

## Biophysics to bedside — the transition

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Many years ago I trained as a chemist (chemistry, physics, math). For my Master's degree I worked on the photoconductivity of organic crystals. My PhD at Cambridge was in theoretical chemistry. Why do I find myself in businesses related to medical devices and early detection of disease? It is a bit of a story.

My first post-doc, at Stanford University, was supposed to be in the theory of organic crystals. My host, Harden McConnell, said "Fine, since you have your own fellowship, but my interest is in proteins". Rapid study of excellent textbooks led me to the realization that proteins and membranes are not mystical, just very complicated chemistry. Into it all I dove. My second postdoc at the Bell Labs in New Jersey was on a possible molecular structure of tRNA, which led to a paper in PNAS. This appeared to be a fascinating opportunity for chemists!!

The National Research Council of Canada (NRC) recruited me to Ottawa, ostensibly to build a complex magnetic resonance instrument, with which I was pretty familiar. Before I arrived I wrote to the then President of NRC, Bill Schneider, "biology is a fertile field for chemical/physical minds, and I would like to explore it". Fortunately he agreed and I became a Research Officer of the NRC, with a mandate to discover new areas of research.

Our early studies were on structure/function relations in biological membranes, leading to interest in whole cells. These led to studies of animals and human subjects. Magnetic resonance imaging and spectroscopy were emerging

rapidly and we helped to develop them further. To do so, we needed to interact with medical doctors and learn what medical areas were needing clarification in molecular terms. We began in Ottawa and the results on cancer detection looked promising. On a lecture tour of Australia I met Dr. C. Mountford, who was actively studying cancer cells from human subjects using MR spectroscopy. This led me to realize that we could have a significant influence on the detection of cancer in humans, and that a heavy involvement of information technology was necessary to ensure the reliability of any conclusions we reached. A successful collaboration ensued.

Early successes led to more government grants, and I came to appreciate that the quality of the diagnoses could lead to the formation of companies to use the technology and give significant returns to the granting agencies. We started companies. Some of our scientists chose to work with the companies, and they succeeded well. Instruments were developed that led to improved and early diagnosis of human disease. The companies developed market values of millions of dollars with employees numbering in the many hundreds. Everybody won!!

Since then I have specialized in mentoring university-based scientists and small spin-off companies in order to help speed their paths to commercialization. It is opening opportunities which graduates had never imagined, brought rewards to the investing agencies, and made medical diagnosis earlier and more accurate. Now in my 70s, I am delighted to be still operating in this area, and enjoying every minute.

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