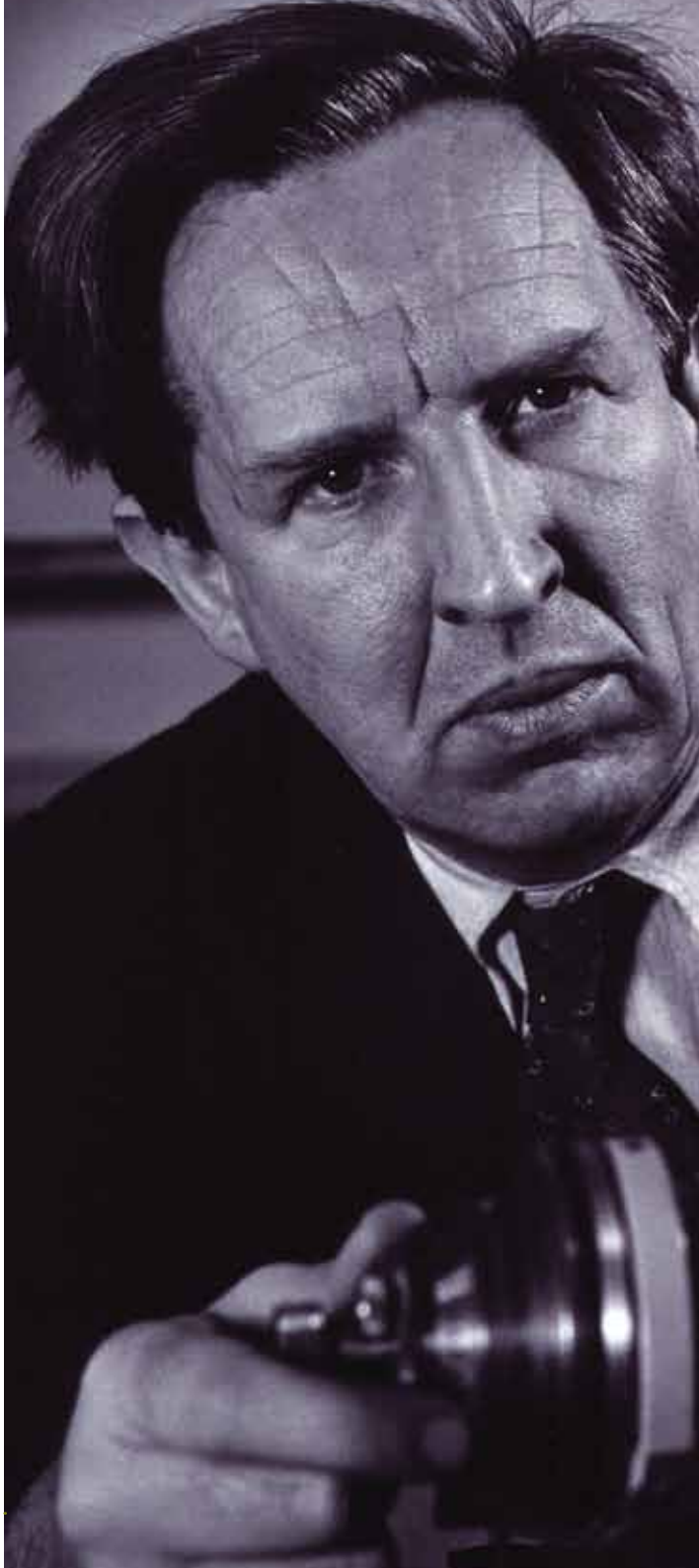
- John Desmond Bernal -

The Bernal Project is named after John Desmond Bernal - one of Ireland's most influential 20th century scientists. Professor Bernal had a reputation as a selfless supporter of and mentor to young scientists. His peers affectionately referred to him as Sage.

His education began at the local school before transferring to Hodder School and then Sandhurst College in England, where he worked his way through the school library each Sunday after Mass. He was accepted into Emmanuel College, Cambridge in 1919 for an undergraduate degree in Natural Science where he developed a strong interest in the emerging science of X-ray crystallography. Only in 1913 did the father and son pair W.H. Bragg and W.L. Bragg demonstrate that the diffraction of X-rays from a crystal could be used to determine the inner chemical structure of the material and in 1923 Bernal joined the elder Bragg in his group at the Royal Institution (RI). There he worked on a range of topics within the burgeoning field including both technical and theoretical developments.

Bernal left the RI in 1927 to become the first lecturer in structural crystallography at Cambridge and remained there until 1937 when he obtained a chair in Physics at Birkbeck College, University of London and was the head of the newly established department of crystallography. His research moved from the technical development to the applications of crystallographic methods to new fields of science especially biologically important materials. Initially, he and his collaborator William Astbury at the University of Leeds, with whom he'd worked at the RI, separated the field of biochemistry between them, with Bernal studying the smaller crystalline components such as amino acids and steroids, while Astbury focused on fibrous materials and proteins. However, as time passed the scope of his group expanded and ground-breaking work on the structure of viruses and proteins led to the foundation of protein crystallography. This development fundamentally changed the focus of biochemical research and the understanding of biological activity as it allowed for the 3-D chemical structure of the component species to be examined as often as the processes occurred.



Bernal specialised in the identification of new fields to explore but rarely stayed long enough to fully develope the area, which he left to trusted colleagues. Indeed, two of his former students (Dorothy Hodgkin and Max Pertuz) were awarded Nobel prizes for pioneering work in protein crystallography for the first structural determination of vitamin B12 and haemoglobin, respectively.

Bernal also pioneered investigations into the structure of liquid water by diffraction methods. Work on water stretched over Bernal's career. In 1933 he proposed the structure of H_2O as a bent molecule with a O-H bond length of 0.96 Å (current value is 0.958 Å) and the presence of hydrogen bonding between the molecules to construct regions of microcrystalline water resembling that of ice with disordered regions connecting these pockets.

During the Second World War, Bernal worked on operational research, contributing to the planning of the D-day landings and he was awarded the U.S. Medal of Freedom in 1945. Subsequently, he became interested in the rebuilding of Britain and initiated research into the structure and properties of metal hydroxides and the silicate components of cements. As often was the case, the final determinations and discoveries were carried out by other groups but the emphasis of importance of these problems was driven by Bernal.

J. D. Bernal was driven by a belief that science and technology would improve the living standards of humanity if properly focused and was a frequent campaigner for peace and demilitarisation in the years after the Second World War. He suffered a series of cerebral haemorrhages from 1963 until his death in 1971. His legacy was the development of crystallography as a central tool across the sciences.

References

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