Science on the Normandy Beaches: J.D. Bernal and the Prediction of Soil Trafficability for Operation Overlord

Murray Lark

The Allied landings on the Normandy beaches, centered at Arromanches-les-Bains (Fig. 1), have passed into the public memory as a heroic turning point in the Second World War. More than sixty years later it is not so widely recognized that the idea of such a large-scale attack—a major, opposed, landing of troops and equipment on an open coast—was all but unprecedented. In fact the closest precedent, the disastrous attack on Turkey in the Dardanelles campaign by Allied forces in 1915 during World War I, was a deeply ominous one.

Louis Mountbatten was the Chief of Combined Operations—a department of the British War Office with wide responsibilities including the preparation for a large-scale landing on the continent of Europe. He observed that the attack would be an "opposed landing on a scale unknown anywhere before" and quickly came to the conclusion that, "I must have among [my staff] the best available non-service men, preferably scientists.... they would have minds open to work on entirely new problems" (Goldsmith, 1980).

Combined Operations' scientific staff members were involved in various projects, including the development of the mulberry harbors, temporary structures that would allow the continued offloading from ships in the coastal waters in the event of storms in the English Channel. They were also involved in Operation Habbakuk, the (ultimately abandoned) plan to build floating iceberg airfields, using a novel (and very strong) material called pykrete (ice with reinforcement such as sawdust or paper pulp). However, less attention has been paid to their crucial work on predicting the trafficability for military vehicles of the beaches and ground immediately inland of the beaches, a problem which, as we shall see, was to connect creatively with our own discipline of soil science.

One of Mountbatten's scientists in the so-called "Department of Wild Talents" (Goldsmith, 1980) was the Irish-born crystallographer John Desmond Bernal (1901–1971). Bernal was a pioneer in the application of X-ray diffraction methods to large, mainly biological, molecules. As such he was a direct contributor to some of the most important advances in 20th century biochemistry through his influence on, guidance of, and direct assistance to workers such as Rosalind Franklin, Aaron Klug, Dorothy Hodgkin, and Max Perutz. Bernal was unquestionably a genius, and a polymath whose field of knowledge was comprehensive, hence the nickname "Sage" that he acquired in his student days. Bernal was also a Marxist, one of the many scientists who, in the 1930s, were captivated by what they saw as the effort to build a new society in the Soviet Union and to harness science to the development of that society. But war makes strange bedfellows, and the aristocratic Mountbatten (great-uncle to the current Prince of Wales) developed a firm respect for Bernal's capacities, and for the generosity of spirit from which many students and post-doctoral assistants were to benefit. 