

technique, and have interesting implications for the total energy balance of the radiation crossing the atmosphere.

Friday morning was devoted mostly to theoretical papers on mesons. The recent advances in the experimental results are most easily interpreted by admitting that the mu meson has spin $\frac{1}{2}$ and the pi meson has spin 0 or 1. The main argument for this conclusion rests on the apparent fact that the pi meson disintegrates into a mu meson and a particle of rest mass zero (neutrino) and that the spectrum of the disintegration electrons of the mu mesons is a continuum with an upper energy limit of about fifty-five Mev. Convincing experimental evidence for both these facts was presented in one of the Saturday afternoon meetings; it comes from investigations on both artificial and cosmic ray mesons.

A supplementary paper announced the successful operation of the three hundred Mev synchrotron. Several mesons, apparently produced by gamma rays, have been observed by the photographic plate technique. Not to be outdone, the one hundred and eighty-four inch cyclotron has been converted to proton operation and three hundred and fifty Mev protons, and very high energy secondary neutrons have been produced. The neutrons have sufficient energy to produce artificial mesons of which cloud chamber pictures (the first ever made of artificial mesons) have been obtained. Friday afternoon was devoted to an invited paper and several contributed papers on the mechanisms of electrical gas discharges and on scintillation counters. On Saturday, besides the interesting meson papers already mentioned, there was a morning session devoted to high precision nuclear spectroscopy of the light nuclei. Among other things, the change of the neutron mass to 1.00899, recently reported, was independently confirmed in a supplementary paper. In a parallel session, papers on nuclear systematics, excitation functions and scattering experiments, were reported. Notable among these were the first results on proton-proton scattering at thirty-two Mev.

This brief account cannot cover all the subjects treated. In spite of a preponderance of nuclear and high energy physics there were also interesting results on the properties of helium-three to be interpreted as a confirmation that its strange behavior is due to the Bose-Einstein condensation, an investigation of liquids by neutron diffraction, and some papers of biological and other interest.

Socially the meeting was enlivened by an evening spent by a good fraction of the attendance at a dinner slightly less sedate than usual for a learned society, by the pleasant luncheons, and by informal gatherings which gave occasion to renew old acquaintances and friendships.

—Emilio Segrè

Reactor Program

Recent disclosures have further outlined the character of the Atomic Energy Commission's reactor development program. In addition to those nuclear reactors already in operation or under construction the program provides for the development of four particular types of test reactors, each of which is expected to provide a substantial fraction of the knowledge which future atomic energy de-

velopment will demand. Two reactors are to be constructed at an unidentified location in the western United States, where a new and major AEC laboratory site is to be prepared for the specific purpose of developing and testing atomic piles. This establishment will be primarily a field station for the Argonne National Laboratory, the present nucleus of the Commission's reactor program, although its facilities also will be available to the Oak Ridge National Laboratory, the Knolls Atomic Power Laboratory, and a few others.

As announced late last year, Westinghouse Electric Corporation has been awarded a contract to construct one of these reactors, a dry-land model of a nuclear propulsion unit for naval vessels. The nuclear fuel to be used is uranium enriched with uranium 235. The navy reactor is still in the planning stage, but the possibility has been voiced that actual construction of the unit may begin in about one year.

A second pile intended for operation at the new western site is to be used primarily for testing materials as possible structural components for future reactors. Its fuel is also to be enriched uranium, and it will act as a strong neutron source for investigating the effects of intense neutron bombardment of these various materials. The very high neutron flux of this pile will make it a valuable research tool, and it has been stated that it will be used for various physical and chemical experiments. North American Aviation, Inc. has contracted to study reactor materials and components "suitable for the practical application of atomic power," according to a recent AEC announcement. Construction of the materials-testing reactor is expected to begin before the end of the year.

Argonne has the responsibility for designing both of these reactors, and also an experimental breeder pile intended to test the feasibility of operating a uranium reactor in such a way that more plutonium is produced than uranium 235 is consumed, and at the same time operating the reactor in a way that will provide a limited source of electrical power. Although it will run at fairly low power, it is reported that the level will still be high compared to that of the Los Alamos plutonium fast reactor. As in the case of the Los Alamos reactor, it will operate with high energy neutrons. R. F. Bacher, in speaking before the American Academy of Arts and Sciences in February, has suggested the desirability of using a liquid metal coolant which will minimize neutron absorption losses and which at the same time will, by rapid transfer of heat from the reactor, permit operation at a temperature level which may allow an effective conversion of heat energy into electrical energy. The location of this pile has not been specified.

The Commission's program also includes the construction of another breeder type reactor. It is now being designed at the Knolls Atomic Power Laboratory in Schenectady operated by the General Electric Company, and will work with medium energy neutrons, a circumstance which makes it unique among reactors. Since no such intermediate reactors have existed heretofore, it is a matter of some interest to discover its behavior during operation. Here also it is planned that the coolant be liquid

metal which may permit using the heat carried out of the reactor to generate electrical energy. The site for the reactor is at West Milton, New York, and construction is expected to begin within the year.

Argonne National Laboratory has completed the preliminary design of a revised version of the heavy water reactor now being operated at Palos Park. Improvements will permit considerably stronger neutron beams. An Argonne announcement states that the reactor will be located at the DuPage site, where it will be one of the laboratory's more important experimental tools. Construction may begin in about a year.

In addition to the above collection of reactors, there are the several older wartime piles at Hanford and at Oak Ridge. The Hanford piles, used exclusively for producing plutonium, operate with natural uranium. They have undergone extensive repairs recently, and the addition of new units now under construction will make possible a higher plutonium production rate than ever. The Oak Ridge pile has been the primary producer of radioisotopes, and has been used as a laboratory tool as well. Los Alamos possesses two reactors which are of considerable value as nuclear research tools. One, the "water-boiler," uses as fuel uranium in water solution, and is important as a source of slow neutrons. The other, an experimental fast reactor using plutonium as the fuel element and operating with high energy neutrons, is the only reactor of its type. Another new reactor is being built at the Brookhaven National Laboratory, and should be completed within the next few months.

The Commission is also studying the possibilities of designing a simplified research reactor which may be produced at a sufficiently low cost to become available for laboratory work and the training of technicians on a somewhat wider basis than is now feasible. Possibilities for future reactor development are being studied by the Commission, and by other agencies. The NEPA (Nuclear Energy for the Propulsion of Aircraft) Project has for the past two and a half years been engaged in investigations which someday may lead to power reactors for use by airplanes. NEPA is an Air Force project which is being carried out by the Fairchild Engine and Airplane Corporation. Another reactor type under consideration is one in which fuel, cooling, reflecting, and moderating elements of traditional reactor design might be mixed homogeneously, and which may lead to the development of a new type breeder and power pile in a single unit.

Taken as a whole the reactor development program seems aimed at constructing rapidly a broad foundation of facts in physics and engineering rather than at furnishing a specific and concentrated attack on any one of the several important aspects of reactor application.

Berkeley in the Summer

The physics department of the University of California at Berkeley has announced plans for two six-week summer sessions for 1949. The sessions, scheduled from June 20 to September 10, will include courses on both the undergraduate and graduate levels. Visiting faculty mem-

bers for undergraduate work will include S. S. Ballard of Tufts College, G. H. Dieke, of Johns Hopkins University, L. H. Fisher of New York University, J. H. Williams of the University of Minnesota, E. A. Uehling of the University of Washington, and G. J. Holton of Harvard University. In the first session J. R. Oppenheimer of the Institute for Advanced Studies at Princeton will give a graduate course in quantum mechanics and a seminar in theoretical physics, while Professor Dieke will give a seminar in forms of gas discharges and their interpretation. In the second session V. F. Weisskopf of Massachusetts Institute of Technology will conduct a graduate course in nuclear physics and a seminar on topics in quantum electrodynamics, while Professor Uehling will give a seminar on nuclear magnetic induction and Professor Williams will conduct a seminar on the scattering of nuclei.

Instrumentation Conference

The 1949 Gordon Research Conferences, sponsored by the American Association for the Advancement of Science, will include a conference on instrumentation to be held from August 1 to 5 at the Colby Junior College, New London, New Hampshire. The conferences are of an informal type consisting of scheduled lectures and free discussion groups. Additional information may be obtained by writing to W. George Parks, Director, Department of Chemistry, Rhode Island State College, Kingston, R. I.

New Name for New Lab

Cornell University's nuclear studies laboratory has been named the Floyd Newman Laboratory of Nuclear Studies by the board of trustees in recognition of a gift to the laboratory of securities estimated to be worth about one million dollars. Floyd Newman, the donor, is a director of the Ashland Oil and Refining Company of Cleveland and a Cornell alumnus.

Awards

Enrico Fermi has been awarded the Donegani gold medal for physics by Italy's Lincei Academy, according to a recent announcement. While still in Italy, Dr. Fermi received a 1938 Nobel Prize for physics. Since January, 1939 he has lived in the United States, where he has played an important role in the American atomic energy program. He is now with the Institute for Nuclear Studies at the University of Chicago.

Officers Elected

Officers elected by the fluid dynamics division of the American Physical Society for 1949 are H. L. Dryden, chairman, J. G. Kirkwood, vice-chairman, and W. Bleakney, secretary-treasurer. H. W. Liepmann and A. Kantrowitz have been elected to the Executive Committee for three-year terms, and W. Bleakney for one year.

Cleveland Norcross

Cleveland Norcross, general manager of the American Institute of Physics, died March 21, 1949, shortly after an emergency operation. He was 37 years old.