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A Perspective on Biophysical Chemistry

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Physical chemists tend to have a flair for mathematics, or at least they experience a feeling of satisfaction when they're able to describe their results in a mathematical form. Confronted with the complexity of biological systems, though, many physical chemists would run a hundred miles. Those who are either brave enough or foolish enough to tackle biological systems head-on are the biophysical chemists. The rewards in doing so can, however, be substantial. One of the founders of ion pump research, Robert L. Post[1,2] (after whom the enzymatic cycle of the Na^+,K^+-ATPase is named), once said to the author at an ion pump meeting that the best scientific problems to tackle were ones which no-one else would touch with a 10 foot barge pole but in hindsight everyone wished they had.

The number of physical chemists involved in biological research is relatively few in comparison to other areas of chemistry. The situation does vary, however, from one country to another. The potential of physical chemistry to solve biological questions seems to have been recognised relatively early in the German-speaking world. This is most likely due to a small number of key scientists who influenced the research directions of a large number of followers. One was Manfred Eigen,[3] Nobel prizewinner for Chemistry in 1967 for his work on rapid reaction kinetics, who co-founded the Max-Planck-Institute of Biophysical Chemistry in Göttingen in 1971. Another was Horst Witt,[4] who established the Max-Volmer-Institute for Biophysical Chemistry of the Technical University Berlin as a world-leading centre for biophysical studies of photosynthesis. Other leading biophysical chemistry departments in the German-speaking world include the Department of Biophysical Chemistry headed by Ernst Bamberg at the Max-Planck-Institute of Biophysics in Frankfurt/Main and the Department of Biophysical Chemistry of the University of Basel's Biozentrum (founded 1971) in Switzerland, headed until a few years ago by Gerhard Schwarz,[5] Eigen's first PhD student.

In comparison, Australia, partly because it has inherited the English collegial university structure rather than the German concentration of research groups around god-like professors, has not a single institute or department for biophysical chemistry. This doesn't mean that Australia has no tradition in biophysical chemistry. In fact a very strong research emphasis in biophysical chemistry was evident in the 1950s–80s at the University of Adelaide under the leadership of Denis Oswald Jordan,[6] foundation professor of physical chemistry at the university's Department of Physical and Inorganic Chemistry (since merged with Organic Chemistry and even more recently with Physics). Doj, as he was universally known, came to Adelaide in 1954 from the University of Nottingham, where together with his former professor, Gulland, he had pioneered the physical chemistry of nucleic acids. In fact it was careful pH titrations of DNA that led Doj in 1947 to suggest that hydrogen bonding exists between the nucleotide bases. This work had a major influence on the thinking of Watson and Crick when they postulated the double helical structure a few years later.[7] Once at the University of Adelaide, Jordan provided strong leadership and developed his department into one of the leading physical chemistry departments in the country at that time. He continued his work on nucleic acids and polyelectrolytes together with several gifted PhD students (John Coates, Tom Kurucsev, Ted Treloar, Laurie Nicol, and Don Winzor) who later went on to faculty positions working in the field of biophysical chemistry at Adelaide, Melbourne, Australian National University, and Queensland Universities. Jordan also had a major influence on the national chemical community. He was a strong supporter of the Royal Australian Chemical Institute (RACI) and was instrumental in the establishment of the RACI's Polymer Division, whose award for outstanding work in polymer chemistry is named in his honour.

Due to the historical connection of biophysical chemistry with the University of Adelaide it was fitting that the first Australian Biophysical Chemistry Workshop (6–10 April, 2010) should be held there. Because Australia has no institutes or departments devoted to biophysical chemistry, biophysical chemists in this country must work in relative isolation. Therefore, the aim of the biophysical chemistry workshop was to provide a venue for biophysical chemists to meet, establish collaborations and learn about modern research techniques in

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their field. The papers presented in this special issue of the *Australian Journal of Chemistry* provide an overview of some of the work presented at the workshop. It is hoped that this issue will demonstrate that the physical chemical approach has great potential for delivering fundamental information necessary for a deep understanding of biological systems and encourage further physical chemists to tackle the fascinating complexity of biology.

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