SCIENCE NEWS

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CONFERENCE ON PHYSICS

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MATTER being annihilated in the heated interiors of the stars and flashing "new star" novae as the origin of the cosmic rays was suggested by Dr. R. A. Millikan when he reported to the International Conference on Physics the first details of the very high altitude survey of cosmic rays made by the California Institute of Technology research team consisting of Dr. Millikan, Dr. I. S. Bowen and Dr. H. Victor Neher.

The only source of the observed cosmic ray energies now in sight, Dr. Millikan reported, is the annihilation of matter. But the softest components of the cosmic rays have energies corresponding to the partial annihilation or atom-building hypothesis, while the energies of the hardest correspond to the complete annihilation of atoms. Thus in his latest interpretations Dr. Millikan sees the cosmic rays as both the "death cries" and "birth cries" of matter. These mysterious penetrating radiations are seen as the signals of both tearing down and rebuilding of the stuff of the universe. The process of annihilation and atom building conceivably take place, Dr. Millikan suggested, because of the ease with which hydrogen particles cluster at the extreme heat of interstellar temperature. Or they may happen because of the extremely high temperatures found in novae, as suggested by Dr. Fritz Zwicky, one of Dr. Millikan's colleagues at California Institute of Technology. Another outstanding conclusion by Dr. Millikan is that photons or radiation of the same kind as ordinary light are responsible for most of the cosmic ray effect or ionization found at sea-level or underneath the sea. This is in accord with his previous findings and is opposed to the ideas of some other cosmic ray observers. The resistance of the atmosphere to incoming electrons, suggested by some as composing the cosmic radiation, would require energies of a billion electron volts on the basis of encounters outside the nucleus of the atoms and five billions of electron volts on account of the encounters within the nuclei of atoms. Nuclear electron encounters were seen as producing only very soft secondaries consisting of both photons and electrons. Dr. Millikan also reported that nearly all the non-field sensitive part of the ionization of the atmosphere above sea-level is due to photons of energy below 500 million electron volts. In the equatorial belt of the earth a small part of the ionization is due to incoming secondary electrons of energies as high as ten billion (10,000,000,000) electron volts. These are responsible for the east-west and the longitude effect found in the earth's equatorial belt. The part of the ionization that is sensitive to the earth's magnetic field increases rapidly with increasing latitude from Panama to Spokane because incoming secondaries of energies decreasing from eight to two billion get through the field's blocking effect in rapidly increasing numbers with increasing latitude, adding greatly in northern latitudes to the underlying ionization of the upper air produced by incoming photons.

PROBING into the region of the extremely minute, where atoms come together to determine the character of larger aggregations of matter, physicists attending the joint conference of the International Union of Pure and Applied Physics and the Physical Society have heard Sir William Bragg keynote the inquiry: "We must look into the region of crystals composed of atoms for explanation of the quality of a steel or bronze, a glass, a textile fiber, a living nerve and other substances. And somewhere here enters the breath of life to control atomic composition which enters into living mechanisms." All investigations of solid bodies of every form, whether animal, vegetable or mineral, have as their primary aim, Sir William said, the connection between the properties of the body on one hand and its composition and architecture on the other hand. Some of these properties are directly dependent, he explained, on the few atoms and crystals of the unit cell. The arrangement of the unit cells determines the behavior of the body as a whole. Some other properties depend on the action of atomic forces in groups of hundreds, thousands or even tens of thousands of atoms. It is pleasant, Sir William told the physicists, that a crystal responds to every effort to improve the accuracy of the measurements that scientists make upon it. He called attention to the distinction made by Professor Adolf Smekkal, of Halle, between "insensitive" effects which are functions of the composition of the crystal itself and the "sensitive" effects which depend upon the crystal's treatment and previous history. Large discrepancies have appeared in the investigations upon solids and the physicists are searching for the cause. For example, the cohesive force of rock salt calculated from the knowledge of its structure and its ionic composition is about 200 kilograms per millimeter, whereas the experimental value is usually less than a single kilogram per millimeter.

ARTIFICIAL production of radioactive elements useful in medicine and superior in intensity to radium was predicted by Professor J. Joliot and Irene Curie Joliot, of Paris, who discovered artificial radioactivity less than a year ago. The Joliots expressed their hope of producing superior radioactive elements with useful properties not possessed by the naturally radioactive substances in the development of which the famous parents of Mme. Joliot played such an important part. These powerful radio-elements that the Joliots foresee when introduced into the living body must behave very differently because of their chemical properties and the fact that they will disintegrate without leaving a radioactive residue. This has great possibilities in medicine. It may mean a new kind of cancer treatment in which artificial radioactive substances produced cheaply can be introduced directly into the cancerous tissue to do their work and then become harmless. The Joliots speculated upon just what

happens within the central portion of the atom when it becomes artificially radioactive. They attributed the emission of electrons and positrons to what they called an "internal materialization" of gamma radiation, radiation of the same kind as light and x-rays. The gamma radiation, they suggest, is transformed into a positive and negative electron in the process of leaving the central portion or nucleus of the atom which gave rise to it. In this manner neutron radiation and gamma radiation are emitted when beryllium is bombarded with the cores of helium atoms, called alpha particles, which are shot off from the naturally radioactive substance polonium. But the Joliots found it difficult to imagine what happens within the atom's heart when neutrons are the bombarding particles. A possible interpretation is that the entrance of a neutron is followed by an expulsion of a negative proton, a particle that has not yet been discovered. This expulsion of a negative proton might explain the formation of a substance heavier than any hitherto known, chemical element 93. Such an element has been reported by Professor Enrico Fermi, of Italy, but doubt has been cast upon its actual existence. Certain experiments, the Joliots reported, suggest that neutrons bombarding phosphorus could produce radio-elements themselves emitting protons. Natural radio-elements, like radium and uranium, are said to be apparently rare survivors of numerous elements which existed under conditions of temperature, pressure and radiation different from those existing now on earth. This must have been millions of years ago.

THE strange fact that two varieties of a radioactive element, exactly the same in mass and in charge, have very different periods of life excited discussion. One of the newly discovered artificial radioactive elements, the mass thirteen isotope of nitrogen, has different periods of decay depending upon how it is produced. Dr. J. D. Cockcroft, of the Cavendish Laboratory of the University of Cambridge, described the making of nitrogen thirteen both by bombarding carbons with protons and with deutons. In both these cases the "half life period," or the time that it takes for half of the newly manufactured nitrogen to disintegrate is ten and a half minutes. But if this nitrogen isotope is made by the method discovered by the Joliots of Paris, bombarding boron with alpha particles, it has a decay period of fourteen minutes. "This proves that some nuclear component or condition as yet unknown must exist," Dr. Cockcroft said in an interview. Wide support was given in the conference for the existence of two particles of matter, the neutrino and the negative proton, which physicists have not yet discovered, although their existence has been suspected. Experiments looking toward the use of neutrons in medicine, somewhat in the same way as radium rays and x-rays are now used, are being made by Professor J. C. McLennan, emeritus professor of physics at the University of Toronto now resident in England.

DR. ENRICO FERMI, the Italian physicist whose experiments on bombarding heavy uranium with non-electrical particles known as neutrons, has set the world of science in a controversy over whether or not super-heavy element No. 93 was created, has performed similar experiments on the element thorium. In an interview Dr. Fermi indicated that his preliminary experiments make him inclined to anticipate the discovery of a whole new radioactive family between the elements actinium and thorium. Actinium has atomic number 89 in the periodic table of the elements. Its atoms weigh about 227 times as much as those of hydrogen. Thorium has atomic number 90. Its atoms are 232 times as heavy as hydrogen. By his atom-bombarding experiments Dr. Fermi has discovered two radioactive substances of thorium having periods of one and fifteen minutes during which they decay, or disintegrate to half their amount. These are the first two members of the new, anticipated radioactive family for which he is searching. They are probably isotopes of thorium or actinium since there is no gap in the table of the elements at this point.

A PARADOXICAL action of gamma rays, one of the radiations from radium, was reported by Dr. R. A. Millikan to the conference on behalf of his Pasadena colleagues, H. R. Crane and Dr. C. C. Lauritsen, of the California Institute of Technology. They found that the higher the energy of a gamma ray the more it is absorbed. These experimenters produced gamma rays by bombarding lithium and fluorine with protons and beryllium, boron and carbon with deutons. A record was made when the maximum energy of the gamma rays was measured as between twelve to thirteen million electron volts. The theoretical physicists had a difficult time keeping up with the experiments reported. One suggestion of what happens in the central portion of the atom was made by Professor G. Gamow, who is lecturing this year at the George Washington University. Professor Gamow suggested that within the nucleus there is an exchange of a proton and negative proton for nuclear neutrons. This change does not affect the mass or charge of the atom but it does provide an explanation of the uranium transformation. Professor Fermi expressed doubt, however.

THE production of a new kind of helium of atomic weight six instead of the usual four was reported by Professor M. L. Oliphant, of the University of Cambridge. Dr. Oliphant was one of the discoverers of triple-weight hydrogen. The new helium of atomic mass six was obtained by bombarding beryllium with deutons, the hearts of double-weight hydrogen.

DR. ARTHUR H. COMPTON, of the University of Chicago, reported that there seem to be two kinds of cosmic ray bursts, an ordinary sort and a rare type about four times larger than the usual kind. This is very difficult, to explain by any known nuclear process and the ordinary explanation would involve an element of atomic weight 1,000." The heaviest known element, uranium, has an atomic weight of 238. Dr. Compton was led to this conclusion by cosmic ray measurements made this past summer in the American Rocky Mountains with Dr. G. S. Brown, Dr. H. A. Rahmel and Professor R. D. Bennett, of the Massachusetts Institute of Technology.

HOSPITALS OF SOVIET RUSSIA

RUSSIA'S present contrasts between modern efficiency and antiquated inefficiency can be found in hospitals and medical and surgical practise as well as in industry and agriculture, according to Dr. William N. Walsh, hospital consultant of Chicago, who has returned from an independent inspection tour of Russia. Dr. Walsh attended the sessions of the American Hospital Association at Philadelphia.

Lack of funds is the chief handicap under which Russian physicians, surgeons and hospitals labor. Lack of funds and high cost of quinine is the reason why there is so much malaria in Russia. Dr. Walsh was unable to buy quinine anywhere in Moscow. Lack of funds is also responsible for the large number of typhoid fever cases in Russia.

While these two diseases are causing too much disability, venereal diseases have been reduced by 50 per cent. in Russia during the last decade. This is largely due to the fact that commercial prostitution no longer exists, Dr. Walsh explained.

In the large cities many of the hospitals are well equipped, modern buildings, while others are old-fashioned and poorly equipped. Russian indifference to odors was apparent in the wards. Noticeable also was the lack of soap, which necessitated washing floors with kerosene instead of the usual soap-suds.

Russian surgeons are doing excellent work, in Dr. Walsh's opinion, but nursing is far below American standards. In some hospitals he found surgeons operating without rubber gloves. Upon inquiry, he was told that the only ones they could afford were the heavy kind which American women wear to do housework and to wash dishes, and which are unsuited to the fine manipulations the surgeon has to make.

Russians are second to no people in the world, as far as their ideals and practises in the care of mothers and children are concerned. In fact, the Russians do not believe they will have much need for hospitals in the future; they expect coming generations to be so healthy, as a result of the care they receive from infancy onward, that they will not get sick and need to go to hospitals. Many of the older people are suffering from chronic diseases, largely as a result of conditions under which they formerly lived. Russian physicians, surgeons and hospital executives are well aware of the family conditions now existing and are trying to remedy them as quickly as possible.

In marked contrast to the picture Dr. Walsh painted of conditions in Russia was the discouraging report of Dr. Donald M. Guthrie, of Sayre, Pa., on conditions he found in Germany and Austria. Dr. Guthrie said that the medical profession has fallen into disrepute in these countries and that if present conditions are allowed to continue much longer, medicine will sink into a bog of absolute inefficiency.

ITEMS

THE village of some of Sweden's Stone Age hunters and fishermen, 4,000 years old, has been found on the shore of picturesque Valdemar Bay on the southeast coast. Professor O. Janse, archeologist who made the discovery, expects to find other, similar settlements in the region. He unearthed quantities of fish and animal bones cast aside by the villagers from their meals, and also the pieces of their earthenware vessels.

DR. ALEŠ HRDLIČKA, of the Smithsonian Institution, has discovered broken heads and other signs of combat in excavations just completed on Kodiak Island. He had been puzzled by the occurrence of "nest burials," heaps of skeletons of all ages, and both sexes, with none of the ceremonial offerings that were ordinarily placed in ancient graves. It now appears that epidemics do not explain these unusual Alaskan burials, but instead there is strong indication that enemies massacred a village, and the few survivors must have returned later to bury their dead in heaps.

A PARADE of the horned dinosaurs, four of their huge, bony skulls in a row, has been arranged at Yale University in the Peabody Museum. The four monster skulls show how evolution revised the dinosaur "models" 60,000,000 years ago in America. Some of the early horned dinosaurs went armed with a big nose horn like a sword to ward off or impale their enemies. Over their brows, these dinosaurs carried small horns, too. Later the horn pattern changed, the nose horn becoming smaller and brow horns developing. The Triceratops, which brings up the rear, is famous because it had the biggest head and in comparison the smallest brain of any land animal known on earth.

NAPHTHALENE crystals, the stuff mothballs are made of, have been found a good means of chemical warfare against the Japanese beetle, one of the worst of the introduced insects pests along the Atlantic seaboard. Experiments by Dr. Walter E. Fleming and Francis E. Baker, of the Bureau of Entomology, U. S. Department of Agriculture, have shown that eggs, larvae and pupae of the beetle can be killed in suitably prepared greenhouse soil, and that when used out of doors a thousand pounds of the odorous crystals per acre of ground will discourage the females from laying their eggs, though it will not stop them from burrowing.

"FOREST PRIMEVAL" conditions are to be preserved strictly in an area of 801,000 acres in the northern part of the state of Washington, newly set aside as the "Cascade Primitive Area," by F. A. Silcox, chief of the U. S. Forest Service. This region, considerably larger than the state of Rhode Island, will have its rugged picturesqueness inviolate against the building of hotels or cabin colonies, and even of roads. Primitive areas, of which the new Cascade region is the latest and largest, are purposely kept without man-made "improvements" and held for the dual purpose of scientific study and recreation by those who can live in the wilderness on its own terms.