Robert Hofstadter 1915-1990

Electron scattering pioneer Robert Hofstadter died on 17 November, aged 75.

His promising career was interrupted by World War II, when he worked for the US National Bureau of Standards and helped develop proximity fuses for anti-aircraft shells. After the war, he recommended research work at Princeton, where he discovered the potential of sodium iodide as a scintillator and went on to exploit its use in detectors.

In 1950 he moved to Stanford, where W.W. Hansen and his talented team were developing their famous series of linear machines to accelerate electron beams. Mark III was delivering 180 MeV electrons by 1951, while Hofstadter had initiated a comprehensive programme of research to exploit the new beams, scattering electrons off nuclei.

From 1953, these experiments displayed clearly the now well known spectra indicative of nuclear structure. With the linac energy boosted to 600 MeV, he moved his attention to smaller nuclei and the proton itself. For the first time, it became clear that the proton and the neutron are not point particles, but their electric and magnetic properties are smeared out, and could be described by ‘form factors’.

In addition to paving the way for subsequent higher energy studies which went deeper inside the proton and revealed its constituents, these experiments hinted at other new behaviour, heavy mesons such as the omega and rho particles. For this epic work on nuclear and nucleon structure Hofstadter shared the 1961 Nobel Prize with Rudolf Mössbauer.

These new insights made Stanford a mecca for young experimenters, among them the talented trio of Jerome Friedman, Henry Kendall and Richard Taylor who went on to demonstrate that the proton had a substructure, a feat which earned them the 1990 Nobel Physics Prize.

With electrons proving such efficient probes, Hofstadter pushed for the construction of the largest possible such machine. Under the guidance of first Edward Ginzton and then W.K.H. Panofsky, this project evolved into the mighty Stanford Linear Accelerator Center, a national US Laboratory which outgrew its university origins.

In later years Hofstadter made valuable contributions to angiography, using radioactive tracers to monitor heart functions.