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RADIOLOGICAL LABORATORY

University of California School of Medicine, San Francisco
Department of Radiology

THE HISTORY OF THE RADIOLOGICAL LABORATORY

1942-1954

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THE HISTORY OF THE RADIOLOGICAL LABORATORY

August 1942-1954

In August of 1942, Dr. Robert S. Stone was asked to take charge of the research and service activities related to the health of the workers in the Metallurgical Laboratory (Plutonium Project) of the University of Chicago. He was called to this task because of his unique experience with fast neutrons as a clinical tool. The Metallurgical Laboratory was then operating under a contract between the Office of Scientific Research and Development (OSRD) and the University of Chicago. One of the major projects there was the chain reacting pile. Therefore everyone was concerned with the deleterious effects of ionizing radiations and means of protection.

It was realized at once that very little was known about the effects of total-body irradiation on relatively normal persons. Since the blood was recognized to be one of the most sensitive indicators of biological change in the body and since it could be studied with relative ease, an effort was made to establish projects where blood studies could be carried out on patients whose diseases did not seriously involve the hemopoietic system and who were being treated with radiation to the entire body or large parts of it.

The University of California School of Medicine was one such place. In the Outpatient Department of the University of California Hospital, the staff of the Arthritis Clinic were referring patients to the Radiation Therapy Department for treatment of arthritis of the spine and other areas, chiefly by means of local x-ray therapy. However, in many cases, the multiple local areas treated resulted in fairly generalized treatment to the trunk of the patient. A new method of treatment of arthritis by irradiating nearly the whole body by a wide-field technique had been advocated for several years by a British doctor, S. Gilbert Scott. After discussion of this method and the results claimed for it, the staffs of both departments agreed to try a modified method of total-body irradiation. By means of a subcontract between the University of Chicago and the University of California, some money was made available for hematological studies on the patients being so treated. This was the beginning of the activities that have developed into the Radiological Laboratory Project.

On May 1, 1943, the Manhattan District of the U. S. Corps of Engineers became the contracting officer for the Metallurgical Laboratory and, therefore, of the sub-project at the University of California School of Medicine, San Francisco. Since the Engineers were also the contracting officers for the Radiation Laboratory in Berkeley, they transferred the contract for the

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San Francisco project to their Berkeley office and incorporated it in the major contract between the Engineers and the University, known as Contract W7405-ENG-48. To designate separately the sub-project in San Francisco, the letter "C" was added to the 48. Henceforth the San Francisco project became known as National Defense Project 48-C, abbreviated to NDP-48-C. However, the reports on the hematological studies done by Dr. B. V. A. Low-Beer in consultation with Drs. Falconer, Mettier, and Aggeler were made to Dr. Stone at the Metallurgical Project headquarters in Chicago from 1942 to 1946. Therefore most of the progress reports were published as sections of Metallurgical Laboratory reports, with the prefix CH. During the war years Dr. Earl R. Miller was the administrative head of this project.

In the immediate post-war period, many of the scientists who were convinced that the research and development work of the Manhattan District in biology, medicine, and health-physics was vitally necessary, made a vigorous effort on a national scale to keep it alive. A Medical Advisory Committee to the Manhattan District was established. It considered the matter thoroughly and recommended that various projects, including that at the University of California Hospital (NDP-48-C) be continued. Its recommendation included continuing the hematological studies and, in addition, expanding into the field of studies of the effects of radioisotopes, particularly radioiodine, under Dr. Miller. It also recommended appropriate budgets for the various projects.

The Medical Advisory Committee of the Manhattan District became the Interim Medical Committee of the U. S. Atomic Energy Commission. The program and budget of the San Francisco Project (NDP-48-C) was approved by this interim committee for the years 1947-1948. Since that time the Division of Biology and Medicine of the Atomic Energy Commission has reviewed the program and budget periodically.

In 1947, Dr. Stone and Dr. Shields Warren were both on the National Advisory Cancer Council of the U. S. Public Health Service, and both became greatly interested in multimillion volt radiation as a means of treating cancer. The National Advisory Cancer Council set up a conference on October 1, 1947 to discuss multimillion volt radiation therapy. This conference stimulated still further Dr. Stone's interest in finding out whether or not multimillion volt therapy could treat cancer more successfully than either the so-called "standard" therapy in the 200-kv range or supervoltage therapy in the 1- to 2-million volt range. A 1-Mev x-ray machine had been in use at the University of California Hospital since 1934. On many occasions Dr. Stone discussed with Dr. Shields Warren, who had become Director of the Division of Biology and Medicine of the Atomic Energy Commission, the possibility of the Commission's supporting a "synchrotron" program at the University of California School of Medicine, and Dr. Warren was very much inclined to recommend support for the project. (There seemed to have been an informal agreement that the National Advisory Cancer Council of the U. S. Public Health Service would support projects using apparatus up to

the 1- or 2-million volt range and that the U. S. Atomic Energy Commission would support those using several million volts.)

During 1948 definite commitments were made by the Atomic Energy Commission to the University of California to provide funds for securing a synchrotron and constructing a research laboratory building in which it was to be housed. On July 1, 1949, the project on the San Francisco campus was separated from the Radiation Laboratory in Berkeley and was placed under a separate contract, No. AT-11-1-GEN-10, Project No. 2. However, the administration of the program of purchasing the synchrotron and constructing the research laboratory building remained with the Radiation Laboratory. The initial order for the synchrotron was placed on July 27, 1949. The contract for the new building was let in June, 1950, and the building was accepted from the contractors on September 18, 1951. Because the Regents of the University needed a name for the building, it was decided to call it "The Radiological Laboratory Building".

The 70-Mev synchrotron was delivered by the General Electric Company on August 26, 1951. On November 9, 1951, x-rays were first produced. However, the synchrotron was not "accepted" until July 1, 1952. It would not have been accepted even then had all the developmental work that was still necessary been anticipated. Since the acceptance of the synchrotron there has been a continuous effort to get it to work in a method that is adequate for physical investigations, biological experiments, and clinical application. This effort will continue until these objectives are attained.

After the acceptance of the Radiological Laboratory Building in 1951, the Biology Section which had previously existed in plans began to take shape and started to work in the new building. The reason for including a Biology Section was the practical need of obtaining sufficient knowledge of the biological action of the radiations from the synchrotron relative to those from conventional x-ray apparatus to safely initiate clinical applications. When the studies of relative biological effect are completed, the Biology Section will continue to work on related problems.

The foregoing describes the development of the Radiological Laboratory. Its present status and objectives are given in extracts from its 1953 Annual Report (UCSF-8):

"The Radiological Laboratory is the name which has been applied to the coalition of research activities deemed necessary for the physical, biological, and clinical evaluation of the radiations obtainable from a 70-Mev synchrotron. It also includes the terminating activities of a radioiodine project and a total-body irradiation hematology project.

"The work is unclassified and relates to the improvement of radiation therapy of cancer. While the study of the value of the synchrotron as a tool for the treatment of cancer is the main objective, the theoretical and practical value of changing other treatment factors such as dose-rate and fractionation is being investigated."

The Radiological Laboratory was built and equipped entirely by funds from the U. S. Atomic Energy Commission, and by far the major portion of its operational funds are provided by the AEC. Occasionally there have been workers whose financial support came from other sources.

There is no intent to make a comprehensive listing in this brief account of all the scientists who have been connected with the project. Below is a list of the principle investigators and the times of their joining the staff.

Dr. B. V. A. Low-Beer initiated the hematology program in 1942. Dr. Paul M. Aggeler acted as consultant in hematology from the beginning. Gradually all the duties centered on him and he was appointed consultant in hematology in 1949. The radioiodine program has been continuously under the direction of Dr. Earl R. Miller, who began this work in 1945. On May 12, 1950, Dr. Gail D. Adams was appointed Lecturer and Consultant to help with the planning of the Radiological Laboratory. He joined the staff on a full-time basis as of January 1, 1951 in charge of the Physics Section and, as of October 1, 1951, was appointed Associate Director of the Laboratory. Dr. Henry I. Kohn, while a Sr. Surgeon in the U. S. Public Health Service, was assigned by that Service to the Department of Radiology of the University of California School of Medicine to study radiation therapy. He assisted with the planning of the Biology Section and, as of January 1, 1951, joined the staff in charge of the Biology Section. He resigned from the U. S. Public Health Service, effective July, 1953, to become a permanent member of the Radiological Laboratory staff.

With respect to the University's administration, the Director of the Radiological Laboratory is responsible to the Chairman of the Department of Radiology of the School of Medicine. He, in turn, is responsible to the Dean of the School of Medicine, he to the President of the University, and the President to the Regents of the University.

Each year, in December, a budget and program for the succeeding year are submitted by the Director of the Radiological Laboratory to the Regents of the University of California through these administrative channels. Copies of this budget and program are also sent to the Manager of the San Francisco Operations Office and to the Director of the Division of Biology and Medicine of the U. S. Atomic Energy Commission. This procedure for sending the intra-university budget and program to the above was established by Dr. Shields Warren. On the basis of this, the University negotiates with the San Francisco Operations Office, U. S. Atomic Energy Commission, for the signing of the annual contracts.

In cooperation with the AEC San Francisco Operations Office, the Radiological Laboratory prepares the Project Proposal and Authorization (AEC Form 189) during the first half of each year. Throughout the year there are frequent contacts between the personnel of the San Francisco Operations Office and the Laboratory in connection with the smooth operation of the Laboratory, and this office has always been very helpful.

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