they fuse to form helium-3. The mass of helium-3 is less than the combined mass of a proton and a deuteron, and the difference—5.4 million electron volts—is available as energy. This energy of fusion is the same energy that is released by the sun or during thermonuclear reactions.

Another way of looking at the reaction was described as follows. The mu meson holds the deuteron and proton together as if in a tiny box until they fuse. Thus fusion does not take place in ordinary molecules because the volume of the box is 10 million times larger.

In order to test their hypothesis, the physicists added artificially concentrated deuterium to the naturally occurring deuterium already in the bubble chamber. As was expected, there was an increase in the fraction of photographs in which there was an ejected mu or a gap at the end of a mu. Two pictures out of 10,000 showed a chain reaction two links long—where a single mu catalyzed two nuclear reactions before decaying.

After the experiments were completed, a colleague pointed out that in the 1954 *Proceedings of the Academy of Sciences of the U.S.S.R.* a theoretical physicist, Ya. B. Zel'dovitch, had already predicted a similar, though somewhat simpler, reaction.

The term *catalyzed nuclear reaction* was selected because of the comparison with what happens in chemistry, where a catalyst is used to speed up a reaction but is not itself used up in the reaction. A catalyzed nuclear reaction is similar to a thermonuclear reaction in that the same nuclear fusion reactions are common to both, but the conditions of the surroundings are quite different. Thermonuclear reactions take place only at extremely high temperature—in stars or hydrogen bombs—between nuclei propelled together by the great heat; a mu meson can pull nuclei together and catalyze a nuclear reaction at any temperature.

One of the great problems of controlled thermonuclear reactions lies in the need to maintain enormous heat in a confined system. Known materials melt at such temperatures, and investigations are under way to make "pinch containers" in which the hot materials do not touch the sides of the container. The difficulty is that the present containers leak.

National Health Survey

The U.S. Public Health Service has announced that a pilot test study under the new National Health Survey program will begin on 28 Jan. in Charlotte, N.C. The National Health Survey is being undertaken under legislation enacted by Congress last summer. The new law authorizes the Surgeon General of the Public Health Service to make continuing annual surveys and special studies of this country's population to determine the extent of illness and disability and gather related information. The last previous such federal survey was conducted 20 years ago.

The initial action in Charlotte will test a number of aspects of a questionnaire that is being developed for national use at a later date. Interviewing will be conducted by the Bureau of the Census, which is to perform this advance test and other field work on the survey. Data to be collected will include statistics on the number, age, sex, and occupation of persons suffering from diseases, injuries, or handicapping conditions; medical care received; the length of time that these people have been prevented from carrying on their usual occupations or activities; and the economic and other impacts of such conditions.

Sesquicentennial of Geodetic Survey

The Coast and Geodetic Survey plans a series of public events this year to celebrate its 150th anniversary. The survey was established in February 1807 under President Jefferson as the Government's first technical bureau. It has grown to the point where it now conducts official basic surveys of land areas and coastal waters of the United States and its possessions.

Its common services include tide tables for navigators, bathers, and fishermen; aeronautical charts for fliers; nautical charts for mariners; and starting points for surveyors. Admiral H. Arnold Karo is the director.

The anniversary program will be marked by the issuance of a special postage stamp. Plans are underway for sesquicentennial dinners, open house celebrations at survey headquarters, field offices and aboard ships, and for meetings of scientific and professional societies.

Teller on the Use of Nuclear Weapons

Edward Teller, nuclear physicist, discussed the moral issue involved in the use of nuclear weapons in a recent issue of the Air Force Association's monthly magazine *Air Force*. Teller stated that it would be "a considerable mistake for us to accept the idea that nuclear weapons are, on a moral plane, of a different nature from conventional weapons."

He noted that the U.S.S.R. had been exploiting the fact that the only use of atomic weapons in war so far had been against the civilian populations of Hiroshima and Nagasaki, Japan. He commented that "Russian propaganda has exploited this theme and has made it difficult, perhaps for the time being impossible, to make use of nuclear weapons, even in situations where such use would be logical and justified."

Rabies Treatment

The effectiveness of serum plus vaccine in preventing rabies in a group of persons who were severely bitten by a rabid wolf in Iran last year, and in similar less extensive experiences, was accepted as clear demonstration of the usefulness of the method by the Third World Health Organization Expert Committee on Rabies which recently met at the Pasteur Institute in Paris.

The meeting had historic interest inasmuch as it was at the institute that Pasteur introduced rabies vaccination for human beings more than 70 years ago.

This important step forward resulted from international collaboration, coordinated by WHO. The committee members, whose laboratories are situated in India, Iran, Israel, Spain, France, and the United States, have been working together on problems of rabies control since 1950.

The new approach involves providing basic protection by giving very small doses of chicken embryo vaccine, or a few doses of ordinary nervous tissue vaccine, followed by a single booster dose of vaccine rather than by the long schedule (14 to 21 days) of inoculations now performed.

Recently developed vaccines prepared from chicken embryos were found to confer long-term protection on dogs by only a single inoculation and were demonstrated to be useful also for cattle. It was stressed by the committeee that it is not only necessary to vaccinate dogs but also to control stray animals.

Rabies in wildlife, particularly in foxes, jackals, and wolves, is a problem in many countries. It also exists in insectivorous bats in areas of North America, and it has long been established that rabies is transmitted to men and animals in Latin America by blood-sucking bats. The finding of rabies in insectivorous bats in Yugoslavia indicates that this problem is not confined to the Western Hemisphere. Wild animal reservoirs present special difficulties, and it was agreed that extraordinary measures must be evolved to combat them.

The committee also suggested the establishment and use of an international standard reference serum and vaccine for countries throughout the world, so that procedures will be more uniform, and the potency of antirabic substances will be assured at time of use.

It also outlined forms for case reporting and case histories, to improve statis-

tics and the evaluation of procedures used in prophylaxis. Other recommendations include a simple guide for physicians in treating persons bitten and for dealing with the problem faced by governments importing cats and dogs from countries where rabies is known to exist.

In the Americas, the countries are receiving assistance with their rabies problems from the Pan-American Sanitary Bureau, Regional Office of WHO for the Americas.

Extensive studies in rabies from bats have been made in Mexico and in the United States-Mexico border area, with the assistance of PASB. Assistance was provided to Mexico in the establishment of equipment and techniques for the production of chick-embryo type of vaccines, including one for the immunization of cattle.

In 1957, a WHO Regional Rabies Training Course is planned which will be held in Caracas, Venezuela. This will be attended by rabies control personnel from each country in the Americas. In addition, PASB/WHO will provide a special adviser to the countries to assist in improving rabies diagnosis, the promotion of antirabies programs, and the production of rabies vaccines and antirabies serum.

Permanent Magnet

A major advance in magnet technology, one that is expected to lead to the commercial development of an unusually versatile and powerful permanent magnet, has been announced by the General Electric Instrument Dept., West Lynn, Mass. The company reports that with a new fine-particle ferromagnetic material it has already produced experimental permanent magnets equal to the strongest commercial magnets now available, and there is every expectation that a magnet can be made that is 10 times stronger.

The new magnet is made from elongated single-domain iron particles of high coercive force with properties that confirm the existence of the shape-anisotropy effect. The submicroscopic particles can be imbedded in plastics, metals, rubber, or glass. The resulting magnets have properties not heretofore attainable, for they can be easily machined, drilled, tapped, and molded precisely into any desired shape, opening up new possibilities to the design engineer. The elimination of cobalt and nickel in the new process makes possible for the first time the application of magnets in nuclear reactors, which so far has been limited because of the potential radioactivity of cobalt.

Key members of the research team that developed the magnet are on the staff of the Measurements Laboratory of the company's Instrument Department at West Lynn, Mass. They are T. O. Paine, laboratory manager, F. E. Luborsky, and L. I. Mendelsohn. Paine and his associates were honored for their work at the recent Industrial Science Citation Dinner sponsored by the AAAS Industrial Science Section.

The permanent magnet is of fundamental importance to industry. Every year more than 50 million magnets are produced and used in the United States. A single bombing plane requires at least 200 magnets in its instrumentation, and a magnet is an essential part of radios and television sets.

Transplantation of Human Tumors

Because of the many requests for such instruction, a 3-day session on the techniques and problems associated with the heterologous transplantation of human tumors will be held 4–6 Mar. at the Sloan-Kettering Institute, New York. In addition to lectures and laboratory demonstrations, opportunities will be provided for participants to work with various transplantable human tumors, a variety of animal hosts, and chick eggs. Tissue cultures derived from the transplantable human neoplasms will be demonstrated also. The value of these tumors in various research programs will be discussed.

The session, for which there will be no charge, will be given by H. Toolan, D. Karnofsky, A. Moore, G. Woolley, and J. Harris. Inasmuch as attendance will be limited to 25 people, requests for participation should be sent as soon as possible to Dr. Helene W. Toolan, Sloan-Kettering Institute, 410 E. 68 St., New York, N.Y.

Spectrophotometric Data

M. J. Kamlet of the chemistry division, Naval Ordnance Laboratory, and H. E. Unguade of the Los Alamos Scientific Laboratory, Los Alamos, N.M., are preparing for publication a collection of all the spectrophotometric data in 60 journals for the period 1946–56. They are currently looking for additional contributors who might help in this project.

New Science Journal for the Public

A new weekly popular science journal, *The New Scientist,* began publication in London late last year. The journal is "published for all those men and women who are interested in scientific discovery and in its industrial, commercial and social consequences." The magazine carries, among other sections, editorials, lead articles, news, an American newsletter, overseas news, book reviews, letters to the editor, and a scientific crossword puzzle. It is published by Cromwell House, Fulwood Place, High Holborn, London, W.C.1. The annual subscription rate for the U.S.A. is $8.50.

Shutdown at AEC's Dana Plant

The U.S. Atomic Energy Commission has announced that operation of its heavy water plant near Dana, Ind., will be discontinued and the facility placed in a standby condition. Dana is one of the commission's two heavy water units. The other is at the Savannah River Plant in South Carolina. Forecasts of future heavy water requirements now indicate that only one of the heavy water production units will be needed during the next few years.

Shutdown at Dana will be accomplished over a period of 9 months, with first layoffs of the approximately 900 employees beginning in the early spring of 1957. A slow, orderly closure is planned to permit maximum recovery of the material in the plant vessels and to assure careful preservation of equipment. The plant is expected to be in full standby condition late in 1957.

Marriage Statistics

The U.S. Public Health Service has announced that an improved system of collecting marriage statistics will be adopted by the National Office of Vital Statistics in cooperation with 29 states and four territories. The system will record data on more than half the marriages that occur in the nation, making it easier to obtain facts about the formation of new families in the participating states. Such information is needed for community planning and many other purposes.

The participating states and territories have agreed to maintain central files of marriage records by securing reports from local officials. (In many states, at present, marriage records are available only in local communities; this makes it difficult for heirs and others to locate old marriage records if they do not know exactly where the marriage occurred.) The 29 states have also agreed to cooperate in making periodic tests of the completeness and accuracy of their marriage registrations. The states will use most of the items on a recommended Standard Record of Marriage.

Standard birth and death registration statistics have been collected for many years and are now nation-wide, providing data which are used by health and