PHYSICS

Radio Carbon as Tracer

Understanding of life processes may be aided by mass production of element as by-product of atomic bomb research.

➤ LONG-LIVED radioactive carbon, the production of which in relatively large quantity may well be one of the most valuable peacetime by-products of atomic bomb research, has been used for the first time in laboratory experiments, a group of University of California scientists have announced.

The experiments, which bring man a step closer to an understanding of photosynthesis and provide new techniques for a study of the basic life processes, were conducted with the only known supply of long-lived radioactive carbon produced before the war, a fraction of a gram prepared over an 18-month period by cyclotron bombardment.

Scarcity of the long-lived radio carbon has prevented its widespread use in nearly every scientific field. Use of the element as a "tracer" of living processes by means of the radioactivity is expected to yield a vast fund of knowledge of value in the advancement of medicine, agriculture and other sciences.

Carbon is the most common constituent of all living things, and its very omnipresence provides a yardstick of the potential value of radio carbon in bringing about further understanding of that element's functions.

With the development of the uranium pile technique, as described in the Smyth report, it may be possible to produce larger quantities of carbon 14, the long-lived radioactive sister in the carbon family. The pile technique makes available a larger and steadier stream of neutrons, the particles used to produce carbon 14, than is furnished by the cyclotron.

The minute quantity of carbon 14 used in the Berkeley experiments was produced from 1,000 pounds of ammonium nitrate which were placed in tanks around the 60-inch cyclotron. Stray neutrons from the machine transformed some of the nitrogen atoms of the ammonium nitrate into carbon 14.

In the experiments just completed, the Berkeley scientists synthesized two simple organic compounds, acetic and butyric acid, by feeding heterotrophic bacteria radioactive carbon dioxide and ordinary sugar.

They succeeded in labeling all of the groups of atoms of the two compounds. Previously it had been possible to label one group of atoms in such organic compounds, using short-lived radioactive carbon, which is not suitable for many experimental purposes.

The research indicates that many organic compounds may be labeled in a variety of ways for tracer studies, and make possible the study of the building up and breaking down of food substances in human and other living systems. For example, it will be possible to study the conversion of sugars into fats in the animal body.

Transformation of carbon dioxide is ordinarily accomplished only by photosynthesis, in which green plants use water, chlorophyl and sunlight to produce all carbohydrates, proteins, fats and other plant products.

The ability to build up organic carbon molecules from carbon dioxide by biological means adds further knowledge on the still-mysterious photosynthetic process.

Several years ago a group of Berkeley scientists carried on experiments with carbon 11, another radioactive sister in the carbon family. However, carbon 11 has a half-life of only 21 minutes, giving researchers a maximum of four to five hours in which to experiment. Carbon 14 has a half-life of 25,000 years, and is therefore suitable for long, complicated chemical procedures.

The scientists who conducted the experiments are Dr. H. A. Barker, associate professor of soil microbiology; Dr. Martin D. Kamen, formerly of the Berkeley Radiation Laboratory and now at Washington University, St. Louis, Mo.; and Victoria Haas, graduate student.

Carbon 14 was discovered at the University of California in cyclotron bombardments by Dr. Kamen and Dr. Samuel Ruben, who died from an accident while conducting war research. *(See also carbon 13 story, p. 25.)*

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The *almond tree* is a native of subtropical China, Persia, Syria, and Asia Minor.