKER BERRY, of the University of Rochester School of Medicine, reported the production of a malignant 100 per cent. killing tumor disease in rabbits by injecting into them a virus of a non-fatal skin disease

to which had been added some completely heat-killed virus of the deadly disease. No disease, whether caused by bacteria or filterable viruses, had heretofore been changed into another.

By aid of delicate chemical tests dry bones of Egyptians who lived 3,300 years ago can be made to give up secrets regarding types of blood that once flowed in their veins. Announcement of the tests was made by Dr. P. B. Candela, Brooklyn physician, who used skeletons of Egyptian women who lived in the days of Egypt's eighteenth dynasty, 1500 B. C., now in collections of the Brooklyn Central Museum. It has been possible, said Dr. Candela, to prepare blood-group maps of the world showing that various races in different parts of the world are mainly of one blood type or another. American Indians, Celts and Basques belong predominantly to type two. Groups as dissimilar as Hindus, Patagonians and Amazon tribes are classed by blood mainly as type three. That this evidence points backward toward some significance in the early history and origin of human races was realized. But to trace that significance required evidence about blood types of ancient men dead thousands of years, and this information seemed lost beyond recall. Recent tests, however, have showed that mummified flesh of Egyptians and Indians can be made to reveal blood types. Dr. Candela's research extends the technique to dry bones, thus opening up the way for science to learn the blood traits of early men even in the Old Stone Age.

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