

PHYSICS

Man-Made Radioactivity Achieved at Pasadena

Using No Natural Radioactive Materials, Americans Follow French Experiments and Get More Lasting Disintegration

ALL THE newly discovered particles of physics—deuteron, positron and neutron—cooperate in one grand experiment to produce a new case of the remarkable artificial radioactivity discovered in Paris a few weeks ago. (*SNL*—Feb. 10, '34, p. 83; Mar. 3, p. 133.)

It was found at the California Institute of Technology, Pasadena, that when deuterons, which are heavy hydrogen nuclei, are driven at carbon atoms by a high voltage tube, positive electrons are produced in great numbers. It is known that neutrons are also formed. But in this case they are not the center of interest. The positive electrons attract more attention because they continue to shoot out from the carbon for many minutes after the deuteron bombardment is stopped. Their number drops fifty per cent. every ten minutes.

These experiments were performed by Prof. C. C. Lauritsen and two graduate students, R. Crane and W. Harper. Definite results were first obtained on Monday, Feb. 26. They took a hint from the French husband-wife research team, M. F. Joliot and Mme. Irene Curie-Joliot, who first found that boron bombarded with radioactive alpha rays continued to give off positive electrons of the same duration as in the Pasadena experiments. Evidently, the same products are formed in the two cases.

The American method is especially significant in view of the fact that no natural radioactive materials are required. All the energy is generated by man-made apparatus. Nevertheless, the number of positive electrons is hundreds of times greater than in the French experiments. Other substances are being investigated for similar effects and other products of the activity are being searched for.

There is no way of telling what the practical applications of the new effect will be but they will probably be important. The theoretical consequences are of the utmost significance. Entirely new elements may be formed and studied to give information which could never

be obtained from the materials which nature provides.

Artificial radioactivity that lasts for a longer period than ever before achieved has resulted from a stream of million volt particles launched against targets of light elements in more recent experiments at the California Institute of Technology.

The same scientists, Prof. Lauritsen and Messrs. Crane and Harper who had previously found that artificial radioactivity persisted over an hour after bombardment of carbon by deuterons, or heavy hydrogen hearts, have tried bombardment of boron with the result that the activity was found to last even longer. The stream of million volt particles consisted of alpha particles, protons and deuterons, but probably the deuterons were the effective projectiles.

The resulting activity from boron was less at first than that from carbon but it lasted much longer. Instead of dropping to half in ten minutes, the boron product took twenty minutes to fall to half value.

Presumably the sequence of events in the case of carbon is as follows: The deuteron enters a carbon nucleus and kicks out a neutron. This act transforms the carbon into a peculiar form of nitrogen, which has a mass of thirteen instead of fourteen or fifteen. The freak nitrogen cannot live long because it has

an excess of positive charge. Spontaneously it ejects a positive electron and thereby turns into carbon again.

The positive electrons have been seen in a Wilson cloud chamber and have been counted in various electrical devices. Their energy runs up to more than half a million volts. This they spend in breaking up atoms in their path. The broken atoms or ions give the clues by which the positrons are detected. When their energy is nearly spent negative electrons seek out the positives and join with them. The positive cancels the negative and the energy goes off as a pair of photons. Prof. Lauritsen and Mr. Crane have observed these photons and found that they disappear at just the same (*Turn page*)

MEDICINE

Injections Lengthen Life Of Tuberculous Rabbits

RABBITS suffering from experimental tuberculosis live much longer when doses of an iron salt, ferric chloride, are injected into their veins, Dr. Vally Menkin of Harvard Medical School has found.

In a report to *Science*, Dr. Menkin states that whereas animals without the iron salt treatment lived, on an average, 81.4 days after infection with tuberculosis, the average life span of the animals treated with the iron salt was 198 days, up to the time when two survivors of this latter group were sacrificed for examination.

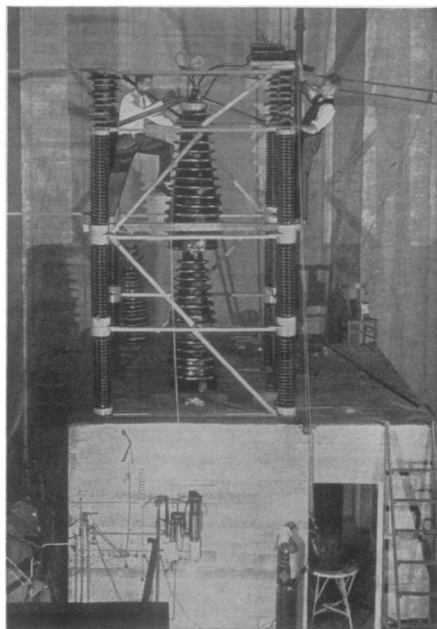
Hope for a specific method of successful treatment for human tuberculous patients is, of course, aroused by reports of the investigation, but it is far too early to apply these results with laboratory animals to human beings.

Science News Letter, March 10, 1934



INDUCERS OF RADIOACTIVITY

Left to right—Mme. Irene Curie-Joliot, F. Joliot and Dr. C. C. Lauritsen.



VETERAN WEAPON

This is the high voltage tube at California Institute of Technology which has been an unusually formidable weapon in the attack on the atom.

rate as the positive electrons.

In the case of boron and deuterons the unstable nucleus formed after the ejection of a neutron would be carbon of mass eleven. Both positive electrons and photons or gamma rays have been observed in this case also. Lithium has been tried but gave feeble results. Moreover the half life is the same as for carbon so it is likely that a slight carbon impurity is responsible for the after effect. More experiments are in progress.

British Continue Experiment

Artificial radioactivity has been produced at Cavendish Laboratory in Cambridge by bombarding graphite with high velocity protons. This man-made radioactivity confirms and extends the work of the French scientists.

Drs. J. D. Cockcroft, C. W. Gilbert and E. T. S. Walton speeded the hydrogen nuclei or protons to a high velocity with the same 600,000 volt tube that has previously performed important atomic transmutations. Positrons or positive electrons were produced.

The new radioelement produced lost half its activity in ten minutes. The scientists believe that the radioactive element formed in nitrogen of mass 13 is created by the addition of a proton to the ordinary carbon mass 12 of the graphite. A report is published in *Nature*.

Science News Letter, March 10, 1934

PLANT PHYSIOLOGY

Plants Retain Heavy Water In Formation of Tissues

PLANTS retain "heavy water" which they take out of the general water supply, and build it into their woody tissues and into the starches and other carbohydrate foods they form. Although it is present only in very minute proportions in the normal water of the soil and of rivers, the plants are in some way able to select it out, so that a larger ratio of it is present in the water bound up in wood and carbohydrate than is present in the "normal" free water which the plant takes in.

This selective action of plants on heavy water was found to be true for willows, in experiments performed at the National Bureau of Standards by the late Dr. Edward W. Washburn and his associate, Dr. Edgar R. Smith. Dr. Washburn, pioneer investigator of heavy water, which contains atoms of the recently discovered double-weight hydrogen, or deuterium, died suddenly on Feb. 6; the report by himself and Dr. Smith has been published posthumously in *Science*.

Dr. Washburn and Dr. Smith thought that plants might exercise a selective action on the minute amounts of heavy water that occur mixed with the general supply of normal water. They decided to test their scientific "hunch" by growing plants with their roots in water, and then analyzing the water bound up in their compounds for its fraction of heavy water.

At first they had hard luck. A big pot of cow peas was coming along nicely, when aphids got into the plants and killed them. Then they tried a pot of corn, only to have it killed by cold.

Finally they grew several cultures of rooted willow shoots, both in normal Potomac river water and in water with a high ratio of heavy water made in the laboratory. These experiments went through successfully.

In every case, they found that the selective action of the plants did not take place on the water as it was absorbed. The water left in the pot after the willows had been absorbing from it for a long time was unchanged in its weight.

But when they subjected the willow shoots to chemical analysis and tested the weight of the water distilled out

of their tissues, they found a different story. One fraction of the water, representing the sap, was uniformly 2.8 parts per million heavier than normal water, representing that ratio of excess of heavy water. A second fraction of the water, obtained by heating the willow tissues to destruction, was, on an average of three samples, 5.4 parts per million heavier than normal water.

The report of the two scientists does not undertake to decide whether this selectivity by the plant is beneficial, harmful or neutral in its effects. This, they state, can be determined only by further experiments. It is known, of course, from experiments by Dr. Washburn and other scientists, that in high concentrations heavy water is harmful to living plants and animals.

One outcome of the experiment is the suggestion that the natural plant products, oils, carbohydrates, etc., may be expected to contain an abnormal amount of heavy hydrogen, if all plants show the same selective action on heavy water that was discovered for willows.

Science News Letter, March 10, 1934

HISTORY

Lost History Sought In Mosque of St. Sophia

THE CHURCH of St. Sophia in Istanbul, which Turkey's modern ruler, Kemal Pasha, has generously opened to scientific inspection, may yield important facts about an empire which is a medieval mystery.

This is the hope of Prof. A. A. Vasiliev, of the University of Wisconsin history faculty, who is completing plans to sail for Istanbul. Research funds have been granted him to study St. Sophia's mosaics and manuscripts which are for the first time in 400 years being shown to western scholars. Since the fifteenth century, when the Turks captured Constantinople, the great church of the Roman Emperors of the East has been a Moslem mosque and a harbor for mystics and scholars of Moslem faith.

Now, American scholars cooperating with Turkish officials are removing the masks of plaster and paint that devout Moslems laid over the glittering, color-