PHYSICS

Radioactive "Tracers"

Radioisotopes, product of atomic energy development, to allow inquiry into disease causes, photosynthesis and life processes. About 100 isotopes are available.

See Front Cover

➤ EXPLODING CHEMICAL elements, made synthetically in chain-reacting atomic energy piles, which will work for peace instead of war, are the products of a new manufacturing enterprise announced by the War Department's Manhattan Engineer District, Oak Ridge, Tenn. (*Science,* June 14).

They are what are called the radioisotopes of the common elements. Introduced into familiar substances, these special synthetic kinds of radioactive atoms can be traced through everyday but little understood processes. They can be tracked by means of the rays they give off.

By such "tracer" studies scientists are making headway in understanding how plants build our food out of water, air and sunshine, how compounds like the sulfa drugs combat disease, how industrial chemical reactions take place, and how life processes are passed on from generation to generation.

New Venture

The new manufacturing venture, resulting from atomic bomb research, undertakes to supply to qualified research organizations the radioisotopes which come out of the Oak Ridge chain-reacting piles as fission products of uranium. Many of them were troublesome by-products of the reactions that produced material for the atomic bombs. Now the men who run the piles are looking for the best uses for them.

Since recovery of the minute amounts of many radioactive elements which occur under the conditions which make the bomb elements has not proved practical, experiments have been directed toward the production of the particular isotopes most in demand for research. These are radioactive forms of carbon, sulfur, phosphorus and iodine. All these are furthering new knowledge of life processes and promise better ways of conquering disease.

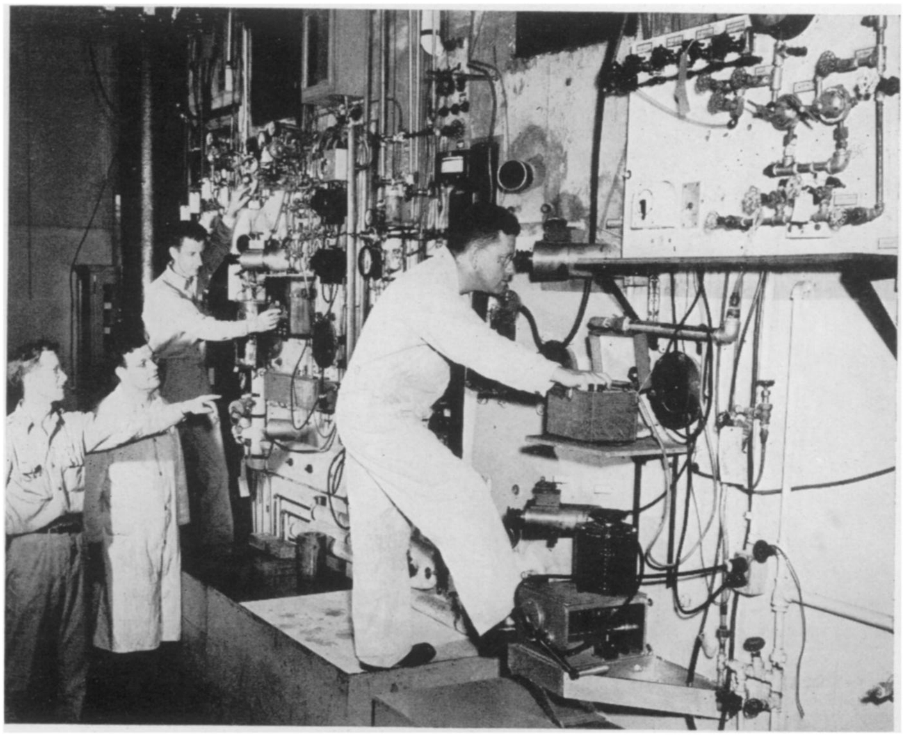
Possibilities of isotope production are, however, by no means limited to these elements. Over 400 man-made radioactive isotopes of the 96 elements are known, and the scientists at Oak Ridge are ready to begin negotiations about supplying any of them with a half-life of more than 12 hours.

Under the program announced, approximately 100 radioactive isotopes will be obtainable in varying quantities. Some of the most important of these include carbon 14, sulfur 35, phosphorus 32 and iodine 131. The numbers following the name of the element refer to the mass of the isotope, that is, to the total of protons plus neutrons in the nucleus. Ordinarily stable carbon consists of isotopes of mass 12 and 13, sulfur of 32, 33 and 34, phosphorus of 31 and iodine of 127.

Since carbon is one of the principal elements found in organic material, the isotope carbon 14 is expected to give great impetus to the study of all organic processes, including the mechanism and growth of normal and abnormal tissues and all plant and animal functions. In the medical field, at least initially, isotopes will yield their greatest benefits not directly in treatment of disease but as tools for finding the causes of diseases.

Phosphorus, which is important in plant and animal metabolism and human hemotology, is also expected to reveal many biological secrets through experimental use of its isotope—phosphorus 32. At the same time, sulfur 35 may be used in tracing reactions of sulfa drugs. Radioiodine is valuable because of its specific incorporation in thyroxin and thus can be used to study functions of the thyroid gland. These isotopes may also be useful as tracers in industrial chemistry and metallurgy.

The radioactive products have been classified in four groups: In Class A they place those whose long half-life permits stock-piling. These the laboratory will have usually on hand. Isotopes whose radioactivity decays more rapidly, so that they can be made but not stock-piled, are listed in Class B. These can be made to order. Isotopes in Class C are seldom on hand, and are produced on an experi-



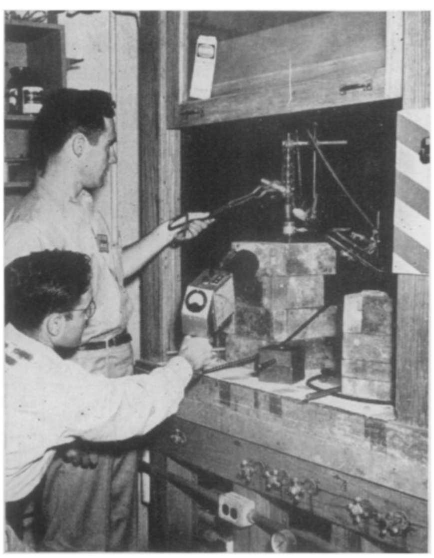
Clinton Laboratory Photos.

CONTROLS OF ATOMIC PILE—Watching and controlling the "hot" operations that separate desired fission elements from the uranium pile. Two-foot thick concrete walls protect the scientists. This particular atomic pile is not making plutonium but is being used to obtain radioisotopes used in scientific experiments.

mental basis only. Those marked Class D can be made, but with difficulty.

Many months of coordinated effort among atomic scientists at various Manhattan Project facilities preceded the release of the radioisotopes for experimental work. Most of the radioisotopes will be prepared at the Clinton laboratories at Oak Ridge operated for the Army by the Monsanto Chemical Company, but the bombardment facilities of the Hanford Engineer Works at Pasco, Wash., now operated by du Pont, to be taken over by General Electric Company about Sept. 1, will also be used. Research will be conducted by the Argonne National Laboratory, which is University of Chicago operated for the Army and also at the University of California and Iowa State College.

The isotope distribution will be supervised by an advisory committee nominated by the National Academy of Sciences, with Dr. Lee A. DuBridge, new president of the California Institute of Technology now at the University of Rochester, as chairman. Dr. K. T. Bainbridge of Harvard is sub-chairman of allocation, while all requests for application of radioisotopes for human medical problems will flow through the hands of Dr. Andrew Dowdy of the Universisty of Rochester.



IODINE FROM TELLURIUM—A sample of radioactive iodine, destined for medical investigational use, is about to be extracted chemically from tellurium bombarded in the atomic pile. This activated sample has become sufficiently decayed in activity to be handled with short tongs and small shielding.

The Manhattan District's isotopes branch is headed by Dr. Paul C. Aebersold, with Dr. W. E. Cohn as chief of the radioisotope development section and Dr. J. R. Coe, director of the chemistry division.

Methods of Producing Isotopes

Several methods are available for making radioactive isotopes. The cyclotron, original apparatus for atom-smashing, and its younger sister, the betatron, are versatile in the variety of radioisotopes they can turn out, because they can utilize different atom-bombing projectiles at different energies. The chain-reacting pile works by slow neutron bombardment, and can produce isotopes by only two processes, fission and gamma ray radiation, but the yields of elements so produced are enormously greater.

The method of producing any isotope must vary with the quantity wanted and the uses to which it is to be put. For some purposes a minute quantity is sufficient. Some uses would require a high degree of purity, while for others admixture with other isotopes of the same element or with considerable quantities of different elements might not be considered undesirable. In general, the Manhattan Engineer District expects the cost of their isotopes to be cheaper if the users will take them as they come from the pile.

The photograph on the cover of this SCIENCE NEWS LETTER is the first picture of an atomic energy pile at Oak Ridge to be released by the Manhattan District. Radioactivated material is being removed from the pile at the end of a neutron bombardment period. The bombarded sample has just been lifted with the long holder from the block that has been pulled from the pile. The pile itself, which is not operating, is concealed behind the thick concrete wall. The sample's radioactive strength is being checked with a counter in feminine hands at the right.

Science News Letter, June 22, 1946

MEDICINE

Vaccine for Streptococcal Infections a Possibility

➤ FIRST STEPS toward a vaccine for protection against the hemolytic streptococci which cause dangerous sore throats and other serious illnesses were reported by Dr. Lowell A. Rantz, of Stanford University hospital, at the meeting of the American Federation for Clinical Research.

Preliminary tests show that antibodies against these germs can be produced in the blood of vaccinated persons. Whether or not this means that the vaccinated persons will be immune to attack by the germs is not yet known.

Some of the men vaccinated had severe reactions with doses of vaccine that may be too small to stimulate production of antibodies. Several became increasingly sensitive as succeeding doses were given.

These efforts to develop a vaccine against streptococci were made under the auspices of the Army's Commission on Hemolytic Streptococcal Infections when it was found that sulfa drug prophylaxis against these germs proved to have limited usefulness.

Science News Letter, June 22, 1946

SCIENCE NEWS LETTER

VOL. 49 June 22, 1946 *No. 52*

The weekly summary of Current Science, published every Saturday by SCIENCE SERVICE, Inc., 1719 N St., N. W., Washington 6, D. C. NOrth 2255. Edited by WATSON DAVIS.

Subscriptions—$5.00 a year; two years, $8.00; 15 cents a copy. Back numbers more than six months old, if still available, 25 cents.

Entered as second class matter at the post office at Washington, D. C., under the Act of March 3, 1879. Established in mimeographed form March 18, 1922. Title registered as trademark, U. S. and Canadian Patent Offices. Indexed in Readers' Guide to Periodical Literature, Abridged Guide, and the Engineering Index.

The New York Museum of Science and Industry has elected SCIENCE NEWS LETTER as its official publication to be received by its members.

Member Audit Bureau of Circulation. Advertising Representatives: Howland and Howland, Inc., 393 7th Ave., N.Y.C., PEnnsylvania 6-5566 and 360 N. Michigan Ave., Chicago, STAte 4439.

SCIENCE SERVICE

The Institution for the Popularization of Science organized 1921 as a non-profit corporation.