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The Naval Ordnance Laboratory

White Oak, Maryland

CORNERSTONE CEREMONIES for the new Naval Ordnance Laboratory took place on 15 August with the Honorable James Forrestal, Secretary of the Navy, and Captain F. S. Withington, Officer-in-Charge, officiating. This project, which was started in 1944, provides some 600,000 square feet of working area and is located on a 938-acre site in the White Oak-Hillandale section of Maryland, about 12 miles from the center of the District of Columbia.

The Naval Ordnance Laboratory is a naval field establishment, operating under the cognizance of the Bureau of Ordnance of the Navy Department. Headed by a naval officer, with a complement of approximately 2,000, most of whom are civilians, it is charged by the Navy with responsibility for research, development, design, and testing of mines, depth charges, fuses, torpedo mechanisms, pyrotechnics, ammunition components, influence devices, and other related items of Naval Ordnance. The projects range from small simple mechanical devices to large complex mechanisms of extreme sensitivity employing advanced electronic designs. Work on these devices proceeds from pure research on the basic principles, through the applied science of design, development, and testing, to the engineering of production and the training of personnel in the use and maintenance of the weapons.

The Laboratory plant at White Oak will comprise about 50 permanent buildings, including a main Administration and Laboratory Building, Auditorium and Cafeteria Building, Magnetic Group, Ammunition Group, Ballistics and Supersonic Aerodynamics Group, the Plastics Laboratory, the Test Laboratory, shop, barracks, warehouse, boiler plant, and other service structures. Most of the buildings will be air-conditioned, and many will be interconnected with pedestrian tunnels. Movable, soundproof steel partitions, placed at 11-foot intervals, will be used in the main buildings. Services, such as 120/208-volt, 3-phase, 4-wire alternating current, 120/240-volt direct current, hot and cold water, compressed air, gas, steam, and acid waste, can be made available in service shafts spaced every 22 feet. Lighting will be fluorescent with an intensity of 35 foot-candles. The equipment accumulated during the war years plus much new equipment, need for which has been demonstrated, will be installed.

Special features in the Test Laboratory consist of a series of controlled temperature chambers, the largest of which is $8 \times 8 \times 40$ feet, with temperatures ranging from $-80°$ F. to $+180°$ F.; a pressure vessel 8 feet in diameter and 38 feet long, handling pressures up to 1,000 pounds per square inch; vibration test equipment; a model tank; and many other varieties of physical test equipment. The Magnetic Group consists of seven buildings of entirely nonmagnetic construction, even to the exclusion of red brick (because of the iron oxide). One building, the Quiet Laboratory, contains no electric lights, water pipes, permanent heating equipment, or other ordinary facilities which might interfere with magnetic studies at low intensities or high frequencies. The Ballistics Laboratory-Wind Tunnel Group consists of a Ballistic Research Laboratory containing laboratories and offices, a Ballistic Range Building containing seven firing ranges, and a Wind Tunnel Building housing the supersonic wind tunnels brought to this country from Kochel, Germany, where prior to their capture they had been used on guided missile and ballistics research. Included in the extensive acoustic laboratories is an anechoic room of unusual size.

Under the Officer-in-Charge, Captain F. S. Withington, and the Technical Director, Captain R. D. Bennett, the Laboratory is organized into seven departments: Research, Engineering, Test, Technical Services, General Services, Personnel, and Supply. Each department in turn is broken down into divisions. Thus, under Research is included the Electricity and Magnetism, Acoustics, Mechanics (aerodynamics, hydrodynamics, external ballistics, terminal ballistics), Explosive Phenomena, Physical Optics, and Ordnance Research Divisions. The Engineering Department is made up of the Ammunition, Mine and Depth Charge, Torpedo, Plastics, and V-T Fuse Divisions. The Test Department includes the Electrical, Mechanical, Ordnance Evaluation, and Field Test Divisions. Under the latter are included field stations at Hiwassee Dam, North Carolina; Fort Monroe, Virginia; Provincetown, Massachusetts; Solomons, Maryland; and Dahlgren, Virginia. Under the Technical Services Department are the Analysis and Publications, Design and Drafting, Industrial Engineering, Library, Technical Museum, Patent, Photographic, Property Control, and Shop Divisions. The General Services Department consists of the Administrative, Communications, Maintenance, Operations, and Plant Engineering Divisions. The Personnel Department is made up of the Employment, Classification, Naval Personnel, Employee Services, Research and Records, and Training Divisions. The last-mentioned division trains naval personnel in ordnance devices, supervises numerous inservice courses, cooperates with universities with graduate courses and theses, and gives training in administration and organization of research laboratories.

One of the duties of the Laboratory will be to maintain continuous and active research and development of new principles and devices. Efforts are being made to incorporate here the best features of industrial and university laboratories in order that the Nation may have the protection of the last word in scientific development.

Fifty Years of Physics—A Study in Contrasts

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IN THE DOMAIN OF PHYSICS there have been two transcendent periods during these past 50 years. The first began in 1895–96 with the discovery of X-rays, followed by the discovery of the Becquerel rays in 1896, the electron in 1897, radium in 1898, and the statement of the quantum theory by Planck in 1900. The second period also began in 1896, but, growing slowly, culminated in 1939. Vast vistas were suddenly opened in 1896. There had been no theory or experiment which had foretold or prepared us for the discovery of X-rays. It came out of the blue. A similar statement may be made concerning radioactivity and the quantum idea. The timeliness of the discovery of X-rays and the electron is shown by the fact that two of the three kinds of rays which came from a complex radioactive source could be explained at once. The nature of the third ray, though quickly postulated by the keen intuition of Rutherford, was not convincingly established until the Rutherford and Royds experiment in 1908, when the process of transmutation of the elements as it occurs in nature was made plain and the way opened for all the vast results which have followed.

My purpose is not to attempt to record the progress of physics in all its great domains during these years but to present here only a few contrasts.

Upon a previous occasion[1] I called attention to the fact that no American physicist participated in any of the great discoveries which have been mentioned. Perhaps that statement should be modified, as will later be indicated.

[1] The second Richtmyer Memorial Address of the American Association of Physics Teachers (*Amer. J. Physics*, 1943, **11**, 23).

Based on an address delivered before the American Physical Society at Cambridge, Massachusetts, 27 April 1946.

In 1899 Arthur Gordon Webster, a distinguished Harvard graduate and one of our most prominent physicists, called together the leading physicists, chiefly of the East, for the purpose of organizing the American Physical Society. Appropriately, Henry Rowland was elected president, and A. A. Michelson, vice-president. In his address as retiring president, Rowland named, without initials or given names, four American physicists—only four—who in all the preceding history of America had won worldwide fame for their contribution to physics: Franklin, Rumford, Henry, and Mayer.

The many-sided Franklin, a legendary figure, had won fame along various lines. Had he not been famous as a publisher and a statesman, he might never have been heard of as a scientist. Balzac described him as "the inventor of the lightning rod, the hoax, and the republic." It has been maintained that there is no clear evidence that he ever performed the kite experiment, and it is certain that the experiment was performed elsewhere before Franklin wrote of it as a possibility. In any event, Franklin's work in science did not lack for publicity.

Rumford left America as a very young man. He was always a British subject and did all his scientific work in Europe. He could hardly be called an American scientist. He was, however, interested in the development of science in America as is evidenced by the Rumford Medal of the American Academy of Arts and Sciences, the Rumford Fund of that Academy, and the Rumford Professorship at Harvard.

Joseph Henry's work in electromagnetic induction