

SCIENCE NEWS

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DISINTEGRATION OF ATOMS BY COSMIC RAYS

RADIATION from the depths of the cosmos with the greatest energy ever observed by man has been detected at the California Institute of Technology, Pasadena, by experiments performed by Dr. Carl D. Anderson under the direction of Dr. Robert A. Millikan.

With energies four hundred times that of the most intense gamma rays from radium and four thousand times that of the most penetrating x-rays used in cancer treatment, these cosmic rays of terrific smashing power are shown to rate a thousand million volts. There are no energies from processes taking place on earth that are more than eight million volts and no higher measurements had heretofore been made. These are from radioactive disintegration.

So large are these energies shown by about ten per cent. of the cosmic rays caught photographically in a new giant ray-track chamber that Dr. Millikan has added two possible hypotheses to his previous suggestions as to the cause of some cosmic rays. The apparent energies in a few of these rays are such as would be expected from the entire annihilation of a proton, the positive unit of matter, in the outer parts of the universe. Or equally well they may be signals of the synthesis of heavy elements of over atomic weight 100 out of hydrogen in distant cosmic spaces. If the latter idea proves correct, it means that silver, gold and other heavy elements are much more plentiful in the rest of the universe than they happen to be here on earth. A thousand million volts is just about the energy that would be given off if silver were synthesized out of hydrogen.

In making the first direct measurements of energies of cosmic rays Drs. Millikan and Anderson were searching for evidence of the nature of this penetrating radiation that has puzzled scientists for the last seven years. The question was: Are cosmic rays electro-magnetic waves, photons, or ether vibrations like light, x-rays and gamma rays, or are they neutron particles of high speed and energy, such as were suggested as a possibility in Europe recently?

By building a large "cloud chamber" in which cosmic rays rushing through moisture-charged air or gas leave a visible track of water droplets and by subjecting the chamber to an immense magnetic field that bends the cosmic rays, Drs. Millikan and Anderson have obtained evidence that the photon hypothesis best explains the cosmic rays and that they are probably of the same family as light and x-rays. No evidence for the neutron hypothesis was found.

A thousand photographs made with the apparatus secured the portraits of thirty-four cosmic ray tracks, with curvatures under the influence of the magnetic field that are less as the energy increases.

In his report to the National Academy of Sciences, Dr. Millikan said that the facts indicate that the cosmic rays are absorbed principally by the heart or nucleus of the atoms they hit rather than by the electrons that

circle about the heart of the atom. His photographs show cosmic rays that hit an atom releasing two other tracks, one negative and the other positive, indicating both positive and negative particles are sometimes thrown out of the nucleus when it is disintegrated. The photon hypothesis is upheld by the fact that the cosmic rays also hit electrons and act in the same manner as gamma rays, producing the well-known Compton effect, and give more energy than a neutron can give.

Nine out of ten of the cosmic rays entering the detecting apparatus have energy values corresponding to those to be expected from the hypothesis advanced by Dr. Millikan several years ago that they originate in the building of the more abundant elements in the depths of the universe. The cosmic birth cries of helium-atom-building would be only 27 million volts and would therefore be absorbed by the atmosphere of the earth and not reach the cosmic ray detector at Pasadena. But 116 million volt rays corresponding to oxygen-building, 216 million volt rays corresponding to silicon-building and 500 million volts corresponding to iron-building are detected.

These researches by Drs. Millikan and Anderson were carried on with the support of the Carnegie Corporation.

RADIUM IN OCEAN SEDIMENTS

RADIUM is more abundant in the sediments of the deep ocean bottom than it is in land rocks. The deep sediments have more than four times as great a radium content as the granitic rocks on land, and more than ten times as much as land basalts. The deeper the sediments, and the farther they are from shore, the greater their radioactive content. These are among the facts laid before the American Geophysical Union at its recent meeting in Washington by Dr. Charles S. Piggot, of the Carnegie Institution of Washington.

The samples of ocean-bottom sediments analyzed for radioactive elements are not at all numerous as compared with the land rock and earth samples similarly examined, but in so far as any generalizations can be made, the facts are as stated.

This accumulation of more highly radioactive deposits in the deepest and most remote places in the ocean may be having an appreciable effect on the course of the earth's geological history. For one thing, such deposits can well act as blankets to slow down the escape of the internal heat-energy of the earth.

A number of theories of probable sources of these radioactive deposits were examined and discarded by Dr. Piggot. He does not believe that they have been concentrated by living organisms and deposited by the down-sifting of their skeletons after they have died. While some organic sediments have high radium contents, on the average the non-organic red clay sediments are three times as radioactive. Neither in his opinion is the theory of submarine volcanism, with intense chemical action where water and hot magma are in contact, any more tenable. Such action would be more or less

“spotty” in its effects, whereas radioactive sediments are found everywhere.

Recognizing that much research yet remains to be done on the question, Dr. Piggot inclines to the belief that the origin of the radioactive content ocean-bottom sediments is to be sought directly in the rocks of the earth's crust. These are worn or broken down into the fine particles that eventually settle on the bottom of the sea, some of them carrying all their original radioactive elements with them, others having a part of the original content removed by chemical processes occurring on the way. Where the sediments are mixed with the remains of minute organisms these latter probably tend to dilute rather than increase their total radioactive content.

FOOT AND MOUTH DISEASE IN CALIFORNIA

THE U. S. Department of Agriculture and the State of California have slaughtered some 12,000 hogs, in five herds at Guena Park, Orange County, known to be infected with foot and mouth disease or to have been exposed to it. The animals were driven into great trenches dug to receive them, shot down, covered with quicklime and buried. No cure is known for foot and mouth disease, and it spreads rapidly among any kind of hoofed animals; so immediate massacre and quick burial are the only known treatments.

Several times have different parts of the United States been threatened with this disease, which attacks human beings as well as livestock, and which is wide-spread in Europe, South America and other parts of the earth. Each time it has been stamped out by the same Spartan methods of mass killing and rigid quarantine of the areas known to contain the infected soil—for the virus lives for some time on the surface of the ground.

Dr. Rudolph Snyder, of the U. S. Department of Agriculture, is in charge of the federal forces in California; in charge of the California forces is Dr. J. J. King, state veterinarian. The invasion was first discovered by Dr. L. M. Hurt, who notified state and federal authorities. Positive diagnosis of foot and mouth disease was made by Dr. Jacob Traum, of the University of California.

In the background, in Washington, stands the chief of the bureau of animal industry of the Department of Agriculture, Dr. John R. Mohler. He has confidence, however, that Dr. Snyder will have the situation in hand; for Dr. Snyder had charge of the federal work during the California outbreaks of foot and mouth disease in 1924 and 1929.

It is not known how the present invasion broke into the country. It seems probable, however, that it was imported, for Orange County lies on the seacoast, between Los Angeles and San Diego counties, and within easy trucking distance of several seaports. The hogs were known to be garbage-fed; and it was garbage from a coastwise steamer from South America that started the 1929 foot and mouth disease epidemic. One encouraging feature in the present situation is found in the relative isolation of the two infected herds of hogs which have been destroyed.

GERMS AS THE CAUSE OF CHRONIC RHEUMATISM

GERMS as the cause of chronic rheumatism and vaccines to treat it were discussed by Dr. Reginald Burbank, of New York City, at the recent New Orleans meeting of the American Medical Association.

In some early investigations into the cause of this wide-spread and distressing disease which doctors call arthritis, Dr. Burbank and his associates found that the blood of these patients carried protective substances against several strains of streptococcus germs. Since these could only have been formed under the influence of the germ, the investigators decided that the germs must be present in the blood. By a special technique they obtained some of the streptococci, but found them to be not the usual virulent type but another less active one that had developed the ability to live without arousing active resistance in the patient's body.

Rabbits after getting injections of cultures of these organisms developed the same chronic disease of the joints that had afflicted the human patients. Various tests showed that the changes in the tissues of the rabbits, identical with those in rheumatic patients, were caused by the actual presence of germs carried to the joint by the blood from a focus of infection such as the teeth or tonsils.

The most effective means of treatment is a vaccine, Dr. Burbank said. Removing the teeth or tonsils, which are the most common foci of infection, may or may not be helpful in chronic rheumatism. If the germ causing the disease is already in the joint, as his investigations tend to show, removing the original source can not give complete relief.

In addition to the vaccine he recommended increasing the general resistance by diet, tonics and general constructive measures. He mentioned especially the beneficial effects of good posture, which improves circulation, decreases mechanical strain and increases general well-being. The intestinal tract is the most important secondary focus of infection, he said, so it is especially important to keep it in order.

TREATMENT FOR DRUG ADDICTION

PRELIMINARY studies which the U. S. Public Health Service has made of the sodium rhodanate treatment for drug addiction, which Professor Wilder D. Bancroft, of Cornell University, reported to the National Academy of Sciences as a “cure” for the condition, fail to confirm the claims of the Cornell investigators, it became known in Washington recently.

The U. S. Public Health Service has investigated the new treatment in about 20 cases at the Fort Leavenworth station which it is maintaining for the study of drug addiction in cooperation with the Department of Justice.

“Our experience there is not quite in keeping with Dr. Bancroft's,” according to Dr. W. L. Treadway, of the U. S. Public Health Service, who is directing the drug addiction studies.

Dr. Treadway explained that because of the many factors entering into the problem of drug addiction and

its extreme complexity, he believed that any new treatment, such as Dr. Bancroft's, must take into account the necessity for more accurate knowledge concerning the chemistry of the opium alkaloids; more reliable information as to their effect on the human body and the exact nature of addiction; together with a satisfactory evaluation of the many psychobiological factors involving addiction about which we have little accurate, concrete knowledge.

"So far as we know there is no treatment for drug addiction from the standpoint of a specific cure that will miraculously operate to rid the drug addicts of their addiction," Dr. Treadway said. "Any treatment advocated for this particular purpose must be scrutinized with care and conclusions about it drawn only after months of experience with a very large group of patients."

HUMANS 75,000 YEARS AGO DESCRIBED BY PRE-HISTORIAN

PROFESSOR GEORGE G. MACCUDY, Director of the American School of Prehistoric Research, Yale University, writes that the records bearing on the physical characters of Neanderthal man are still relatively rare. But in the past few years they have become much more complete than are those of the pre-Neanderthal period, when such beings as *Eoanthropus*, *Pithecanthropus*, *Sinanthropus* and *Homo Heidelbergensis* existed.

Neanderthal man lived in the third inter-glacial and the early part of the fourth glacial epoch. In his physical make-up he retained many primitive characters, due to his branching from the main human stem as early as the Pliocene epoch. His lowly estate physically is even reflected in his kit of tools. Although a hunter, he never got so far as to represent by means of carvings, engravings or drawings in color the animals he hunted. This step was taken by his successor, the so-called race of Cro-Magnon.

The cable received from Theodore D. McCown, field director of the Joint Expedition of the American School of Prehistoric Research and the British School of Archeology at Jerusalem, said: "Three adult Mousterians surely Neanderthal, heavy brow ridges, taurodont dentition." This is said to be the greatest discovery of Neanderthal remains ever found. They are at a moderate estimate at least 75,000 years old.

The present is the fourth season of joint expeditions by the British and American Schools near the foot of Mount Carmel, during which time scores of thousands of artifacts, dating from the Mousterian and subsequent epochs, have been unearthed.

ITEMS

CANCER, it is claimed, can be detected by a serum reaction discovered by Dr. H. J. Fuchs, of Berlin. The reaction is based on the fact that fibrin from the blood of a person without cancer is broken down or digested by the serum of the blood of a person with cancer, with the production of some non-protein nitrogenous substances which can be detected by suitable chemical means. The method, as it was described by Dr. Fuchs, required special apparatus and some special training for the observer, which tend to prevent its general use.

Professor M. von Falkenhausen, of the University of Breslau, Germany, now reports a simplification of the method that may make it possible for other observers to test its validity. He has introduced into the reaction a colorimetric procedure which he states makes the method more exact and at the same time much simpler to carry out. He reports a series of eighty cases in which the reaction was used and in which there was not a single failure in the diagnosis.

THE light from a distant nebula, such as one in the constellation of Ursa Major, reaches the earth at the ordinary speed of about 186,000 miles a second, even though the nebula is apparently moving from the earth at a velocity of 11,500 kilometers per second. This fact was discovered last year by Dr. Gustaf Strömberg, of the Mount Wilson Observatory. It has been confirmed by independent work of Dr. George Van Biesbroeck, at the Yerkes Observatory, of the University of Chicago. Both Dr. Strömberg and Dr. Van Biesbroeck have found that the aberration with the rapidly receding nebula is just the same as for nearer stars, even ones that are approaching us.

A POSSIBLE reconciliation between the at present discrepant results of "ether drift" experiments has been presented to the American Physical Society by Dr. N. Galli-Shohat, of Bryn Mawr College. This famous experiment, known as the Michelson-Morley experiment for the men who first performed it, failed to show any positive evidence of the existence of an ether, and set a train of scientific investigations in motion that eventually led to Einstein's relativity theory. Later, Professor Dayton C. Miller, of the Case School of Applied Science, repeated the experiment, and reported positive results. Dr. Galli-Shohat claims to reconcile the disagreement by taking into account, not the earth's motion about the sun, but the motion of the whole solar system through space.

DR. W. J. HUMPHREYS, of the U. S. Weather Bureau, told the American Meteorological Society, meeting in Washington, that the melting of the great ice caps of the earth would raise the ocean level about 150 feet. Explorations of the past year, which determined by sonic sounding the average thickness of the great Greenland ice sheet to be about one mile, make possible a fairly accurate estimate of the height the oceans will rise. Dr. Humphreys said that there must be 4,000,000 cubic miles of ice on Greenland, the Antarctic continent and Iceland, which may be expected eventually to melt.

THE germs of typhus fever and of spotted fever are very much alike, but differ in the important respect of growing in different parts of the cells they invade, Dr. Henry Pinkerton and Dr. G. M. Hass, of Boston, reported to the American Association of Pathologists and Bacteriologists. The spotted fever germs grow and multiply massively in the nucleus of the cells, but infect the surrounding part of the cell only sparsely, they found from studying how the germs grow on animal tissues. Typhus fever germs, on the other hand, do not invade the nuclei of cells, but grow on the cytoplasm.