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MONTHLY STATUS REPORT
DIVISION OF BIOLOGY AND MEDICINE
Month of May 1951

Research Projects Approved During May 1951

The following is a summarization of research projects approved for negotiation or renewal during the month.

	No. of Projects	Amount
Biology	24	$ 334,184.80
Biophysics	2	68,282.09
Medicine	16	405,768.20
Total	42	$ 808,235.09

The Division staff devoted a major portion of their attention during the month to analyzing research proposals received for consideration.

In the bio-medical program emphasis is being increased on investigations of the thermal, blast and radiation effects of atomic weapons upon living systems.

Note: A summary of all actions taken on direct research proposals received in the Division is distributed monthly to Operations Offices, National Laboratories, interested contractors, etc. Additional copies may be obtained from the Division of Biology and Medicine.

Advisory Committee for Biology and Medicine

The 27th meeting of the Advisory Committee for Biology and Medicine was held at the University of Rochester, New York, on May 18 and 19, 1951.

Dr. John C. Bugher, Deputy Director of the Division presented his report and recommendations based upon his recent survey of the Atomic Bomb Casualty Commission in Japan. The Committee was in agreement with his recommendations namely, that certain phases of the research work should be given continued support. A staff paper setting forth these recommendations is being prepared for submission to the Commission for consideration.

Sub-Human Primates

The Joint Atomic Energy Commission National Institutes of Health program of research of sub-human primates is getting under way. A meeting

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of the new Committee on Radiation Studies was held at the National Cancer Institute on May 13 with Dr. James H. Sterner, Chairman, presiding. (Dr. Sterner is a Consultant to the Division). Several proposals of research projects in the general field of radiation studies including one dealing with radiation effects on the neurophysiology of the monkey were approved for support subject to joint approval by the National Cancer Advisory Council.

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Operation Greenhouse

During the third shot at Operation Greenhouse a modified Biomedical Test Program was carried out with the remaining animals not used for the principal Biomedical Test Program in the second shot. The purpose of this program was to verify some of the results from the second shot and to collect additional data on the efficiency of biological dosimeters.

Biological dosimetry values were determined by counting the various kinds of chromosome breaks in the pollen mother cells of the plant, Tradescantia, by measuring the loss in weight of the spleen and thymus of mice after exposure, and by determining the LD 50 of mice. Dosimetry values from these experiments are being compared with values obtained by physical measurements such as film badges.

Flash burn studies indicated that the time for maximum burn occurred at about 0.3 of a second after the initiation of the explosion. At present this is a tentative value, however it indicates that there is not time to dodge behind a protection to minimize flash burning. The blast wave, of course, travels much slower.

The LD 50 for neutron exposure with mice was investigated as well as the LD 50 with gamma radiation on mice, dogs, and swine. Autopsies were performed on dogs and swine, tissue samples were preserved for analysis in this country. The 3,100 surviving mice from Operation Greenhouse have been returned to the Oak Ridge National Laboratory. There they will be kept for observations on the effect of the radiation on their life span and for pathological changes such as development of cataracts and tissues.

The principal scientific investigators concerned with the Biomedical Program at Operation Greenhouse will devote the summer to analyzing their data at Los Alamos. Detailed results are scheduled for completion by August 1.

(Biophysics)

A member of the Biophysics Branch was assigned to the National Bureau of Standards Group on the Greenhouse Test and assisted them in their "Radiation dosage as a function of distance measurements". Final results of this work will appear in the Bureau of Standards Greenhouse report.

(Radiation Instruments)

Fifteen types of AEC sponsored or developed instruments were tested through Project 5.1 at Operation Greenhouse. The integrating type instruments included in the program were tested by flying them through the atomic cloud in drone planes and by subjecting them, in blast proof housings, to the prompt radiation. The dose rate type instruments were tested under field conditions by carrying them into the contaminated area and comparing the readingswith those obtained simultaneously by the radiological monitors. It is felt that the tests were highly successful and will yield valuable information with which to guide future development of instruments. The initial work leading to production engineering contracts for two Oak Ridge National Laboratory-developed instruments has been completed. It is contemplated that a neutron survey meter and an alpha proportional counter will be carried through the production engineering phases, resulting in the production of 20 prototypes of each instrument.

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Biological Effects of Radiation

While the main efforts during the first eight months of the project on Biological Effects of Radiation under the direction of Dr. John W. Gowen at Iowa State College have been devoted to planning expanded and remodeled facilities and to expanding the breeding colony of mice to the numbers that will ultimately be required, some significant results have been obtained from pilot experiments with Drosophila.

Male and female drosophila were exposed to seven different doses of 100 KV X-rays ranging from 0 to 1,000 r. Pair matings were made in all possible combinations with three replications making 147 pairs in all. Twenty-six different criteria were used to measure the physiological effects of the radiation.

In his progress report, Dr. Gowen presents graphs showing the relation of nine of the criteria to X-ray dosage. Seven of the nine

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variables behave more or less similarly showing a decrease with increasing X-ray dosage. These variables are total eggs laid, total days on which eggs were produced, three-day highest egg yield, percent of life female produced eggs, three-day highest hatchability, percent of eggs fertilized, and percent of life when males were fertile. Two variables, days of life for males and for females failed to show a significant trend with increasing dosage.

A pilot experiment with mice is now in progress and the Drosophila experiments are being continued. Plans for this project have been expanded to include study of the effects of chronic gamma exposure upon physiological processes and longevity of mice.

Genetics

In a manuscript to be submitted for publication in the American Naturalist, Dr. Bruce Wallace summarizes the first two years' results in the study of drosophila populations exposed to acute and chronic ionizing radiation. The rates of accumulation of lethal, semi-lethal and sub-vital mutations are presented. A consideration of the frequencies of lethals, semi-lethals and sub-vitals within the populations and of estimates of the adaptive values of the populations suggests that hetterotic gene combinations have been developed within some of these populations. These results have an important bearing on the estimation of damage to populations resulting in gene mutations.

Civil Defense
Personnel Shelters for AEC Installations

Discussions were held with a representative of Armco Drainage and Metal Products, Inc. on underground shelter possibilities. Plans and costs for an acceptable structure have been secured from the company.

FCDA Test Exercise

Members of the Branch have participated in conferences with representatives of the FCDA and other interested agencies on the proposed FCDA test to determine the effects of an atomic bomb on structures and shelters.

Design Criteria for New AEC Construction

Work is continuing, in cooperation with the responsible program divisions, on design standards for protective construction in connection with new plants and facilities.

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GPO 16—55741-1

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Loan of Radiation Detection Instruments

Loans of instruments for state or local civil defense training were made to South Dakota, Maine, and the City of Tacoma, Washington, during the month.

Biophysics

Report on Radiation Protection Criteria

At the request of Mr. William L. Borden, Executive Director of the Joint Congressional Committee on Atomic Energy, a report was prepared explaining the activities of the Division of Biology and Medicine in the control of radiation hazards in AEC operations, its efforts to reduce the costs of radiation protection wherever possible, and its philosophy in maintaining a high level of protection. In particular, the report pointed out that present AEC policies have resulted in a very low radiation injury rate, small need for extra-hazard pay to labor, normal insurance rates for most workers, and ready psychological acceptance of atomic energy developmental activities by workers and the general populace alike. Because of the unexpectedly high hazard due to neutrons, and because of genetic effects not yet fully evaluated, the Division does not presently feel justified in recommending any relaxation of its present criteria for radiation health protection.

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Feasibility Studies on the Proposed Continental Underground Tests

A member of the Biophysics Branch staff actively participated in the study of the feasibility of carrying out a proposed underground atomic test in the continental United States. Activities in this connection have included (1) working with AFSWP in preparing calculations as a preliminary study; (2) reviewing the results of these calculations for members of the Commission and for the General Advisory Committee; and (3) participating as a member of the Ad Hoc Panel which recommended the criteria under which such a test might be safely carried out. This Panel, consisting of five consulting specialists, and members of the AFSWP, AEC, Los Alamos and Sandia staffs, recommended that a preliminary shot be carried out at a depth sufficient to render the hazard negligible, yet such that observations could be made on which to base approval of more shallow shots. Criteria of safety were analyzed and recommended. Minutes of the meeting, including additional calculations, were prepared by the Biophysics Branch.

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Visits to AEC Research Projects

A visit was made to Mound Laboratory where Dr. Davis S. Anthony has recently been appointed Director of the biological program, including radiation protection (health physics), waste disposal and biological research. Radiation protection is adequately provided through a system of closed cells and dry-boxes in which chemical processing and fabrication is carried out. Scrupulous care of corridors, use of clothing change rooms between "hot" and "cold" areas, personnel monitoring and a regular bioassay schedule serve to keep personnel exposure to a minimum in difficult processing areas. Continuous monitoring and chemical engineering studies are improving the waste disposal record. The biology laboratories are being rearranged to permit work on a new program to study the effects of actinium on living organisms - looking toward possible large-scale use of this element in AEC operations.

Visits were made to the biophysics and biology laboratories of ANL in connection with attendance at the Bio-medical Laboratory Directors' Meeting which was held there on May 28-29. In connection with the same meeting, the AEC-supported project at the University of Chicago Institute of Biophysics and Radiobiology was inspected. These facilities are being used by Dr. R. E. Zirkle to study the effects of 2-million-volt protons on individual structures in living cells by means of his "micro-beam" technique. When perfected, this technique promises to solve many questions as to cell sensitivity and relative biological effectiveness of various radiations.

Miscellaneous Conferences

The Biophysics Branch was represented in a number of conferences and discussions:

Several discussions have been held with representatives of the Division of Military Application and the Federal Civil Defense Agency regarding the role that the AEC will undertake in the proposed Civil Defense Atomic Bomb test. An inter-departmental committee, including a member of this Branch, will further study this role, together with the necessary plans for radiological safety.

A discussion with Captain Winant of Joint Task Force 131 indicated that a residual group of about 30 radiological monitors may be available for use in projected continental tests. Use of this group would greatly lessen the demand on AEC installations to furnish temporary assistance at these tests.

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GPO 16—55741-1

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The Sub-Committee on Protection Against Unconventional Attack met with members of the parent Interdepartmental Committee on Internal Security to discuss the significance of some of the Sub-Committee's recommendations, including the means and costs of putting them into operation. General accord was reached in outlining practical solutions to a majority of the more important problems.

The Sub-Committee on Radiobiology, of the National Research Council Committee on Nuclear Radiations, met in Cleveland on May 6, to discuss its conferences on radiobiology (jointly supported by ONR and by AEC through the Biophysics Branch,) to consider the formation of a new society in the field and its publication problems, and other items.

Instrumentation Conference, Harwell, England

The Third Joint United Kingdom/Canadian/United States Instrumentation Conference was held at Harwell, England, April 30 through May 11, 1951. Six persons representing the major AEC areas and laboratories of the United States attended and contributed to the meeting. The programs included discussions covering major fields of instrumentation falling within the scope of the Technical Cooperation Program. Visits to the AERE Harwell Laboratories and to various instrument companies were arranged. In general, it was observed that the English designed instruments stressed reliability in operation and were more standardized than are U. S. instruments. It is felt that the United States uses higher quality components and that, although our country does not stress instrument longevity and standardization to the extent the English do, our system of design freedom and resulting competition has led to better products.

Conference on Basic Instrumentation

The Fourth Conference on Basic Instrumentation was held by the National Bureau of Standards, Office of Basic Instrumentation, on May 22, 1951. The Basic Instrumentation Program is cooperatively sponsored by the Office of Naval Research, Office of Air Research and the Atomic Energy Commission. Some of the work engaged in under this program is reported on in the Quarterly Progress Report of the Office of Basic Instrumentation, March 31, 1951, National Bureau of Standards Report OBI 1010.