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III - BIOLOGY AND MEDICINE

Research Projects Approved During July 1949

Biology:

- (1) University of Wisconsin Agricultural Experiment Station - Drs. R. W. Burris and P. W. Wilson - (a) "Studies of Biological Nitrogen Fixation with Isotopic Tracers" - Estimated amount \$5,600; (b) "Metabolism of Organic Acids in Higher Plants and Microorganisms" - Estimated Amount - \$6,500 - Drs. R. W. Burris, M. J. Johnson and P. W. Wilson.

Medicine

- (1) Presbyterian Hospital of the City of Chicago - Dr. R. Gordon Gould - "The Mechanism of CO₂ Fixation" - Estimated Amount \$6,000.
- (2) Peter Bent Brigham Hospital - Dr. Francis D. Moore - "Intracellular Changes in Trauma, Depletion and Repair; Biochemical Studies in the Human Being with the Aid of Isotopes" - Estimated Amount - \$25,000.
- (3) Iowa State College - Dr. S. Aronoff - (a) "Metabolism and Physiology of Foetus" - \$8,050; (b) Dr. R. R. Sealeck - "Combined Biochemical and Physiological Action of Tyrosine and Vitamin B₁₂" - \$9,900.
- (4) Massachusetts General Hospital - Drs. William H. Sweet and Bertram Selverston - "The Use of Phosphorus³² for the Precise Localization of Brain Tumors" - \$11,880.

Research Projects Extended During July 1949

- (1) University of Virginia - Dr. Alfred Chanutin - "Fractionation of Blood Plasma".
- (2) Ohio State University - Dr. M. L. Pool - "Radioautographs".
- (3) University of Washington - Dr. R. H. Williams - "Effects of Radioactive Sulphur".
- (4) University of Oregon - Dr. Edward S. West - "A Study of Labelled Acetic Acid and Ethanol in Relation to Fat Metabolism".

Los Alamos Hospital

At the instance of the Division of Biology and Medicine, Dr. C. Rufus Rorem (PHD, CPA), of Philadelphia, Pennsylvania, made a survey of the Los Alamos Hospital with a view to recommending policies and procedures to improve and maintain quality of service and to reduce the net subsidy now being made by the Atomic Energy Commission for health services at Los Alamos.

The report indicates that by reasonable control of revenue and expenses the annual operating deficit may be reduced from \$600,000 to \$285,000 without reduction in the quantity or quality of health service.

The Division of Biology and Medicine as well as the Divisions of Production and Military Application are studying the recommendations and progress is now underway towards effecting them.

Civil Defense

Negotiations are progressing on Civil Defense Planning. The preliminary report of the National Security Resources Board covering assignments within the Federal Government for Civil Defense Planning is being studied by the Division of Biology and Medicine.

This report proposes that the Federal Works Agency will have the primary responsibility for the development of plans for war time civil disaster relief with the Atomic Energy Commission designated as one of the participating agencies to assist Federal Works Agency in the development of these plans.

One of the first and most obvious responsibilities in a planning program will be a further determination of the scope of the planning activities. Technical information on which planning for disaster relief against radiological warfare, together with a detailed study which is now in process of several AEC activities bearing on civil defense planning, will be made available to the FWA by the Director of the Division of Biology and Medicine.

Protein Synthesis

At the California Institute of Technology investigations have shown that amino acids are taken up most readily by bone marrow cells. Apparently all tissues can take up all labeled amino acids with different efficiencies. Bone marrow takes up amino acids at the rate of about one percent per four hours as compared to 0.5 per cent for liver. The uptake of amino acids is much faster in embryonic and malignant tissues than in normal adult tissues.

Woods Hole

The Chief of the Biophysics Branch participated in several conferences with health physicists at Woods Hole during July. These discussions led to a firmer basis for permissible radiation levels to be received under emergency conditions and to limited portions of the body. While final agreement has not been reached, it is believed that substantially higher emergency dosages than those previously announced may be allowed. Several conferences with representatives of Columbia University led to a better understanding of the requirements of biophysics training at post graduate levels. Columbia University is now offering greatly extended training of this sort and should provide a very useful training ground for AEC technical fellowship training in biophysics.

Proposed Meetings

Plans are being formulated for an ad hoc panel consisting of the following members: Drs. Austin M. Brues, A. M. Dowdy, G. Haila, J. W. Cowan, M. J. Snyder, Stafford L. Warren and L. I. Marinelli, which will meet the early part of September to consider a research program on the effects of acute and chronic exposure to radiation.

A meeting of principal investigators to discuss their work on research projects in the fields of radiation biochemistry, particularly those phases dealing with nuclei, nuclei acids and nucleoproteins will be held at the AEC on September 12, 1949.

A conference with leaders from the four AEC Regional Fellowship Training Centers will be held in Washington on September 16 to discuss future training plans, curricula and related problems.

Trips

The Deputy Director of the Division is now in Japan making a survey of the Atomic Bomb Casualty Commission activities in Nagasaki, Hiroshima and Kure. All phases of the program will be studied and he will make a full report to the Director of the Division of Biology and Medicine upon his return around September 16.

Appointments

Dr. Charles L. Dunham, of the University of Chicago, Dr. George A. Hardie, of Johns Hopkins Hospital and Dr. Walter B. Claus, of Pabst Research Laboratories, have joined the staff of the Division of Biology and Medicine.

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IV - Reactor Development

Argonne National Laboratory Reactor Projects

Materials Testing Reactor. Design work on the Materials Testing Reactor is continuing under the direction of the Steering Committee. Individual engineering tests on the reactor components are essentially complete. The mock-up at the Oak Ridge National Laboratory is being equipped with test instruments for studying velocity and pressure patterns in the cooling channels, for studying dimensional stability, and for analyzing control rod performance. It is expected that the testing will be started early in August.

During the period from May 11th to July 14th, thirty-four 8" diameter beryllium billets were extruded into large squares at Adrian, Michigan, in connection with the program of the Materials Testing Reactor. Due to internal cracks in most of the billets and improper extruding practices, only two sound 40" lengths of extruded metal were obtained. It is believed, however, that sufficient experience has thus far been acquired so that, if sound billets are available, consistently acceptable extruded sections can be produced.

Mark I Navy Reactor (the first phase of the program of the Naval Reactor Division)

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Meetings have been held between representatives of the Argonne National Laboratory and Sylvania Electric Products, Inc. concerning the development of a new type of fuel element for the Navy Reactor

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Westinghouse Electric Corporation. Bids on the construction of the new Administration and Laboratory Building at the Bettis Site have been received from eleven general contractors and a selection has been made. The contract, with the approval of the Atomic Energy Commission on July 22nd, was awarded to Ragnar Benson, Inc. It is expected that the roof and outside shell of the building will be completed before winter and that the entire structure will be finished by June 1, 1950.

Pending completion of the new building, the Atomic Power Division is in particular pursuing vigorously assignments made by the Argonne National Laboratory on metallurgical studies and the construction of a mercury control rod mock-up. Work on the construction of water and gas pumps continues in the Research Laboratory in East Pittsburgh and at the Bettis Site.

Knolls Atomic Power Laboratory Reactor Projects

Preliminary Pile Assembly. The most recent measurements of alpha, the ratio of the probabilities of neutron capture to fission, at the center of the preliminary pile assembly SAPI-V yield a value between 0.15 and 0.21 for U-235 and between 0.25 and 0.30 for plutonium.

The plutonium yield in the outer portions of the breeding blanket of SAPI-V has been increased by a factor of seven merely by surrounding the uranium with an outer layer of beryllium. This may be quite an important effect in maintaining a reasonable plutonium yield to produce the outer blanket of a power-breeder.

It now appears that with a proper blanket design a breeding ratio as high as 1.6 may be obtained with a fast plutonium breeder.

Intermediate reactor. The determination of a maximum fuel rod length of 70" has now made it possible to limit the maximum outline dimensions for associated equipment. These studies, together with current design studies of heat exchanger and steam generator equipment that have narrowed down to two types, will make possible a determination of major space requirements in the reactor building and the storage tunnel. Layouts of equipment in the heat exchanger pit and steam generator cell are being made by Flawless.

Aircraft reactor

A sub-committee to the Atomic Committee for Aircraft Nuclear Propulsion met at Oak Ridge from July 18th to the 22nd to prepare recommendations for the design and power-plant phases of the

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Aircraft Nuclear Propulsion program.

Materials and Components

Zirconium. The Zirconium Advisory Committee, together with representatives of the New York Operations Office, the Oak Ridge Operations Office, the Y-12 laboratory, and the Washington AEC, met in New York on July 25th. The main objective of the meeting was to discuss ways and means of curtailing costs in the zirconium program by concentration of effort on the most promising methods of zirconium-hafnium separation and zirconium production. Work has been initiated and will continue throughout the next few months on the accomplishment of this objective.

Studies on the separation of hafnium from zirconium by diethylether ammonium thiocyanate extraction at the Y-12 Laboratory in Oak Ridge show high promise. These studies will continue on a laboratory scale for the next few months until a decision is rendered as to production on a large scale.

Materials Procurement. A meeting was held in the New York Operations Office on July 27th, involving representatives of that office and the Washington Division of Reactor Development, Production, and Research, to discuss the requirements and the procurement of reactor materials.

Reactor Physics

Shielding. An informal meeting was held at the Brookhaven National Laboratory on July 28th to discuss the future Brookhaven shielding program. Representatives of the Brookhaven National Laboratory, the Oak Ridge National Laboratory, the Knolls Atomic Power Laboratory, the Massachusetts Institute of Technology, the Washington Reactor Development Division, and AEA were present at the meeting. In particular, the objective of this meeting was to assist Brookhaven in the design of the large scale testing facility to be operated there. It was agreed that a "lid" type of facility, such as that recently submitted for approval at the Oak Ridge National Laboratory and different from a "plug" type, should be used at Brookhaven. Detailed discussions on this general type of facility will be held.

Members of the Summer Internship Program at the Oak Ridge National Laboratory visited the Brook Ridge Laboratory on July 13th and 14th to obtain data on shielding experiments made at that laboratory.

Idaho Operations Office

The transfer of [REDACTED] to the AEC

seems assured. It is expected that actual transfer of the property will be effected shortly after the passage of the 1950 appropriation bill.

Preliminary surveys of the site by the Corps of Engineers, Conservation Corps, Weather Bureau, and Geological Survey have begun in order to facilitate overall site planning and the choice of locations for the MTR and the CP-4. A proposed location for the CP-4 has been core drilled.

During the month contract negotiations were begun between the Idaho Operations Office and Flaw-Knox for the design of the MTR.

At the end of the month the personnel strength at Idaho was 36. Organization of the office is proceeding satisfactorily.

Liquid Waste Processing

Hanford. The design, fabrication, and installation of a waste evaporator for the 441-T tank farm has been initiated. The evaporator is intended for processing first-cycle supernatant solution; a tentative flow-sheet has been prepared and the necessary equipment is being assembled. Fifty gallons of Hanford first-cycle supernatant has been shipped to Oak Ridge for experimentation in the pilot evaporator.

Oak Ridge. The full-scale evaporator continues to operate satisfactorily to substantially reduce stored wastes. A preliminary run was made with the one-slug fluorination unit which is built to isolate uranium, plutonium, and fission products for waste disposal. K-15 is continuing its work on electrolytic precipitation of radioactive wastes on a laboratory scale.

The uranium-235 pilot plant is being prepared (it has been used for Relox) to develop the fuel recovery procedure for the Materials Testing Reactor. Enriched slugs, irradiated at Hanford and having an activity from 45 curies/slug to 525 curies/slug, will permit a gamma decontamination of 3×10^6 to 3×10^7 . This investigation should be finished late in 1949. The pilot plant using solvent extraction for uranium-235 recovery is now being assembled.

Argonne. A choice of pilot plant evaporation equipment has been made, with the selection of the Strainers-Wells' proposal costing about \$13,000. It will have a capacity of 50-75 gals/hr, is designed to provide experimental investigation of all types of radioactive solutions.

New York. Preliminary negotiations are under way with the Power Weld Process Company for development of a procedure for coating surfaces with an insulating material. This coating should be useful

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in preventing permanent contamination of these surfaces.

Mound. The Hanford second-cycle waste supernate being studied by Mound has been determined to contain 84% ruthenium and 11% cesium. Carrier precipitation techniques for fission product concentration are being emphasized; early experiences with ruthenium co-precipitation have been encouraging. Ion exchange experiments to immobilize cesium have not been fruitful.

KAPL. The building for processing wastes from the laboratory should be completed by the end of September with possible operation in about three months. This plant is designed to handle 9000 gallons daily of industrial radioactive waste from SPRU, the laundry, and laboratory.

Idaho Site Development. The study of chemical processing operations required at the site is continuing. Coordination of these developments at Oak Ridge, Argonne, and Knolls is under way.

Environmental Sanitation

Oak Ridge. Following a conference at Oak Ridge with representatives of ORNL, the Austin Co., and Oak Ridge Operations, a review was made and transmitted to General of the proposed sewage treatment plant for the X-10 area. One of the important points noted was the extent of infiltration of clear process water entering the sanitary sewer system.

Brookhaven. A meeting was held with representatives of the U. S. Geological Survey and BNL to discuss a cooperative geological research program which it is proposed to carry out at Brookhaven. In this program the geological research would be problems of disposal of wastes to the ground which the Geological Survey has been working on at various AEC areas which are centered at BNL. The system of ground water which is now being used at BNL would be utilized in this research.

Cooperative Water Supply Decontamination Research Program. Minutes of the meeting held on June 3 with representatives of the Navy, Corps of Engineers, Medical Department, Air Force Special Weapons Project, CRH, and Division of Environmental Medicine have been prepared. A draft of a paper entitled "Program for Research in Decontamination of Radioactive Materials for Civilian and Military Uses" has been prepared and distributed to the above agencies and the Divisions of AEC for comment and approval.

National Research Council. As a result of conferences with representatives of the British and the Divisions of the Medical Division of the National Research Council, a report on administrative

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staff at NRC, the basis was established for a proposed contract with NRC to obtain assistance and advice on the disposal of waste and the organization of sanitary engineering and environmental sanitation in the atomic energy industry.

Stack Gas Problems

A. B. Little, Inc. A test chamber has been built for use with the cascade impactor to measure particle penetration through various filter media.

An unsuccessful machine run was made in an attempt to coat filter paper with cellulose acetate. This resin in small amounts improves the strength and resistance-to-scuff characteristics without affecting performance. Another run will be made.

Discussions were held with representatives of Schenectady operations and A. B. Little, Inc. relative to the extension of the present contract.

Koppers Co. Tests have been made on an electrostatic precipitator for the decontamination of the chemical processing in the X-10 area. A unit was received from the company and was purchased. Discussions were held on this subject with representatives of the Koppers Co.

General Corp. Three years' division of finance requirements for 1957 filters for the next fiscal year have been ascertained. The total amount of filters for production estimates made earlier

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