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SOME PAPERS PRESENTED AT THE ATLANTIC CITY MEETING

THE distance between the United States and England appears to vary each day as the moon moves across the sky. If the hypothesis advanced to the American Astronomical Society by Dr. Harlan T. Stetson, director of the Perkins Observatory at Delaware, Ohio, and Alfred L. Loomis, of the Loomis Laboratory, Tuxedo, New York, is correct, the change in distance is about 63 feet. They make this suggestion to account for surprising variations in British and American time which have been uncovered by Mr. Loomis' researches. With what is probably the most complete installation of the latest type of precision clocks in the world, and automatic radio sets, to record time signals from a number of national observatories, he has found that the times do not agree. The time is determined at both places by observing the instant that a star crosses the meridian. Therefore, if the two observatories are shifting slightly in longitude, the star will cross slightly early when it is west of the average, and late when it is to the east. In the absence of any other satisfactory explanation, Dr. Stetson and Mr. Loomis have adopted the idea that such a shift does take place. The Loomis-Stetson hypothesis to explain this variation in step with the moon's position is that there is a natural stretching or shifting in the earth's crust, within its elastic limits, which would yield and recover periodically under the stress of the moon's gravitational pull. Another result of the studies is the indication that the radio wave takes twice as long to cross the Atlantic as would a beam of light traveling the same distance.

A NEW theory of the origin of cosmic rays was suggested to the American Physical Society by Dr. Ross Gunn, of the U. S. Naval Research Laboratory. Out in the stars that are still young there are born in great "star-spots," like sun-spots on our sun, negatively charged ions or electrons which are given great energies. These pass through the outer layers of the star and each picks up a positive ion, and the two together form an energetic neutral pair of some 10 to 100 thousand million electron volts. When such particles hit the earth they become separated in the upper atmosphere by electromagnetic forces or collisions and become the cosmic rays. Such neutral pair particles which are fathers to cosmic rays are uniformly distributed in space, Dr. Gunn believes, thus accounting for the cosmic radiation coming from all directions. The sun-spots give rise to weaker neutral radiation which gives rise to the aurora and magnetic storms but are not powerful enough to generate cosmic rays.

A NEW process of x-ray generation, caused by the passage of a swiftly moving electrified particle through gas, was reported to the American Physical Society by Dr. Gordon L. Locher, National Research Fellow at the Bartol Research Foundation of the Franklin Institute. Dr. Locher discovered the new process of ionization while investigating the nature of the cosmic rays. Part of the charge in an ionization chamber such as used for measuring the cosmic radiation is caused by characteristic x-radiation generated by the passage of the cosmic radiation particle through it.

THE new type electrostatic high-voltage generator, invented by Dr. R. J. Van de Graaff, and constructed by the Massachusetts Institute of Technology at Round Hill, Massachusetts, with a Research Corporation grant, will develop a steady direct current potential of 10,000,000 volts with a continuous power output of about 20,000 watts. One of the first tasks of the generator will be atom-smashing. To provide a portable high-voltage machine, Dr. Van de Graaff and E. H. Bramhall have designed a rugged machine mounted on rubber-tired casters that will develop 1,500,000 volts. Both generators work on the principle of the old-fashioned static electricity generator and belts carry the electric charges to large discharging spheres.

DISCOVERY of 236 stars in the northern Milky Way with layers of glowing hydrogen surrounding them was announced to the American Astronomical Society by Dr. Paul W. Merrill and Cora G. Burwell, of the Mount Wilson Observatory. These are known as type Be stars, and are of interest to astronomers because of some of their peculiar properties. Astronomers at Mount Wilson have been making a search for them, using the spectroscope to study the lines in the stars' spectra. As a result, the total of known Be stars has been raised to 408.

ULTRA-VIOLET radiation is much more damaging to bacteria than it is to the filtrable virus class of disease causes. This is indicated by researches reported to the Botanical Society of America by Professor B. M. Duggar and Alexander Hollaender, of the University of Wisconsin. Cultures were exposed of the virus of tobacco mosaic and of three kinds of bacteria to the action of ultra-violet rays of a certain narrow range of wavelengths. It was found that the virus resisted radiation up to 150 times the amount that sufficed to kill one of the bacterial species. The spores or resting-stages of the bacteria were more resistant to ultra-violet than were their vegetative cells.

FOR the first time, evidence was brought forward on the possible shape of the active particles in the filtrable viruses that cause such diseases as smallpox, yellow fever, hog cholera and plant mosaics by Drs. William N. Takahashi and T. E. Rawlins, of the University of California. If the invisible, filter-passing particles in these viruses have the shape of tiny rods they should present a bright appearance if light waves arranged all in one direction fall on them at the proper angle. Accordingly, they directed a beam of polarized light, in which all wavefronts are parallel, upon a solution of a virus flowing from a small tube. The solution did present a bright appearance, confirming the hypothesis.

A CHANCE mosquito bite of a chicken or a monkey may be an unsuspected source of malarial infection. Studies showing that chickens may be infected by certain strains of malaria were reported by Professor Reginald D. Manwell, of Syracuse University. It has not been known generally that such large birds as chickens could get malaria. This is because the disease runs a short, mild course in the barnyard bird and so is not recognized. Professor Manwell's discovery that chickens could be infected resulted from efforts to find a more suitable bird than the canary for his studies of the disease. Since chickens can be infected artificially, Professor Manwell questioned whether they and other animals hitherto supposed to be not susceptible to malaria may not also be infected in nature. It that case they would serve as unrecognized reservoir hosts, their blood containing enough malarial parasites to infect other mosquitoes but not enough for detection by ordinary microscopical methods. It is quite conceivable that monkeys or other mammals might in this way contribute to the perpetuation and spread of human malaria.

DR. MICHAEL LEVINE, of Montefiore Hospital, New York City, reported to the American Phytopathological Society that, after many vain attempts, he had finally succeeded in inducing a cactus to develop crown gall, a form of plant tumor caused by a microorganism. His efforts to produce the disease in smaller cacti, like the familiar prickly-pear, were not successful, but when he inoculated young specimens of the Sahuaro, or giant tree cactus of the Southwest, he obtained the characteristic abnormal growths. However, the resistance apparently natural to cacti appeared partially even here, for the internal structure of the plant tumors on the Sahuaro was not that of fully developed crown galls, but remained in a more or less juvenile or embryonic condition.

MOTION PICTURES demonstrating how nerve fibers grow through living tissue, and how they repair themselves when injured, were shown by Professor Carl C. Speidel, of the University of Virginia. Professor Speidel, who was the winner of the $1,000 prize of the association at the midwinter meeting at New Orleans last year, gave a summary of his work up to that time and of advances made since then. As explained by Professor Speidel, nerve growth is pioneered by what are known as "growth cones" on the ends of the nerve fibers. These are thickenings of the tips, which probe their way through the tissues, constantly sending out and retracting tiny processes from their surfaces. As the nerve progresses, special cells develop along its course. They hug its sides closely, though they take no part in its actual growth process, nor in its function as a nerve. These are known as the "sheath cells." Finally, as the nerve becomes more mature, it develops around itself a layer of fatty material called the "myelin sheath."

THE exact way in which a single tuberculosis germ multiplies into three or more new germs has been observed by Professor Morton C. Kahn, of Cornell Medical College, New York. Bacteria or germs have a life cycle something like the egg, the pupa and the butterfly. Professor Kahn was the first to work out that cycle for the tubercle bacillus. He considers that the question of how disease-producing bacteria reproduce, or multiply into more bacteria, is one of the most important problems confronting present-day bacteriologists. The rod-shaped tuberculosis germ cleaved into three or more oval bodies which became further reduced in size to extremely fine granules. From these tiny granules very small and delicate rod-shaped types developed. These rods finally elongated and thickened until they became the same size and shape as the tubercle bacillus from which they started. These new, rod-shaped tuberculosis germs were able to produce typical tuberculosis in guinea-pigs. Contrary to the claims of some investigators, Professor Kahn did not find that the tubercle bacillus, even in the form of the almost sub-visible granules, could pass through fine-pored filters. He did find that some of the fine young granules and rods formed from the original tubercle bacillus lost the family characteristic of retaining certain aniline stains even after exposure to acid.

DR. ROSEBURY and his associates at the College of Physicians and Surgeons, Columbia University, have found that they could produce or prevent dental fissure caries in rats at will by changing the size of the particles of uncooked rice in the rat diet. No tooth decay occurred when cooked rice replaced uncooked rice in the diet. The type of tooth decay thus produced is so much like the dental caries of the fissures or crevices of human teeth that it is assumed that the same causes produce the condition in man and in rats. The tooth decay may be produced in healthy, well-grown rats that are on an adequate diet with plenty of vitamins, minerals and other food essentials, and that have teeth free from structural defects. Rats on adequate diets, however, have less tooth decay than rats on deficient diets. Dr. Rosebury pointed out that there are several kinds of tooth decay to be found in rats. Not all of them are comparable to human caries. Failure to distinguish between the different types of rat caries has caused much confusion in experimental studies of tooth decay in the rat.

A CHANCE that diabetics may be freed from the hypodermic injection method of taking insulin and may be able to take it by mouth instead is indicated by the chemical study of the hormone reported by Dr. Hans Jenson, of the Johns Hopkins Medical School. The activity of insulin may be due to a peptide composed of cystine and glutamic acid. It that case it might be possible to give it by mouth. Insulin itself, whether extracted from the pancreas or whether prepared in chemically pure form, is destroyed by the enzymes of the stomach and intestines. That is why it must be given by injection under the skin to be effective. If a peptide or similar protein compound of low molecular weight could be found having the insulin effect, probably enough of it could be absorbed from the stomach to make it possible to give it by mouth.

DR. W. R. COE, of Yale University, outlined the sex life of the oyster. He said in part: "It was formerly believed that the commercial oyster of our Atlantic coast

was of separate sexes and that the sexuality of any individual remained unchanged during its entire lifetime. Recent studies, however, have shown that this is not entirely correct, for it has been proved that an individual that has functioned as one sex during one spawning season may assume the opposite sex the next year. But only a small proportion of the adult oyster population shows this change in any one year, the majority of individuals retaining the same type of sexuality for two years or more. And it is not improbable that some—perhaps many—individuals retain the same sex throughout life or, at least, after passing through an initial male phase during their first or second year."

MANY seeds of trees, shrubs and other plants of commercial or ornamental value are wrapped up in coats so highly resistant that it takes months or years for them to germinate. Professor J. Nelson Spaeth, of Cornell University, reported to the Botanical Society that seeds of linden or bass wood did not germinate in two years if left untreated. Chilling them at various temperatures, even as low as that of liquid air, failed to have much effect on their torpidity. But when seeds were treated with concentrated sulfuric acid for from twelve to twenty minutes, they showed 49 to 63 per cent. germination in four months. Florence Flemion, of the Boyce Thompson Institute for Plant Research, experimented with the stubborn seeds of Rhodotypos, an ornamental shrub of the rose family. These appear to need a period of "after-ripening" in order to germinate and grow properly. By peeling off the seed coats, she induced a few of them to grow without this after-ripening period, but they developed very slowly, and the young plants have the appearance of being dwarfs.

THE forest of Alaska is marching northward. Its front is made of young trees, none of them over a hundred years old, though a few miles to the rear there are plenty of specimens that can boast three centuries. This and other evidence of advancing tree line in the North was presented before the Ecological Society of America by Professor Robert F. Griggs, of the George Washington University. His observations in Alaska are supported by similar studies made by other botanists in the Scandinavian countries. Professor Griggs's most striking observations were made at Kodiak, which is now just beyond the timbered area, though old records indicate that areas now heavily forested were treeless a few generations ago. "The trees at the edge of the forest are small and squat, suggesting an adverse climate," he said, "but when examined they were found to be growing as rapidly as the same species a thousand miles within its borders to the southeastward. They are likewise reproducing freely."

THE machine age may starve to death in the near future, victim of to-day's profligate use of metals, coal and oil. In his presidential address before the American Society of Naturalists, Professor Ross Aiken Gortner, of the University of Minnesota, observed that precious, irreplaceable stores of natural resources absolutely essential to modern industrial civilization are disappearing into the maws of industry and dissipated wastefully over the earth. "In the last hundred years this lusty infant, applied science, has increased its food consumption perhaps a thousand fold," he said, "and unfortunately for mankind already the shelves in some of nature's cupboard show signs of exhaustion of specific food supplies." Professor Gortner warns that the coal and oil supplying this energy will be exhausted within the next thousand years. More menacing is the approaching exhaustion of copper, antimony, tin, lead, zinc, chromium, manganese, nickel and iron stored in parts of the earth accessible to man. In the past hundred years the tools of science have wrested from the earth from a tenth to half of the available natural resources. Man has enjoyed them for a moment, then destroyed them or cast them aside in a form useless to coming generations. Water power, alcohol from vegetation and solar energy are totally inadequate to replace oil and coal.

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