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SOME PAPERS READ BEFORE THE CAMBRIDGE MEETING OF THE BRITISH ASSOCIATION

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LORD RAYLEIGH, president of the British Association for the Advancement of Science, in his address at the opening of the annual meeting, declared pessimistically that "the world is ready to accept the gifts of science to use for its own purposes, but it is difficult to see any sign that it is ready to accept the advice of scientific men as to what those uses should be." Disagreement with their leader's pessimism is already being registered, however, by many British scientists, as well as by some of the foreign visitors at the meeting. A surprising number of the more optimistic scientists hold that there is a growing movement among leaders, showing solid determination that scientists shall have a say regarding the utilization of the riches they bestow upon civilization. It is probable that scientific liberals will demand more than mere fact-finding rôles for themselves and insist that political and economic leaders take scientific advice in running the world. Lord Rayleigh challenged the idea that science is responsible for application of its own discoveries to the purposes of war. He pointed out how the chief of staff of the British Army in 1908, five years after the successful flights of the Wright brothers, had scorned aviation as of no military value. He stated that, "The application of the fundamental discoveries of science to the purposes of war is altogether too remote for it to be possible to control such discoveries at the source."

DISCOVERY of the second example of a new kind of immense but extremely faint star system in the heavens was the subject of a paper by Dr. Harlow Shapley, director of the Harvard Observatory. Only a few months ago Harvard astronomers found the first of these systems, called the Sculptor cluster, on a photograph made with the southern hemisphere's most powerful telescope, the 60-inch reflector at Harvard's station at Bloemfontein, South Africa. The new star cluster is in the constellation of Fornax, only about 20 degrees in the heavens from the Sculptor cluster. It is an immense aggregation of stars probably about 300,000 light years distant from us. Dr. Shapley said that at least 5,000 individual stars in the Fornax system have been spotted. The reason that astronomers are rather excited about these discoveries is that they have found a new kind of star grouping that "may have high significance in the general study of the nature of stellar systems." It is remarkable in that it is neither a globular cluster, nor a Magellanic cloud, nor a spheroidal galaxy, but has certain properties of all three of these well-known kinds of stellar systems. The extreme faintness of the great mass of stars is one reason that it has not been discovered earlier. It took a two-hour exposure with the powerful telescope to demonstrate the existence of the Fornax cluster. Doubt that the universe is expanding, Dr. Shapley hinted, may result from the extensive study of the distribution of the galaxies that Harvard Observatory has been conducting for several years. There are major inequalities in the way the great "universes" of stars, each somewhat like our own Milky Way, are distributed in space. Dr. Shapley reported the discovery of a transverse gradient in the space-density of galaxies across the south galactic pole. As a result of this work the scientific controversy as to whether the universe is expanding may be renewed.

PROFESSOR W. H. FURRY, of Harvard University, spoke on the heavy particles of about 200 times the weight of the unitary electron, that get knocked dizzy by occasional incoming cosmic rays, describing how much (or how little) physical research has thus far disclosed about these elusive citizens of the sub-atomic world. There do not seem to be many of them, at least in the rather widely scattered parts of the earth where cosmic ray research goes on, for of the thousands of photographs that have been taken of particle collisions only a few have shown these heavyweights being jostled about. Of course, nobody ever sees or photographs the particles themselves. But when cosmic rays are permitted to dash through a partial vacuum containing a little water vapor, the electrically charged particles they hit fly off at an angle, leaving behind a trail of white mist, and this can be seen and photographed. It is something like a skyrocket —you can not see the rocket itself, but you know where it goes from the trail of sparks it leaves behind. The weight of such particles can be quite accurately estimated by applying the field of a strong magnet, and measuring the amount by which they are pulled from their course, just as you could tell the difference in weight between a tennis ball and a baseball by throwing them both across a strong wind. The mass or weight of the newcomers in the field of atomic physics has been worked out by such methods as about 200 times that of the well-known and far more abundant electrons.

WE could learn about cosmic rays much more rapidly if it were not for the unfortunate circumstance that the earth has an atmosphere. Professor E. Regner, of the Stuttgart Technical College, told of some of the troubles introduced by the presence of such a lot of air over the earth. "Unfortunately there are great experimental difficulties in the exact measurement of cosmic rays at great heights," he said. "Nevertheless it is firmly established that a transition effect exists at the limit of the atmosphere, which is shown by a detectable maximum in greater heights." The sun's behavior is another disturbing element. When Old Sol stirs up a magnetic storm on earth with a burst of unusual activity in his own massive body, there is a corresponding increase of cosmic ray activity at greater altitudes on earth, while at the same time, paradoxically enough, the cosmic ray activity at sea-level diminishes.

THE first understanding of exactly what happens within the hearts of atoms, showing that they get hot and bothered and finally go smash, was presented by Dr. Niels Bohr. When the nucleus or heart of an atom is subjected to bombardment with electrical particles, the events resemble on a small scale what happens when you heat up an ordinary larger object. At first, energy is added and a semi-stable compound nucleus is formed. Then the whole thing either goes to pieces or de-activates itself by radiating away the energy that has been shot into it.

COLD normally makes liquids thicker and more viscous, until at last they solidify: "slow as molasses in January" is a traditional expression of this fact. Dr. J. F. Allen, of the University of Nebraska, reported that one form of liquid helium, which is so cold that a January blizzard seems like a furnace blast by comparison, flows thinner than water. This form of helium (designated by the symbol HeII) approaches absolute zero in temperature. Absolute zero is 273 degrees Centigrade below freezing point. HeII offers so little resistance to stirring or pouring that it resembles a gas in this respect rather than a liquid. Thus far, Dr. Allen stated, no comprehensive theory has been developed to explain all its properties.

THE love philtres of old-time alchemists have their counterparts in synthetic compounds produced by modern chemists. Substances not at all related to the natural sex hormones stimulate normal sex reactions, according to a report made by Professor E. C. Dodds, of the University of London. He was able to produce characteristic physiological changes in female animals with a whole series of organic compounds which he made in the laboratory. This "indicates that a complete change of view must be made on the question of the specificity of biological action," he remarked, adding, "The bearing of this on the whole question of hormones and vitamins is of the greatest importance." In line with Professor Dodds's suggestion, it appears possible that chemists may eventually be able to produce synthetically substitutes for the present costly and laboriously extracted "biologicals" much used in medicine that will cost far less and yet be much more potent. Dr. A. S. Parkes, also of the University of London, cited examples of male gland secretions, or hormones, that also had the power of stimulating underdeveloped female animals to normal growth and activity along the lines of their own sex. This falls in line with the lack of specificity in such substances discussed by Dr. Dodds.

ISLANDS played a classic rôle in the development of the doctrine of evolution. Darwin was impressed with the effects on animals and plants of ages of isolation on the Galapagos; similar phenomena on the smaller islands of the East Indies had a like effect on the mind of Alfred Russell Wallace. But isolation can produce evolutionary effects without any islands, it was pointed out by several speakers before the association. Animal and plant communities can be surrounded with conditions on land that prevent their migration just as surely as though they were marooned in the midst of the sea. For example, a forest may be surrounded by grasslands which many of its species are quite unable to cross, or Alpine species may be isolated if the mountain range is in the midst of a desert. The effects of this kind of isolation, termed "ecological isolation," were discussed by Dr. W. B. Turrill, of the Royal Botanic Gardens at Kew. An even narrower isolation is possible, when the nature of an organism, or the minute interior structure of its cells, prevent it from interbreeding with species that surround it and are somewhat like it, but not sufficiently so to permit successful mating and reproduction. These types of isolation, known, respectively, as genetic and chromosomal isolation, were the topics of Dr. C. D. Darlington, of the John Innes Horticultural Institution, and Dr. D. G. Catcheside, of King's College, London.

CIVILIZATION'S dawn—the time when men learned how to systematize production and live in towns—recedes farther and farther into the midst of years the longer the problem of culture origins is studied, it was indicated in the address of Professor V. G. Childe, president of the section on anthropology. Recent German excavations in lower Mesopotamia show well-developed town life as far back as 4,500 B.C.—long before the invention of writing. And the towns found buried beneath the ancient river plain show every evidence of having been built by peoples already civilized, who apparently migrated into the land from somewhere else, bringing their relatively advanced culture with them. Evidence also increases that there was a continuity of civilizations, with business and cultural contacts between the peoples, during all these uncounted centuries of unrecorded history. Archeological finds all the way across Europe, from Macedonia to Scandinavia, give indications of these contacts far back into the Late Stone Age. East met West ages upon ages ago.

NATIONAL hoards for emergency purposes are already showing a tendency to take the form of food reserves rather than gold reserves, it developed in discussion by J. M. Keynes, C.B., of the University of Cambridge. As he summed it up: "It is an outstanding fault of the competitive system that there is not sufficient incentive for the storing of raw materials so as to average periods of high and low demand, except by means of excessive price fluctuations. There is, therefore, a *prima facie* case for government action to supplement this deficiency, which is not easily supplied by the competitive system from within. In present circumstances three considerations combine to reinforce this *prima facie* case: (1) storage for war purposes; (2) with the object of mitigating the fluctuations of the trade cycle; and (3) the stabilization of prices by holding some part of the central banking reserves, not in gold, but in a composite commodity."

FARM mechanization has not proceeded as far in Great Britain as it has in the United States, but Dr. S. J. Wright, deputy director of the Agricultural Engineering Research Institute at the University of Oxford, sees its

coming to the islands without very great misgivings. He stated that "Mechanization is neither a serious menace to our rural amenities nor a royal road to prosperity. Most of the changes for which mechanization have been blamed are due to purely economic causes, and, in the long run, agriculture can absorb mechanization without prejudice to its own interests. Moreover, under present conditions, only the machine can give the agricultural worker the leisure and amenities which he is entitled to demand."

WILL the great city of London become "one with Nineveh and Tyre" through lack of water? There is a definite threat of failure to the subterranean water supply, according to Dr. S. Buchan of London. "The truly artesian conditions of a century ago are gone and in one area the surface of the water stands 300 feet lower than it did sixty years ago. Water is being extracted from the center of the London Basin more rapidly than it is replenished. . . . Owing to the geological structure the lowering of the water level has caused brackish water to flow from the tidal reaches of the River Thames into the chalk and to pollute the supply in an area of high-yielding wells. As the fall in level continues, pollution will become more intense. . . . The large number of abandoned wells create another potential danger to the water supply."

AMAZINGLY "modern" is the broken skull of an exceedingly early Stone Age man discovered at Swanscombe, associated with extinct elephants and other animals that disappeared from Europe with the passing of the Ice Age. This important fossil was discussed by a group of seven scientists, who tackled the question from all possible angles. Although this earliest of Early Britons was an exceedingly crude fellow, so far as his tools and other cultural achievements are concerned, he was not a Neanderthaler, nor a Heidelberger, nor a member of any of the other clumsy, beetle-browed races we have been accustomed to regard as dominating the dawn of the Age of Man on this planet. He was like us, a member of the species *Homo sapiens,* so far as all the evidence now in hand can be interpreted.

GOLD mirrors, once supposed to be a secret of the ancients, were demonstrated to the British and foreign scientists attending the meeting, in the works of the Cambridge Instrument Company. Gold mirrors, better than queens of antiquity ever possessed, yet within the reach of the ordinary citizen's wife, can now be prepared, thanks to modern chemistry. The gold is first made up into an organic compound (something the ancients never accomplished) and then the compound is decomposed over glass, depositing the precious metal in an exceedingly thin but brilliantly shining film.

ITEMS

OBSERVATIONS at Mount Wilson Observatory have enabled scientists to determine, for the first time, the size and physical characteristics of the only eclipsing stars in outer space in which astronomers are particularly interested. An eclipsing star is really a pair of stars that revolve around each other. An eclipse occurs each time one member of the pair passes between us and the other member. The largest star in the eclipsing system, named Zeta Aurigae, is equivalent in size to about 10,000,000 of our suns, while the smaller is also much larger than the sun. The large star is approximately 20 times the diameter of the smaller, hotter star. The largest star in the system is a giant "K" type star. The most striking feature about Zeta Aurigae is that the large star is as dense as the vacuum of an electric bulb. This information about Zeta Aurigae is outlined by William H. Christie, of Mount Wilson Observatory, who has observed the last two eclipses, in a leaflet published by the Astronomical Society of the Pacific. The eclipse occurs every 973 days, the larger star passing before the smaller. The eclipse lasts about 37 days. Mr. Christie explained that the reason for the great interest in the Zeta Aurigae eclipses lies in the fact that it is the only star known, other than the sun, in which man can actually measure the heights to which various elements constituting the atmosphere of a giant star extend.

POINTING the way toward eventual adoption of ultra short-wave radio communication by the air transport industry, month-long tests on a skyliner between New York and Pittsburgh have shown the practicability and freedom from static of ultra high frequency radio waves, according to an announcement made by the Western Electric Company. Radio waves of a frequency of 125 megacycles were almost entirely free of static in tests which covered a wide variety of test conditions. Elimination of static has been one of the major problems of aviation communication system and is particularly important during winter operation when storms are more frequent. Tests were conducted on a regular Transcontinental and Western Air transport plane, which carried its full complement of regular radio equipment while the tests were being conducted. The chief handicap to ultra short-waves is the fact that they do not travel beyond the horizon, thus limiting their effective range.

VALUABLE plant specimens in the museum of the Catholic University of America are now being protected against destruction by insect pests without having to be treated with poisonous or explosive chemicals, hitherto used in all leading herbaria. The insects and their eggs are literally cooked to death, yet without damage to the specimens. The method was devised by Dr. Hugh O'Neill, botanist on the university faculty. Dr. O'Neill puts a batch of specimen sheets into a double-walled steel cabinet lined with asbestos and fitted with a tight door. At the bottom of the cabinet is a pair of electric heaters, controlled by a thermostat. Temperature is raised to 140 degrees Fahrenheit and kept at that point for several hours. A tank of water in the cabinet prevents the contents from becoming too dry. The heat penetrates even such things as acorns and fleshy fruits and kills insect eggs and larvae within them. Since installing the heat-treating cabinet, Dr. O'Neill and his colleagues have used it on nearly a quarter of a million botanical specimens. Insect depredations in the university herbarium have been stopped.