Maurice Pryce 1913-2003

Maurice Pryce came to UBC late in his career after holding positions at Cambridge, Oxford, Liverpool, Bristol, and the University of Southern California. He completed his PhD on the wave mechanics of the photon and during WWII worked on advancing radar technology and the development of nuclear reactors. Later he had many research interests including fundamental particle physics with implications for such issues as quantum entanglement.

Early Life

Maurice Pryce was born in Croydon, England, in 1913 and grew up in Guildford. He attended the Edward VI Royal Grammar School where he showed promise in mathematics from an early age.

Cambridge & Princeton

In 1930 Pryce enrolled at Trinity College, Cambridge and graduated in Mathematics in 1933. After graduating Pryce continued with graduate work at the university, studying under Max Born (whose daughter he later married). As a graduate student Pryce was part of what Fred Hoyle called the "fearsome front row" of the theoretical physics colloquia - he, along with R. H. Fowler (Rutherford's son-on-law), C.G. Darwin (Charles' grandson) and Paul Dirac would regularly eviscerate speakers. A notable victim was Arthur Eddington, who was speaking on the Chandrasekhar limit issue.

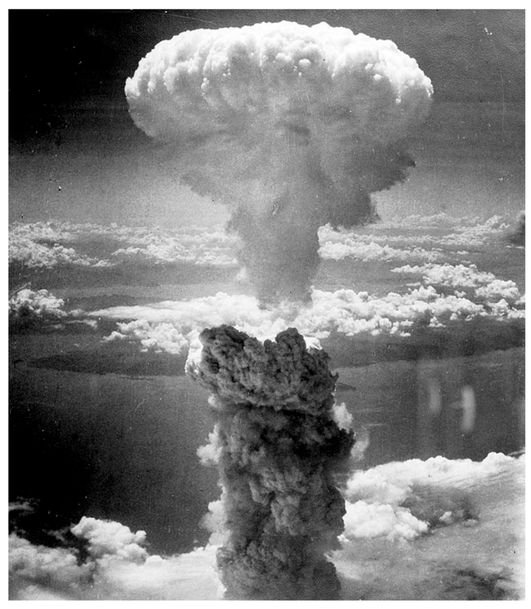
After two years of graduate work at Cambridge, Pryce (together with Alan Turing) was awarded a Commonwealth Fund Fellowship to go to Princeton in 1935. He worked under Wolfgang Pauli and John von Neumann and completed his dissertation on the wave mechanics of the photon. In 1937 he returned to Cambridge as a Fellow of Trinity College and a Faculty Lecturer in mathematics. Here he was persuaded by Paul Dirac to publish his work that rubbished the then-popular two-neutrino theory of the photon, which held that light quanta were made of pairs of neutrinos.

Maurice Pryce, at UBC 1967
(UBC Archives)

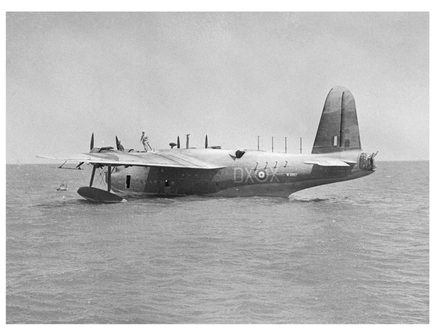
Liverpool & WWII

In 1939 he accepted a lectureship in theoretical physics at Liverpool University. Here he studied the feasibility and internal mechanics of the fission bomb, but was horrified by his findings and decided to end his involvement in research that might lead to the construction of such a bomb. In 1941 he joined the Admiralty Signal Establishment in Portsmouth and Sussex where he calculated the diffraction of radio waves around the curvature of the Earth, the results of which are crucial to long-range navigation. He went on to assist in the design of microwave components essential to developing centimetric radar.

In 1944 Pryce joined the British/Canadian atomic energy team (including UBC physicist George Volkoff) designing nuclear reactors in Montreal. It was here that he calculated for Bruno Pontecorvo the flux of solar neutrinos at the Earth's surface, showing that a measurement was conceivable. Pryce then moved back to the UK Atomic Energy Research Establishment at Harwell and worked alongside E.A.Guggenheim to build the first British reactor there.



Maurice imagined how the explosion would unfold, mushroom cloud and all - much like the one shown here for the explosion in Nagasaki, Japan - and decided to walk away. Photo from U.S. National Archives and Records Administration, public domain.



Centimetric, or microwave-band, radar was key to the Allied victory in the Battle of the Atlantic. It allowed small, powerful radar with high definition to be installed in aircraft, meaning that things as smallas a Periscope could be Identi-fied even in rough water. Left: a Royal Air Force Sunderland with ASV radar antennae on its back. Photo by Cecil Beaton, public domain.

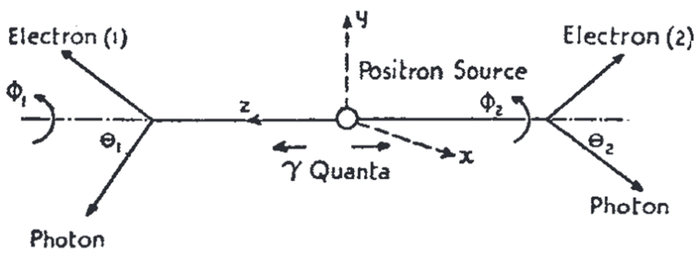
As head of theoretical physics at Harwell, Pryce replaced convicted and imprisoned spy Klaus Fuchs. Left: police photograph of Klaus Fuchs (war time ID badge photo from the Los Alamos National Laboratory, public domain).

Oxford

In 1946 Pryce was elected to the Wykeham Professorship of Physics at Oxford and was awarded a Fellowship at New College. Here he supervised many graduate students including Anatole Abragam and John Clive Ward (who later discovered, independently, what is known as the Teller-Ulam mechanism of the hydrogen bomb).

His main area of study was magnetic properties of ions, specifically hyperfine structures. He also made important contributions to the development of the shell model of atomic nuclei. In 1947 he published with Ward a seminal paper (a mere half-page long, in Nature) on the polarization of photons emitted when an electron and positron mutually annihilate.

The cross section given by the formula below was soon shown to be correct in an experiment by C. S. Wu. The implication that the two photons have correlated polarizations no matter how far apart they are had profound implications for such ideas as quantum entanglement.



$$\tfrac{1}{16} r^4{}_0 \, d\Omega_1 d\Omega \left[\frac{\{(1-\cos\theta_1)^3+2\}\{(1-\cos\theta_2)^3+2\}}{(2-\cos\theta_1)^3\,(2-\cos\theta_2)^3} - \frac{\sin^2\theta_1\,\sin^2\theta_2}{(2-\cos\theta_1)^2\,(2-\cos\theta_2)^2}\cos 2(\varphi_1-\varphi_2) \right]$$

Move to UBC

After spending some time at the Universities of Bristol and Southern California, Pryce was persuaded by George Volkoff in 1968 to move to UBC to take up a full professorship. He was involved in many different fields of research; he was especially interested in finding a theoretical explanation for the observed spectrum of the OH radical (which remains a problem).

After retiring from UBC in 1978 he sat on the Technical Advisory Committee of Atomic Energy of Canada, Ltd., which was concerned with nuclear waste management.

Maurice Pryce, later in life
(UBC Archives)

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