



Obituary Note

Personal Recollections of John O'Mara Bockris

Michael C.H. McKubre*

Energy Research Center, SRI International, CA, USA

Abstract

Nobody contributed more to the development of physical electrochemistry than John Bockris. He did this directly through his thinking, research and teaching, and indirectly through his numerous publications and by taking responsibility for the training of the next generations of electrochemists in Europe, North America (twice) and Australia / New Zealand. My career might have been impossible, and would certainly have been greatly different, were it not for the direct and indirect contributions that John Bockris made to my life and learning. For this I am eternally grateful. Some details are described.

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I first heard of John O'Mara Bockris in the Chemistry Department of Victoria University, Wellington, New Zealand, when I was finishing my bachelors degree. John Bockris' influence on the sub-discipline of physical electrochemistry was perhaps unequaled anywhere in the world – slightly less in the US – but the Bockris school of electrochemistry had a particularly strong influence in New Zealand. By the time I first met John in my masters year he was a living legend through his papers, books, and the stories told of him. He did not disappoint. Unlike the painfully uninteresting man in television advertising, John Bockris *was* the most interesting man in the world.

It is not possible to document fully the contributions that John Bockris made to the fields of electrochemistry, energy and science. He was the father of Physical Electrochemistry in which an attempt is made to understand the basic mechanistic processes that occur at a charged metal-electrolyte interface from a physical (rather than empirical) perspective. Such processes include all batteries and fuel cells, electrolysis, electro-synthesis, and corrosion, as well as many sensor and display applications. Our modern understanding of these phenomena owes more to John Bockris than to any other individual. Two other people might be mentioned in this context: Michael Faraday, the father of electrochemistry; and Alexander Frumkin who preceded slightly and pre-deceased John Bockris by many years. Frumkin fathered an exceedingly strong school of electrochemists in the then Soviet world. John was also a strong proponent of “the Hydrogen Economy” many decades before it was fashionable, and, in his later years, laid claim to the “first observation of a nuclear product in cold fusion experiments”. In his case this product was tritium and that

*E-mail: michael.mckubre@sri.com

honor perhaps should be shared with Ed Storms and Carol Talcott, and with the BARC group headed by Srinivasan and Iyengar. But such was the stature of John Bockris that few would gainsay his claim.

Shortly after Martin Fleischmann died some of his friends put together a volume commemorating his contributions [1]. There were 19 chapters in all and could have been twice that length; each chapter was dedicated to a different aspect of Martin's creative output. Mel Miles and I contributed a chapter on Martin's last project, cold fusion. To my knowledge no such project has been contemplated or attempted for John Bockris, for two reasons I suspect. The great people that John Bockris created had largely pre-deceased him or long retired from influence. But the second reason is practical. Any comprehensive similar effort for John Bockris would extend to many hundreds of chapters that to some extent had already been accomplished in his lifetime. John was the driving force behind two highly influential series of books: *Modern Aspects in Electrochemistry*, edited initially with Brain Conway [2]; and *A Comprehensive Treatise* edited initially with Brain Conway and Earnest Yeager [3]. John is also survived and immortalized by the classic textbook of electrochemistry known affectionately and eponymously by the name of the authors: "Bockris and Reddy" [4]. First published in 1970 just at the time I was starting out, the textbook is taught today and is still relevant and insightful.

Rather than attempt the impossible I will confine myself to what I know, the effect that John Bockris had on me directly and indirectly in my formative years. The all-pervasive influence of John Bockris in electrochemistry in the English-speaking world had to be experienced to be appreciated. In the *Infinite Energy Obituary for John* [5] I stated that no man except my Father had more influence on me than John Bockris. I started writing this in Wellington, New Zealand, where I first met John Bockris, and first learned of his death some 42 years later. This influence, always positive, sometimes uniquely, occurred in several forms that I will attempt to remember and recount. I returned to NZ with my family after 4 years in the US, to Wellington where I was to continue my studies of physics and chemistry at Victoria University. Unlike the US, electrochemistry is taught in New Zealand at undergraduate level. With an inclination for the physical side of chemistry (and compensating disinclination for the organic side of chemistry) I naturally gravitated to electrochemistry. The first teaching texts I read on the subject and first research papers were written or co-written by John Bockris. This was not a coincidence although I did not appreciate that at the time. But my thinking about electrochemistry and the framing of the issues were conditioned by John Bockris and his immediate students from the time I first knew that electrochemistry and electrochemists existed.

At that point, 1969–1970, Victoria University of Wellington (affectionately known as "Vic") was undergoing something of a renaissance in physical and electrochemistry. The Professor of Physical Chemistry, my first John Bockris proxy, was John Tomlinson, one of Bockris' first group of Ph.D. students. John Tomlinson can be seen second from the left in the back row in Fig. 1, taken at Imperial College some time in 1947 or 1948. A few years earlier, in the middle of World War II, John Bockris had founded and built what was to become arguably the most influential and advanced school of electrochemistry the world has ever seen. It is said that "you are known by the company you keep". Professors are known by their writings and the students they produce. Few ever have matched John Bockris in either category. According to Wikipedia [6] Bockris authored and/or co-authored more than 712 papers and more than 24 books. About 250 people collaborated with Bockris between 1945 and 1997. Eighty-five students obtained a Ph.D. degree with his supervision. Many of these people are exceedingly eminent in their own right. Also seen in Fig. 1 are Roger Parsons, Brian Conway and Martin Fleischmann. Every one of these individuals was pivotal in creating the field of electrochemistry that we recognize today, and every one of them owes that stature to the teaching, training, mentoring and support provided by John Bockris.

Bockris was contacted when Victoria University of Wellington was looking for a Department Chair and Professor in Physical Chemistry. Bockris recommended John Tomlinson. He thought that Tomlinson would be a good fit for what was a prestigious appointment at one of New Zealand's top Universities, but still nevertheless somewhat of a scientific backwater. As with all (or most) Bockris' products, Tomlinson was brilliant. He displayed, however, a "cold British reserve" that many "Kiwis" found discomfiting and he was not aggressively ambitious. As a result Tomlinson

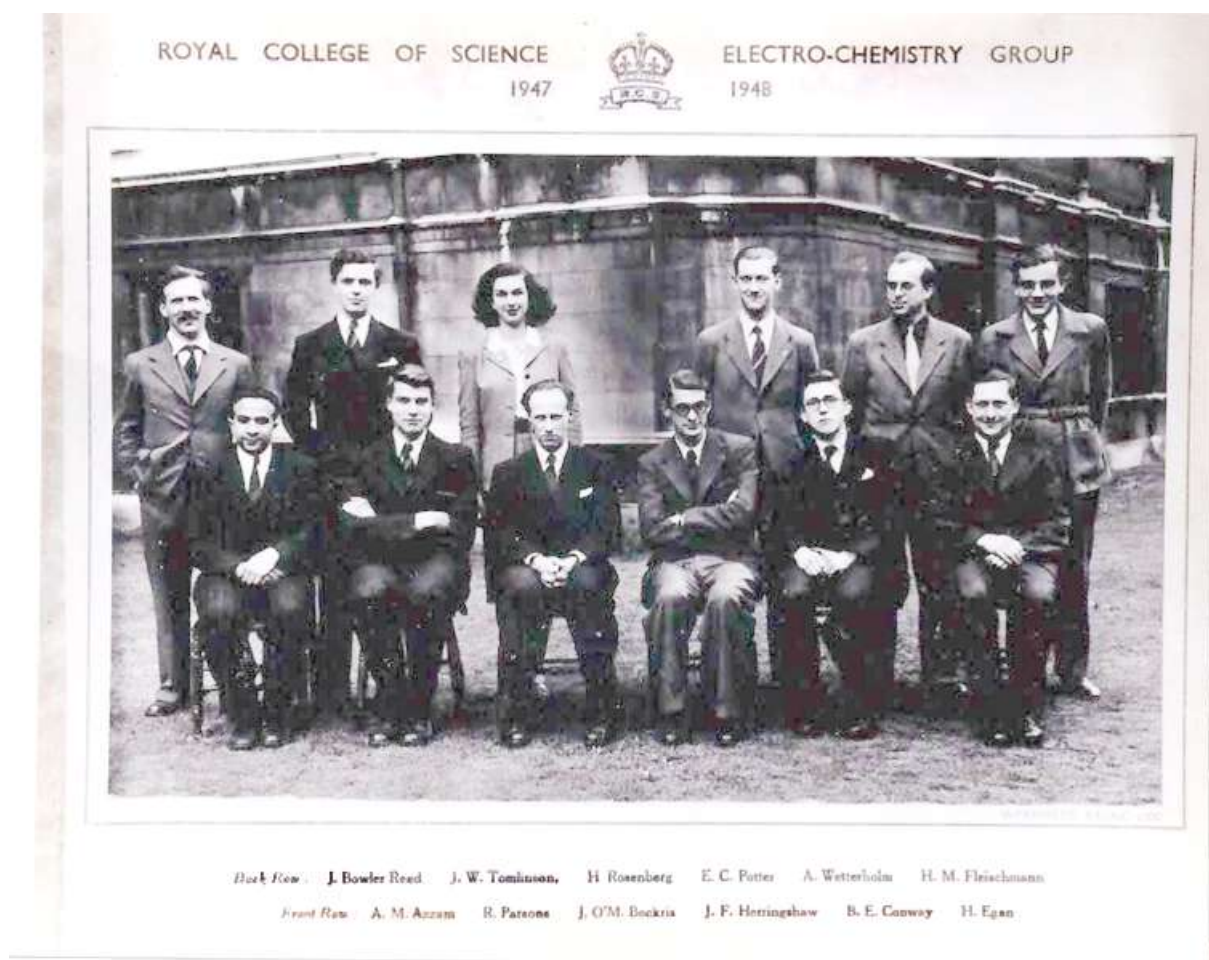


Figure 1. Bockris' Electrochemistry Group at Imperial College, 1947-1948.

had very few graduate students, and graduated only thirteen doctoral candidates in his sphere of influence over his 24 years at Victoria University [7]. In one of the first of many well-timed Bockris-inspired “coincidences” I applied to John Bockris’ hand picked man, John Tomlinson, to supervise my Masters and then Ph.D. degrees. It was just at that time that Bockris uprooted himself from the University of Pennsylvania where he had been for nearly two decades supervising one of the largest Electrochemistry groups in the world (see Fig. 2) that produced a significant fraction of the world’s more eminent electrochemists.

Bockris’ transition took place in 1971 with his chosen destination Flinders University in Adelaide, South Australia (see Fig. 3). Although 2000 miles (3200 km) of rough sea apart, Flinders is the closest major overseas university to Victoria. The strong personal bond between John Bockris and John Tomlinson meant that their two electrochemistry groups had strong overlap. Bockris visited often and, as Tomlinson’s Ph.D. student I dined occasionally with “John & John”, where my two seniors, almost like brothers, would regale their juniors with stories from “the dawn of science”, great men they knew and corresponded with, wine (of which both men were extremely knowledgeable and fond) and



Figure 2. Bockris' Electrochemistry Group at the University of Pennsylvania, 1953.

more mundane topics. Both men had exceedingly acute personal perception and finely honed senses of humor in the “British style”. Interestingly, although Bockris was born in South Africa and Fleischmann in what is now the Czech Republic, both men were exceedingly British in their manner and outlook. When he was in town Bockris attended chemistry department functions (traditionally “wine & cheese” parties with staff and students combined). I may be the only man in the field who has observed the great man, John Bockris, participate (enthusiastically) in a food fight.

In those days Bockris would give lectures, often *impromptu*, to the chemistry department at Vic. As I noted in my comments for Infinite Energy on the passing of John Bockris [5] “*On one occasion Professor Bockris gave the most impressive display of intellectuality I have ever witnessed. Conducting a lecture on no set topic to the mixed Chemistry Department, answering questions on any subject, he fielded perhaps a dozen questions in an hour or more, dealing with each thoroughly using direct quotations and complete citations written out on the blackboard — all from memory. I was exceedingly impressed and somewhat awed as I was about to go to Southampton for my postdoc (studying with another J. O’M. protégé — now Sir Graham Hills). I wondered — if they are all that good, how will I survive? They were not. There was only one John.*”

My trajectory to Southampton, and thus Martin Fleischmann, was also indirectly Bockris’ doing. When John left Imperial College London to try his hand in the new world colony of Pennsylvania he left behind his hand picked friend and colleague Graham Hills (later knighted to Sir Graham Hills) to look after his group and department at Imperial. Three years younger than John, Hills and Bockris were also extremely good friends. Graham deeply respected Bockris’ technical knowledge and people judgment. Hills maintained the stewardship of Bockris’ department at Imperial from 1953 to 1962 in which year he was appointed to Professor of Physical Chemistry at Southampton University on the



Figure 3. Bockris' third research group at Flinders University, 1975.

south coast of England (although I do not know this, almost certainly John Bockris' had assisted this appointment). With an industry of purpose and people management skill that I have never witnessed in another individual Hills set out to establish what turned out to be the next pre-eminent school of electrochemistry in the English speaking world. To do this Graham needed a leader. On the recommendation of John Bockris, Graham Hills selected Martin Fleischmann.

The reason to desire postdoctoral access to Southampton was the presence there of two giants and the institutional credibility established by them: Graham Hills and Martin Fleischmann; both intimately connected to John Bockris. But my opportunity at Southampton was forged at heavy price by others. Graham Hills' first wife Brenda died in 1974. To enable Graham to attend his wife during a long illness and be with their children afterwards, John Tomlinson spent most of a year in Southampton, operating in Graham's stead, in the department and the university. It was this created bond of respect and friendship that allowed Tomlinson to propose my name to Graham Hills when his fledgling student was looking for a postdoc at a "good school" in the "motherland".

When my wife Carolyn and I arrived in Southampton on Christmas Day in 1976 Graham was waiting for us on the railway platform from London. Without having exhibited any reason to deserve it, this bond of respect and friendship was transferred without demand or condition to my wife and I, allowing me to establish myself in the chemistry department at Southampton, and hence to know Martin. Without having come to know personally, and respect intellectually Martin Fleischmann in those years (and Stan Pons, also), I doubt I would have taken seriously

the claims of March 1989 or taken serious effort to check out Fleischmann and Pons' proposition of nuclear effects in PdD. With such twists of fate careers are created and consumed. I would like to take this opportunity, sadly in all cases posthumously, of thanking the four giants of this tale without all of whom I would not be writing this story today: John O'Mara Bockris; John Tomlinson; Sir Graham Hills; Martin Fleischmann. All were extraordinary men in their own right. But none of these would have had the careers they had, nor made the contributions that they have made, without the first and greatest, John Bockris. And neither would I.

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