Physical Sciences Notes

ATOMIC PHYSICS

Einsteinium for Bombardment

Four millionths of a gram of einsteinium—the largest quantity isolated yet—has been sent to Lawrence Radiation Laboratory at Livermore, Calif., to feed experiments with still heavier atoms.

The einsteinium, an artificial element with atomic number 99, was separated from two milligrams of californium (98), which in turn had been produced by irradiating thousands of grams of plutonium in an atomic reactor. The separation was done at Oak Ridge National Laboratory, Tenn.

Most of the einsteinium will be the target of high-energy protons from the LRL cyclotron. When struck by the fast-moving protons, the element is expected to form new isotopes of fernium (100), mendelevium (101) and the unnamed element number 102. Once produced, the rate of decay of these isotopes number radiation will be measured

PARTICLE PHYSICS

Symmetry System Supported

As a way to classify the many elementary particles and predict their characteristics, physicists developed a theory, called SU(3) symmetry, which groups the particles in sets of eight or 10.

One of the consequences of SU(3) is a prediction of the internal magnetism of the various particles.

Experiments to measure the magnetism of one particle, sigma-plus, showed results which matched the values predicted by SU(3). The measurements had an accuracy of 25 to 30 percent.

Sigma-plus is a short-lived particle, lasting only eight hundred-billionths of a second (8×10^{-11}). In the experiments, reported in the June 19 PHYSICAL REVIEW LETTERS by Dr. C. E. Roos and three other physicists from Vanderbilt University, the particles were created from high-energy beams at the California Institute of Technology electron accelerator and the Brookhaven, N.Y., Alternating Gradient Synchrotron.

Another particle, lambda-zero, had previously been shown experimentally to have the magnetism predicted by the theory. The lambda particle belongs to the same octet or eight-group as the sigma-plus.

Experiments are now going on at Brookhaven to test the magnetism of a third member of the octet, xi-zero.

MATHEMATICAL PHYSICS

Archimedes Spiral in Ice

Any mechanism for producing Archimedes spirals is interesting because of the frequent occurrence of such shapes in biological phenomena, as well as the great importance attached to them in studies of crystal growth.

Dr. Charles A. Knight of the National Center for Atmospheric Research, Boulder, Colo., has found spiral air bubbles in forming ice, but is unable yet to explain them.

Although the spirals could not be directly observed during the less than a minute in which they grew, he suggests the following origin:

First, an air bubble nucleates within a brine film. As the air bubble grows, it tends to become surrounded by ice. The ice forces the brine film away from the bubble, cutting off its supply of air.

When the rates of growth of the air bubbles and the ice have just the right ratio, the spiral figure is formed. After growth, no brine is in contact with the spiral bubbles, Dr. Knight reports in SCIENCE (June 24).

REACTOR PHYSICS

A Pioneer Shuts Down

The first plant of significant size to demonstrate the production of electricity directly from steam originating from water boiling in a nuclear reactor, the EBWR, ended 11 years of service at Argonne National Laboratory on June 30.

After it began operation in 1956, the EBWR scored a number of firsts in the Atomic Energy Commission's program on nuclear power research, including successful operation in 1962 with uranium fuel at a level of 100,000 kilowatts—five times its initial design output.

It was also the first boiling water reactor to use plutonium as a fuel in significant quantities, reaching a power level of 70,000 thermal kilowatts last March.

The data obtained from the EBWR are expected to be of significant value in the development of plutonium as an economic power reactor fuel for use in light water reactors, a preliminary to plutonium's use in fast breeders.

NUCLEAR POWER

Heavy-Water Reactor for Euratom

Design work on a prototype heavy-water-moderated, organically cooled reactor will be started soon by a consortium of French, German and Italian industrial firms for the European Atomic Energy Community (Euratom).

The reactor, called ORGEL, will be built by the group if design work goes ahead well. Organically cooled reactors can operate under low pressure, which helps in the design of reactor components.

The U.S., which recently decided not to build its own reactor of this type (SN: 4/15), hopes to make an agreement with Euratom to share the research gains from the European experiment.

NUCLEAR POWER

Swedish Firm Gets Enriched Uranium

The Atomic Energy Commission has signed a contract with a private Swedish power firm to provide enriched uranium for a nuclear power plant. It will be the first time the U.S. has supplied enriched uranium to non-governmental foreign users.

The arrangement is under a new toll-enrichment system, by which the AEC takes privately-owned uranium and, for a fee, increases the amount of fissionable U-235 in it. The contract has a 30-year duration.