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U. S. NAVAL RADIOLOGICAL DEFENSE LABORATORY

The Naval Radiological Defense Laboratory is our country's only research organization solely devoted to the study of the radiation and related effects of nuclear energy and to the development of means of preventing or minimizing the hazards of those effects.

While NRDL is primarily concerned with military research, the information gleaned is also applicable to civilian defense problems. Thus, the Laboratory plays a responsible role in the over-all defense planning of the Nation. In addition, it explores methods for the use of nuclear energy for peacetime applications.

NRDL began without benefit of planning. The 1946 Bikini nuclear test explosions known as Operation CROSSROADS resulted in a series of complex problems involving radioactivity, specifically the decontamination of target ships which were brought to the San Francisco Naval Shipyard for this hazardous undertaking. This work was performed by what was then called the "Naval Radiation Laboratory," a part of the Shipyard's Shop Superintendent's organization which was set up under the auspices of the Bureau of Ships. Subsequently, with one problem "touching off" another in a sort of chain reaction, the scope of investigation was broadened to include basic as well as applied research, and the study of radiological hazards for the Bureau of Medicine and Surgery. Sponsors were increased and projects established

by other branches of the armed forces and other government agencies, including AEC, with especially qualified officers assigned by their respective agencies to report on these projects and establish liaison with the Laboratory Director and his scientific staff.

The Commanding Officer of USNRDL, a naval captain, is also in command of the San Francisco Naval Shipyard where the Laboratory is located, although since 1 September 1950, it has operated as a separate activity having the status of a component of the San Francisco Naval Base. Directly responsible to the Commanding Officer for operation of the Laboratory is the Director, also a naval captain. Organizationally, the Laboratory is divided into four departments: Scientific, Medical, Management Engineering and Comptroller, and Administrative.

1. The SCIENTIFIC DEPARTMENT is headed by a civilian Scientific Director, who, with his staff, plans and carries out a scientific program which currently includes such areas as: a) the characteristics of radiation; b) hazards of radioactivity to personnel; c) detection and measurement of radiation; d) development of countermeasures. Three divisions and a staff group comprise the Scientific Department:

2. BIOLOGICAL AND MEDICAL SCIENCES DIVISION is concerned with effects of nuclear and thermal radiations on personnel. This involves diagnosis, prognosis, pathogenesis, and treatment of radiation sickness. Experimental animals are used for the different types of investigations.

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(2) CHEMICAL TECHNOLOGY DIVISION is concerned with the mechanism of creation, transport, deposition and removal of radioactive materials. This involves the determination of the physical, chemical, and radiochemical properties of these substances.

(3) NUCLEONICS DIVISION is concerned with the properties of nuclear, electromagnetic, and thermal radiations, and other phenomena peculiar to nuclear detonations and nuclear chain reactions. This includes design, development and evaluation of radiac instrumentation, basic studies in radiation shielding, and effects of thermal radiation on materials.

(4) In addition to the three divisions, MILITARY EVALUATIONS GROUP operates as part of the Scientific Director's Staff to interpret and adapt scientific information in terms of military requirements.

The results of the Laboratory's scientific work are published as Laboratory reports and technical manuals. When the work is unclassified and hence can be released for open publication, it often is accepted for further publication in scientific journals.

Accompanying the program expansion has been the increase in personnel from half a dozen "pioneers" in 1947 to nearly 600 in 1955. Drawn from almost every field of scientific research, the scientific staff now includes chemists, physicists, health physicists, biologists, engineers, medical doctors, physiologists, psychologists, mathematicians, metallurgists, and laboratory technicians.

2. The MEDICAL DEPARTMENT is in charge of the Laboratory's health program, which is closely related to the Laboratory's use of radioactive

sources and isotopes. Radiological safety is the responsibility of this department's Health Physics Division.

3. The MANAGEMENT ENGINEERING AND CONTROLLER DEPARTMENT prepares and administers the Laboratory budget, and is the management staff arm of the Director's office, planning and recommending management and administrative policies. It plans long range facilities, controls space allotments, and participates in Laboratory Passive Defense and Disaster Control planning.

4. The ADMINISTRATIVE DEPARTMENT sets in a support capacity in logistics and services. Services include:

(1) SECURITY, incorporating all clearance and identification of personnel; physical security of Laboratory property and areas.

(2) COMMUNICATIONS, providing mail, file and messenger service, and control of classified material.

(3) TECHNICAL INFORMATION, including a modern technical library stocked with scientific reports, books and journals; specialists in editing, reproduction, photography, illustrating, and information to aid in report preparation, reproduction and clearance for publication.

(4) ENGINEERING, supplying support in engineering design, in precision instruments and electronics; and through shops which are operated for work in metal, wood, plastic, and glass.

(5) MATERIALS CONTROL, effecting procurement of a wide variety of supplies and materials for scientific research and support groups.

(6) PERSONNEL, aiding in employment, position classification, employee training, various employee benefits, and travel arrangements.

Supporting personnel include administrators, clerical workers, editors, librarians, illustrators, photographers, mechanics, electricians, glass blowers, draftsmen, specialists in equipment, information, communications, training, transportation and laborers.

On 1 March 1955, NRDL began the move from the 20 widely separated Shipyard buildings (to which it had spread in 5 years), to its own \$8,500,000 building #815 located near the South Gate of the Shipyard. This building is a 6-story structure of reinforced concrete, with total floor space of 282,000 square feet, designed without windows for maximum protection from possible atomic detonations, more useable wall space and reduced construction and maintenance costs.

Building 815 has many other modern features including movable inside partitions to provide flexibility; a specially designed ventilation system with separate intake and exhaust on each floor so that air is never recirculated; escalators which expedite inside "traffic" flow; a penthouse cafeteria with an unobstructed view of San Francisco Bay, and surrounding communities. Adjacent to Building 815 is Building 816 which houses the 2-million electron volt Van de Graaff accelerator. The Van de Graaff accelerator is a primary source of radiation equipped for acceleration of both positive and negative particles, and is used for a variety of studies in connection with radiation effects. This building was put into commission in June 1954.

The smooth concrete exterior of the new building scarcely prepares one for the complex equipment inside. Facilities and equipment for research are of the latest design for maximum utility. In addition to the Van de Graaf other radiation sources include several 250 Kev x-ray machines and an eight-curie cobalt source. Several climatic simulating chambers ranging from small 8-foot ones to large walk-in types are among the important facilities. For work with high levels of radioactivity, a change house and hot cell with special shielding and waste disposal facilities are provided. Thermal investigations are conducted with three thermal sources -- a 36-inch reflector; a 60-inch reflector, and a Mitchell type. Other equipment includes: a calorimeter, a high speed bolometer system, a spectrometer, an optical spectrograph, x-ray diffraction unit, mass spectrometer, and electron microscope.

The Animal Colony is provided for study of radiation effects on living organisms. Superior standards are maintained in the air-conditioned rooms which house the experimental animals, numbering some 10,000. They are cared for by professional caretakers under the direction of a veterinarian.

Thus, the problems of atomic defense are being attacked from all angles at NRDL. Although some of the work is still in the pioneering stage, excellent results are being obtained and new data constantly established. With its program of broad scope and ever widening horizons, this Laboratory faces with confidence the future challenge to provide further valuable contributions toward solving the problems arising from nuclear energy and its uses.