

A Personal Journey in Physics

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I have been asked to give a brief outline of my career in physics, mainly, I believe, to emphasize to the younger generation the unpredictability of one's trip through such a career and to encourage them to seize new opportunities that may arise, particularly in new fields of research.

My trip really started in 1958 with my Honours Physics year at Adelaide University. I was fortunate that my project supervisor was a young Lecturer called Bob Crompton, who encouraged me to go to ANU for my PhD since I wanted to do it in nuclear physics. My thesis research program was progressing very well when precisely at mid-term a major fire overnight destroyed my equipment and the control room of the accelerator I was using. So I was forced to change tack but still managed to submit the thesis and have an appropriate end of scholarship party after three years. After a brief stint as an AINSE Research Fellow in 1962, John Carver, the Elder Professor of Experimental Physics at Adelaide University, offered me a lectureship, which I accepted. I realized that I would have to change tack and move from nuclear physics. I decided that atomic collision physics had much to gain from the techniques developed in nuclear physics, and so established a program in electron collisions with atoms, in particular with atomic hydrogen, which was of fundamental interest as well as having relevance to other fields. I was fortunate to find a keen young student, Peter Teubner, to help take on this challenge.

During my time as a PhD student I was intrigued by the first nuclear momentum spectroscopy measurements in 1959 [1] and 1960 [2]. These (p,2p) experiments were analyzed by Ian McCarthy and co-workers using the DWBA. So I was very fortunate to find Ian at Adelaide University in the Mathematical Physics Department, and in 1962 Ian and I discussed the possibility of (e,2e) experiments that resolved valence states of atoms and molecules and determined that we be involved in the field if possible. Events intervened but this possibility eventuated in 1970 when I joined Ian at Flinders

University. Ian left Adelaide in July 1963 to lead the nuclear theory program at the University of California, Davis, and I followed him to the USA in 1964 after being offered a position by Lloyd Wood, the Director of Physics at AFOSR. This offer was made over some whiskey drinks in his Adelaide motel room. I accepted it and joined their Nuclear Physics Division, which I later headed. I had planned to stay for only one year, but instead stayed for nearly seven years. It was a fascinating period at AFOSR.

In 1969 I was offered the position of Deputy Director of the Enrico Fermi Institute at the University of Chicago. This was very tempting, but my wife insisted that we bring up the children in the safe environment of Australia. I had kept in close touch with Ian and he was keen for me to join him at Flinders, which I did. I immediately started construction of an apparatus designed for state-resolved EMS measurements on atoms. The first evidence of the experimental feasibility of EMS was given in 1969 by the coincidence measurements of Amaldi et al, [3] and the low energy measurements of Ehrhardt et al [4]. The first EMS measurement was published by Camilloni et al. [5] in 1972. They observed the 1s orbital of solid carbon in a 9 keV experiment with 90 eV energy resolution.

The first experiment in valence EMS was published by us in 1973 [6]. It verified the concept of orbital manifolds for the 3p and 3s valence orbitals of argon. This experiment also showed that more states are observed than the simple 3p and 3s one-hole states. In the same year we published the first valence EMS study of molecules, namely methane [7] and hydrogen [8]. Thus started the EMS study of atoms, molecules and later condensed matter. Some of the significant results will be discussed.

References

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