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Jim Morrison—Mass Spectrometrist for All Seasons

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James D. Morrison is a true pioneer in the mass spectrometry of molecules, with seminal contributions ranging from the fundamentals of gas-phase ionization to many unusual applications such as the basis of odors of honey, trees and wet rocks. I personally appreciate Jim Morrison for all the scientific ideas and insights he has shared in innumerable discussions over many decades, and because he (and John Beynon) consider me as 'younger' in the field. Emphasizing his unusual ability to communicate and to make friends worldwide, his outstanding scientific reputation in Europe and North America was achieved while residing 'down under' in Australia. Although his equally great skill as a teacher makes him eminently deserving to be called Professor Morrison, here I will refer to him as Jim, as he is known to so many in the scientific world.

At the University of Glasgow, Jim started out as an organic chemist, but took his PhD degree under the x-ray crystallographer, Professor J. Monteath Robertson, studying effects such as those of conjugation and hyperconjugation on bond lengths. He entered mass spectrometry by moving to the Commonwealth Scientific and Industrial Research Organization of Australia in 1949 to investigate the possible chemical applications of their new instrument. This was a truly pioneering move, both scientifically and geographically. Mass spectrometric analytical applications of the time were almost entirely empirical; recognizing this, Jim embarked on an ambitious research program concerning the mechanisms of ion formation, of energy transfer and of the detailed structures and energetics of ion species that have been a principal interest to this day. A fellowship in 1956 at the University of Chicago with Professor Mark Inghram resulted in a successful instrument for measuring photoionization efficiencies utilizing a vacuum UV monochromator with a mass spectrometer, yielding data on autoionization and vibrational fine structure of excited ionic states. Further work, and improved instruments, gave complete support to theoretical threshold laws, making it possible to convert such ionization efficiency data into reliable bond energy values.

Such progress around 1960 presaged the explosive growth in molecular mass spectrometry that continues to this day. At the forefront of this new wave were the 'Australian Jims'; the complementary research discoveries of Jim Shannon in organic mass spectrometry gave us a double reason to try to focus eyes and ears halfway around the world. For me, the sabbatical leave of Jim Shannon in the U.S.A. in the mid-sixties was a real milestone; how could we possibly communicate now without fishhooks and arrows?

Nearly half-way through Jim Morrison's career he assumed the Professorship of Physical Chemistry at La Trobe University in 1967, a move that would greatly increase his administrative duties, with no noticeable slackening of his high scientific productivity. Jim was first Master of Chisholm College for 250 students. He recruited and nurtured a new physical chemistry faculty, and developed its computer and machine shop facilities to be the equals of those of any chemistry department. In the intervening years, these facilities (and faculty) have spawned on average a new spectrometer every year. The La Trobe computer program SIMION for ion trajectory simulation is now a worldwide standard.

Of these many and wondrous instruments, the one I know best is the 'grand-scale' reverse-geometry double-focusing mass spectrometer; this was under construction by Jim and Peter Derrick when I spent a sabbatical semester at La Trobe University in 1976. I was overwhelmed by the 1 m radius of the magnet, as compared with the standard 30 cm radius for most commercial instruments; mass range goes up as the square of the magnetic radius, and the construction complexity by an even larger factor. In the years since its completion, this instrument has contributed mightily to our understanding of a wide variety of important problems such as field ionization, fast atom bombardment, metastable ions and collision-activated decomposition spectra of large molecules, energy transfer in collisional activation and metastable ion lifetimes. This is despite the fact that the instrument has been moved twice, now being with Peter Derrick at the University of Warwick. Equally revolutionary has been the triple quadrupole mass spectrometer, built by Jim and his student Don McGilvery, which they with Yost and Enke applied to tandem mass spectrometry; now manufactured by several companies, this is the instrument most widely used for analytical tandem mass spectrometry (MS/MS) applications. This and its quinquequadrupole successors have also been used by Jim for pioneering studies on the photodissociation spectroscopy of ions. Here his classic spectrum of ionized methyl iodide shows more resolved lines than any large molecule mass spectrum I know; Jim has used this information, for example, to elucidate for the first time the change in shape of an ion brought about by such excitation.

I think we ordinary mass spectrometrists, however, are equally intrigued—yea, have the most fun—with Jim's gas chromatography/mass spectrometry (GC/MS)

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liquid chromatography/mass spectrometry (LC/MS) and MS/MS results from a wide variety of interesting samples. These include the flavor and odor constituents of honeys, herbs, foods, insect pheromones and other natural materials, organic pollutants in drinking waters and even ocean water, and air pollutants; he has shown that the carbon monoxide content of air at his ocean-side cottage on the southern coast of Australia is the lowest in the world of any measured on habitated land. A paper-punch sample from the leaf of a gum (eucalyptus) tree can distinguish hundreds of varieties. And, yes, it is true that after a rain in the desert, an ordinary rock does smell; Jim identified the released vapors as short-chain fatty acids, somehow catalytically synthesized on the rock surface. He is now a principal in the compilation of an Australian aboriginal pharmacopoeia, an effort to identify the active components in herbal material used as native medicines. His group did some of the earliest work in computerization of GC/MS and computer interpretation of unknown mass spectra. For the near ultimate in creativity, I remember an early seminar of Jim's in which he played an audio tape to demonstrate that a mass 79 pyridine ion went 'boing' when it hit the detector, but a mass 79 bromine ion made a 'ping'. Unfortunately, the obvious analytical applications of this discovery have not yet been exploited.

Not surprisingly, Jim's list of honors is much too long for a single issue of this journal. To mention a few, he is a Fellow of the Australian Academy of Science and of the Royal Society of Edinburgh, has received the Rennie Memorial Medal and the H. G. Smith medal of the Royal Australian Chemical Institute, a medal of the University of Liege, the Queen's Jubilee Medal, and has been created an Officer of the Order of Australia by Queen Elizabeth II. He has been Adjunct Professor of Chemistry at the University of Utah since 1975, at the University of Delaware 1987–89 and a Visiting Professor at Princeton University. He has served as Vice President of the Australian Academy of Science, President of the Royal Society of Victoria, Chairman of the National Committee for CODATA and Scientific Information and member of the Australian Research Grants Committee.

On a personal note, my family has felt unusually fortunate over many years to count Chris and Jim Morrison and their family as close personal friends. Their hospitality when three of our children accompanied us on sabbatical at La Trobe University in 1976 was off-scale; we were automatically added as part of their family, which not only included three sons but also 250 students resident in Chisholm College. Then they even 'donated' their son Richard as a chemistry graduate student at Cornell, where he proceeded to win our 'best student' prize (unfortunately, but possibly because, he did not work with me). I am also grateful to the University of Utah, as the regular Morrison residency there has greatly increased the probability of their being available for social visits and scientific stimulation. Not only has the progress of mass spectrometry been much more spectacular because of the creative and varied inputs of James Douglas Morrison, but it has also been far livelier, interesting and just plain fun. Speaking on behalf of your legion of friends, Jim, our heartfelt thanks and our best wishes go to you for a very enjoyable future.