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# MONTHLY STATUS AND PROGRESS REPORTS FOR JANUARY 1953

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U. S. ATOMIC ENERGY COMMISSION

Washington, D. C.

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### III - BIOLOGY AND MEDICINE

#### Research Activities (UNCLASSIFIED)

Off-site research program. The Division of Biology and Medicine has reserved in its 1953 budget some \$6,500,000 for the financial support of an estimated 360 research projects in cancer, medicine, biology, and biophysics to be conducted at universities, hospitals, and other institution laboratories throughout the country. The estimate includes approximately \$5,800,000 for the renewal of some 295 research projects, and \$700,000 for anticipated support of new worth-while research projects. Through January of the current fiscal year, the Division has renewed some 117 projects at approximately \$2,500,000; in addition, 34 new research projects totaling approximately \$400,000 were approved. In the month of January alone, customarily a slow month for contract actions, the Division approved 14 renewals at \$150,000 and approved 5 new projects for a total of \$40,000.

Respiratory exchange recording system. Equipment which will greatly facilitate and improve the accuracy of studies on the action of ionizing radiation on mammalian respiratory metabolism has recently been developed under a National Cancer Institute-AEC project. This equipment will permit continuous automatic analysis and recording of total metabolism of small laboratory animals. The animal is undisturbed by any attachment to the apparatus and can remain free in a comfortable enclosure from which urine can be collected for nitrogen analysis. The newly developed equipment can record the rate of oxygen consumption, the rate of carbon-dioxide production, and the respiratory quotient, continuously for an indefinite period, and with a degree of resolution on the time scale such that minute-to-minute changes are readily distinguished. It provides also an integrated tabulation of the total respiratory gas exchange over any set period. The combined records permit ready calculation of the separate rates of consumption of fats, proteins, and carbohydrates, and the shifting disturbances of the metabolism in this regard, in parallel with the animal's activity.

Radiation-induced cataract study. At the State University of Iowa, a quantitative study of radiation-induced cataracts is currently in progress. This group has been comparing the effectiveness of fast neutrons (cyclotron-produced) and X irradiation (200 KV) on the production of cataracts in laboratory mice, in both single and cumulative doses. The median effective (single) dose for the production of complete cataracts was found to be about 210 r.e.p. (roentgen equivalent physical) for the neutron radiation and 860 roentgens for the X radiation. In the multiple exposure experiments (with weekly neutron irradiation of 70-90 r.e.p. and X irradiation of 300-400 r.) it appeared that X irradiation was less effective than the corresponding neutron fractionation.

Effects of radiation on ocular lens. Investigators at the Kresge Eye Institute in Detroit, studying the effects of neutrons and other radiations on the ocular lens, have reported some interesting findings. Their observations suggest that the portion of the lens which is most sensitive to X-ray damage is the epithelium, and, of the compounds investigated, nuclear protein is the first to be affected. This finding is consistent with the observation of others who have found that X rays produce a more or less immediate effect on cell division, presumably through their effect on cell nuclei. A secondary chemical effect of X irradiation reported by this group is the inhibition of carbohydrate metabolism. Studies are being continued to elucidate further the mechanism involved.

Improved tracer technique for blood volume determination. Investigators at the St. Louis University School of Medicine have developed a useful new modification of tracer technique for the study of human blood volume and turnover. In the study of cases of severe closed head injuries, the usefulness of the results has been partially vitiated by the delay caused by the necessity of incubating the patient's own blood with the tracer. The inability to predict the time and place of arrival of these patients led to unavoidable delay in initiating the procedure, and variation in therapy instituted during this period further confused the

picture. The new procedure avoids these difficulties by making use of "universal" donor (Rh-negative, type O) red cells. Large batches of these cells are tagged with chromium 51 every few weeks at a central station and divided into a number of single dose aliquots, some of which are stored at each of several hospitals. This procedure permits immediate initiation of the blood volume determination upon the patient's arrival at any of these points.

#### General

Proposed biological laboratory at Eniwetok. Beginning with the Bikini tests in 1946 and continuing through the recent tests at Eniwetok, a program has been conducted to study the radioactive contamination of plants and animals in the Bikini and Eniwetok areas. The investigations have been carried out chiefly by the Applied Fisheries Laboratory of the University of Washington, with surveys being made immediately following atomic detonations and resurveys after intervals of several months or longer.

The advisability of establishing a small permanent marine biological laboratory at Eniwetok is being investigated since the Commission has the responsibility to carry out continuing studies of radioactive contamination of the test area. Virtually nothing is known of the biology of marine life of that part of the Pacific, including food chains of marine animals which determine the abundance of food fishes such as salmon and tuna. Other scientific groups have expressed both an interest and a willingness to cooperate in such an undertaking. Arrangements have been made for a party of six scientists from the Office of Naval Research and from the Pacific Science Board of the National Research Council (who will be meeting in Hawaii in February) to visit Eniwetok in the company of Dr. Karl Wilbur of the Division of Biology and Medicine. This visit is being coordinated with the Divisions of Military Application and Security.

During the visit to Eniwetok the group will visit Perry Island to inspect present laboratory facilities and to evaluate the site from the standpoint of possible future facilities.

Tri-Partite Conference on Permissible Doses. Delegates from Canada, the United Kingdom, and the United States will meet in Washington on March 30, 31, and April 1, 1953, to participate in an international conference on permissible dose levels. This will be the fourth meeting of the Tri-Partite Conference on Permissible Doses, which meets periodically to review the permissible dose levels for both external and internal radiation. These periodic reviews permit a maximum exchange of information and experience on permissible dose levels, thus minimizing variations in standards between the participating countries.

Cesium teletherapy unit for cancer research. The Oak Ridge Institute of Nuclear Studies recently awarded a contract to the W. F. and John Barnes Company of Rockford, Illinois, for design and construction of a prototype cesium 137 teletherapy unit. Delivery of the unit is expected

[REDACTED]

within a year; it will be used for cancer research under the teletherapy evaluation program by the ORINS medical division and the participating medical schools.

National laboratory spring program reviews. It is planned that the practice of holding spring reviews of the national laboratory programs will be continued this year as in the past. A sampling of opinions has indicated that the management staffs of the national laboratories and operations offices, and staff members of the Washington program divisions have found these reviews to be extremely valuable from the standpoint of over-all review of programs and review of financial requirements for ensuing budget years. (End of UNCLASSIFIED section.)

Civil Defense Activities [REDACTED]

Transmittal of weapons information to FCDA. As reported periodically, the Division has transmitted to the Federal Civil Defense Administration information in various established weapons effect categories upon showing of the justification of need by FCDA. These categories have been mutually agreed upon under a cooperative arrangement with Armed Forces Special Weapons Project of the Department of Defense. AFSWP is currently considering recommending to the Joint Chiefs of Staff a revision of the listing of such categories of information in order to effect a broadening and simplification. At the request of AFSWP the Division has reviewed and commented upon the proposed revision.

Concurrently, the FCDA has requested broader access to certain types of information available to the AEC. This request involves weapons development data, as well as the effects categories mentioned above. In reply the Commission has pointed out that all information available to date in the agreed-upon categories, up to Operation IVY, has been provided; that other agencies such as NSC, CIA, DOD, and NSRB are inextricably concerned with this request and that their collaboration is necessary; and that specific review of present FCDA needs be accomplished through existing liaison channels. (End of [REDACTED] section.)

[REDACTED]

## IV - RESEARCH

### Highlights of Research

Plutonium separations tests. Two calutron test runs were completed at Oak Ridge National Laboratory on the separation of the isotopes of plutonium using plutonium trichloride as charge material. The first run was unsuccessful because of mechanical troubles associated with the high filament temperatures employed. The second run has not been evaluated. The third test may be run late in February.

Purex pilot runs completed. The completion of the five Purex pilot tests at Oak Ridge National Laboratory with 60-day cooled Hanford irradiated slugs will provide General Electric with required process criteria. It is the opinion of ORNL and GE personnel that no additional runs are necessary. The Purex program at ORNL is now essentially complete and final reports will be prepared during the next few months. Preliminary results indicate that 60-day cooled material can be adequately decontaminated with two extraction cycles and without headend treatment.

Stored energy in graphite. Information had been received from the British that incidents involving the spontaneous release of stored energy in the graphite of the Windscale production reactors had occurred. Arrangements were therefore made to discuss with British representatives the problem of stored energy in graphite at a meeting in Washington January 22 and 23. It was learned that the first incident had occurred on shut-down of the #2 Windscale reactor. When shut-down cooling fans were cut off the graphite temperature increased slowly and on reaching about 80° C. began to heat up more rapidly. Cooling fans were turned on to prevent further temperature rise and a maximum temperature of about 300° C. appeared to have been attained. A second similar incident occurred in the #1 Windscale reactor somewhat later. A third planned and controlled release of stored energy in the #2 reactor was staged this past fall. In this planned experiment reactor power was permitted to raise the graphite temperature to 200° C. in the reactor center. Power was then shut off and stored energy release continued to raise the temperature to about 350° C. The temperature wave passed slowly from the center towards the outside of the reactor, although energy release was not obtained in all outer regions. Time involved in the release was apparently several hours.

Conclusions from the meeting were:

1. In the temperature range 80° - 200° C., stored energy resulting from irradiation of graphite can be spontaneously released by heating the graphite slightly above the temperature of irradiation.
2. Normal cooling is sufficient to control this energy release since the rate of release is comparatively slow.

[REDACTED]

3. To prevent build-up of excessive amounts of stored energy of the type that is released at 200° C., consideration should be given to periodic controlled releases of the stored energy in graphite reactors in which the graphite operates below 200° C.

#### Construction of Research Facilities

Computer facility. New York University has acquired a building on its Washington Square Campus for housing a UNIVAC computer. Some alteration work is required and the building should be ready to receive the UNIVAC by about March 20.

CP-5. Construction on the Argonne research reactor and its associated equipment is progressing successfully. The reactor shielding tank is nearing completion and preparations are being made for the installation of the thermal column structures.

Bevatron. Information was obtained from Brookhaven for a preliminary estimate for the shielding required for the bevatron at the University of California Radiation Laboratory. The results of the tests on the cosmotron will be valuable in operation of the bevatron. It is expected that this machine will begin operation sometime this year.

#### Computer Council

The AEC computer council held a meeting in Philadelphia on January 27, at which time Dr. John Wheeler of Princeton University resigned as chairman because of heavy commitments and the termination of Project Matterhorn. It is expected that Dr. Edward Teller of UCRL will replace him as chairman.

#### Uranium Alloy Newsletter

In view of the extensive interest in uranium alloys the Division of Research is collecting and assembling bimonthly brief research reports from all contractors active in the field. These are distributed as the Alloy Newsletter to all metallurgical groups. It is hoped that this device will help prevent duplicating programs and assist the rapid utilization of research results.

#### Off-Site Research Proposals Approved

<u>Institution and Investigator</u>	<u>Subject of Research</u>	<u>Annual Support</u>
Brown University R. A. Peck	Precision measurements of neutron interactions (renewal)	\$ 17,500



[REDACTED]

Columbia University W. A. Selke	Ion exchange chromatography (renewal)	\$ 2,474
R. M. Noyes	Photochemical reactions of iodine (renewal)	7,450
University of Illinois P. E. Yankwich	Studies in radiochemistry (renewal)	20,000
University of Indiana W. B. Schaap and F. C. Schmidt	Electrochemical research in solvents	13,290
Mass. Inst. of Technology S. C. Collins	Properties of metals at low temperatures (renewal)	8,003
Syracuse University H. Linschitz	Photochemical reactions of complex molecules in con- densed phase (renewal)	13,000
University of Texas G. W. Watt	Unusual oxidation states of transitional elements	18,000
Wayne University K. H. Gayer	Solubility of uranium and thorium oxides in dilute acid and base (renewal)	7,000
University of Wisconsin D. A. Lind	Excitation of nuclei by in- elastic neutron scattering (renewal)	20,500

Off-Site Research Proposals Disapproved

Columbia University J. R. Dunning	Install, maintain, and operate an AEC computing facility	297,000
University of Denver J. G. Roeschlaub	High temperature character- istics of molybdenum and molyb- denum alloys	14,266
Mellon Inst. of Ind. Research J. R. Bowman	AEC computing facility	102,400
University of Minnesota O. H. Johnson	The isolation and purification of scandium oxide	14,861
University of Pennsylvania J. G. Brainerd	Computing facility for AEC	295,502
University of Rochester	Computing facility for AEC	377,500

V - REACTOR DEVELOPMENTReactors in Operation

Experimental Breeder Reactor. A sample of enriched uranium containing 4 percent zirconium was exposed in the LITR at Oak Ridge for 1.5 percent burn-up. Preliminary measurements indicate that the dimensions increased only about 0.25 percent. The surfaces of the metal are good. Further exploration of irradiation damage to zirconium-uranium alloy is under way. Specimens of plutonium-uranium alloys immersed in hot sodium-potassium corroded badly, whereas pure uranium is resistant under similar conditions. This indicates that NaK bonding, which has been used in EBR enriched uranium fuel elements, will not be satisfactory for plutonium.

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