CSIRO PUBLISHING
Guest Editorial
www.publish.csiro.au/journals/ajc
Aust. J. Chem. **2003**, *56*, 343–348

John Hamilton Bowie: An Appreciation

Richard A. J. O'Hair

School of Chemistry, University of Melbourne, Parkville 3010, Australia (e-mail: rohair@unimelb.edu.au).

This special issue of the *Australian Journal of Chemistry* is dedicated to Professor John Bowie on the occasion of his sixty-fifth birthday on July 16, 2003. Through this collection of papers, John's students, collaborators, colleagues, and friends gratefully acknowledge his diverse and important contributions to organic chemistry. This introduction is divided into two parts: firstly a summary of John's research career[1] and secondly an 'interview' with John[2] to provide insights into his career and his thoughts on a variety of issues.

Overview of John's Research Career

John's scientific career is most distinguished for his research into the chemistry of negative ions in the gas phase and for his studies of the structure–activity relationships of bio-active peptides in the skin glands of anurans. John's gas phase and condensed phase studies have resulted in over 500 publications, numerous plenary lecture invitations, the award of a Doctor of Science (University of Adelaide, 1969), and the award of many of the major honours of the Royal Australian Chemical Institute (Rennie Medal in 1968, H. G. Smith Memorial Medal in 1974, and the A. J. Birch Medal in 2001).

Early Years

John commenced his work as a graduate student on the structure elucidation of quinone natural products. These studies continued these studies with the elucidation of the structures of the complex aphin pigments of aphids while working with Lord Todd FRS and (the then) Dr D. W. Cameron at Cambridge University. While pursuing this work, a collaboration with (the then) Dr D. H. Williams sparked John's interest in the use of techniques of mass spectrometry and nuclear magnetic resonance to determine structure. These interests have continued to the present day. Whilst at Cambridge, John also collaborated with Williams to investigate the positive-ion mass spectra of a variety of different types of organic compounds. This work was notable for the discovery of a number of complex rearrangements which occurred during the fragmentation of the molecular cations of these compounds.

Fig. 1. John Bowie in 2000.

Independent Research Career at The University of Adelaide

John continued his studies of the rearrangement processes of positively charged organic molecules from his appointment to the University of Adelaide in 1966 up until the mid 1970s. It is primarily for this work that he was one of the top 1000 scientists cited in the period 1965–1978, and for which John was awarded the Rennie Medal in 1968.

Towards the end of the 1960s, John turned his attention to the ion chemistry of organic negative ions. At this time, knowledge of the chemistry of negative ions in the gas phase was sparse. Another motivation was that some of the most important synthetic reactions in organic chemistry are known to involve the interaction between negative ions and neutral species. In the early days, John and his research group chose to study the fragmentations of functional groups attached to

Under the supervision of John Bowie, Richard O'Hair graduated with a Ph.D. in organic chemistry in 1991. After carrying out post-doctoral work with Roger Truscott (University of Wollongong) and Charles DePuy, he established his own independent research program as an assistant professor at Kansas State University (1993–1996) in the area of gas-phase ion chemistry of biomolecules. Since moving to Melbourne, his group is only one of a handful who have modified a LCQ instrument to allow the introduction of neutral reagents to probe gas-phase ion–molecule reactions, which has been applied to organic, inorganic, organometallic, and biological systems. He has published 90 papers and serves on the editorial advisory boards of the European Journal of Mass Spectrometry *and the* International Journal of Mass Spectrometry.

 10.1071/CH03081 0004-9425/03/05343

Table 1. Ph.D. Students, Postdocs and Research Associates and Collaborators

Ph.D. Graduates	B. C. S. Chia	Dr S. J. Blanksby	Prof. C. Wesdemiotis
P. F. Donaghue	T. Rozek	Dr P. A. Wabnitz	Prof. D. E. Lewis
P. Y. White	K. L. Wegener	Ms K. L. Wegener	Prof. A. Lebedev
R. H. Simons	S. Peppe		Dr C. Severini
B. Nussey	S. Pinmanee	**Visiting Scientists**	Dr M. A. Cooper
A. C. Ho	A. M. McAnoy	Prof. A. Fry	
B. J. Stapleton	C. S. Brinkworth	Prof. R. A. W. Johnstone	**Interstate Collaborators**
S. Janposri	M. Fitzgerald	Prof. D. E. Lewis	Assoc. Prof. J. A. Carver
D. J. Underwood	M. A. Apponyi	Prof. J. L. Holmes	Assoc. Prof. F. Separovic
G. Klass		Prof. A. Lebedev	Assoc. Prof. R. A. J. O'Hair
R. N. Hayes	**Postdocs and Research Associates**	Dr C. Gao	Prof. L. Radom
M. J. Raftery	Dr R. K. M. R. Kallury		Dr L. Llewellyn
B. J. Currie	Mr T. Blumenthal	**Overseas Collaborators**	
R. A. J. O'Hair	Dr J. A. Benbow	Prof. S.-O. Lawesson	**Local Collaborators**
G. W. Adams	Dr J. C. Wilson	Prof. A. Fry	Dr J. C. Sheldon
K. M. Downard	Dr V. C. Trenerry	Prof. J. H. Beynon	Dr M. A. Buntine
P. C. H. Eichinger	Dr M. B. Stringer	Prof. P. J. Derrick	Prof. M. I. Bruce
R. J. Waugh	Dr M. Eckersley	Prof. J. L. Holmes	Assoc. Prof. M. J. Tyler
A. M. Bradford	Dr P. C. H. Eichinger	Prof. C. H. DePuy	Prof. J. C. Wallace
S. J. Steinborner	Dr D. J. M. Stone	Prof. R. Damrauer	Prof. I. N. Olver
J. M. Hevko	Dr M. J. Raftery	Prof. N. M. M. Nibbering	Prof. R. V. Baudinette
S. J. Blanksby	Dr R. J. Waugh	Prof. H. Schwarz	Dr I. Musgrave
P. A. Wabnitz	Dr S. Dua	Prof. M. L. Gross	

species which could capture electrons, i.e. species with high electron affinities especially compounds containing quinone and nitroaryl moieties. This work uncovered a rich ion chemistry and showed that negative-ion mass spectrometry could be used, in concert with positive-ion mass spectrometry, to elucidate the structure of unknown molecules.

In the early 1970s, the Australian Research Council (ARC) funded the purchase of an ion cyclotron resonance (ICR) mass spectrometer, and this instrument enabled the study of reactions between negative ions and neutral molecules. Research by John's group at Adelaide established them as one of the leading research groups in world in the study of the gas-phase chemistry of negative ions. Much of this work involved studies of gas-phase nucleophilic substitution reactions at carbon centres, and this work has been reviewed in *Accounts of Chemical Research*.[3]

The Bowie group also used the ICR instrument to study the anionic chemistry of organosilicon compounds, an area that was also being explored at the same time by Charles DePuy at Boulder using the flowing afterglow mass spectrometry technique. Collaboration with DePuy on a number of negative ion projects, and many trips by John to Boulder, has culminated in an article in *Accounts in Chemical Research* describing the gas-phase chemistry of silicon-containing anions.[4] In 1974, John was awarded the H. G. Smith medal for his research on anion chemistry.

Much of the experimental negative ion chemistry studied by the Bowie group has been supported by theoretical studies. Dr. John C. Sheldon (University of Adelaide) undertook many of the computational aspects of this work, commencing in the late 1970s at a time when computational chemistry was in its infancy. From this time on, virtually all the experimental research of the Bowie group has been supported by some form of theoretical chemistry.

In the mid 1980s, the ARC provided funding for the purchase of a VG ZAB 2HF reverse-sector mass spectrometer. John had previously visited the laboratories of Professors Beynon (Swansea), Holmes (Ottawa), and Nibbering (Amsterdam) to learn how to use this instrument. To the present day, this instrument remains John's major research facility, however it has been much modified for recent work. After commissioning of this instrument, work commenced on the inter- and intramolecular chemistry of deprotonated organic molecules (closed-shell anions),[5] as well as extensive studies on negative-ion rearrangements in the gas phase, like the Smiles, Claisen, pinacol, Favorskii, Payne, and Wittig rearrangements, to name a few.[6] This work is continuing.

In the mid 1990s, the ZAB instrument was modified to four-sector capability and equipped with seven collision cells to enable the formation and studies of neutrals formed by charge stripping negative ions. This was the beginning of the studies by the Bowie group on interstellar molecules formed by the neutralization–reionization procedure first introduced by McLafferty and others. Currently some twenty cumulenes and oxocumulene neutrals, which are circumstellar species, have been generated in unequivocal routes by Suresh Dua, Stephen Blanksby, and other members of the research group. Again, these experimental observations are supported by high-level theoretical chemistry.[7] In addition, a number of interesting neutrals have been prepared which have not been detected in interstellar regions (e.g. linear C_4 and the first report of rhombic C_4 [8]). Some of this interstellar work has been done in collaboration with Helmut Schwarz (Berlin), with whom John has a long-term collaboration. The ARC has continuously funded the ion chemistry research since 1967. Since 1969, the instruments of the Bowie group have been maintained by Tom Blumenthal, without whose skilled professional assistance none of the ion chemistry research would have been possible.

In the early 1990s, the Bowie group commenced work on the identification of bio-active peptides from the skin glands of Australian frogs and toads in collaboration with the zoologist Michael Tyler. The common link between this work and John's ion chemistry studies is the use of mass spectrometry to sequence the peptides. The Bowie group have a continuing research programme into the fragmentation reactions of negative ions of peptides, with a view for this method to complement the use of positive-ion mass spectrometry as a viable analytical technique to sequence peptides. To this time, 25 species of Australian anurans have been studied, with more than 180 bio-active peptides identified, and some of the most active peptides in the animal kingdom have been found. These include analgesics, neuropeptides, antibiotics, antiviral agents, antifungal agents, anticancer agents, and nNOS inhibitors.[9] This work uses mass spectrometry to determine the primary amino-acid sequence and NMR to determine the 3D structures of the peptides and their mechanism of action. The NMR work is done in collaboration with Assoc. Profs. John A. Carver (Wollongong) and Frances Separovic (Melbourne). One of the most interesting aspects of this work was the discovery of the 25 residue peptide splendipherin from the male tree frog *Litoria splendida*, the first aquatic male sex pheromone of a frog to be reported; this work featured in *Nature* in September 1999.[10] This amphibian work has been funded principally by the ARC and to a lesser extent by the South Australian Anticancer Foundation. This work has recently been extended to investigate how Australian marsupials (e.g. wallabies and wombats) protect their young in the pouch when the young have not yet developed their own immune system. This work is carried out in collaboration with the zoologist Prof. Russell Baudinette (Adelaide).

The research reported by the Bowie group over the years has been carried out by 50 graduate students (including 32 Ph.D. students) and 15 research associates, listed in Table 1. Some of the projects have involved collaboration: international collaboration for some ion chemistry projects, and Australian collaboration for the peptide studies.

An Interview with John

R.A.J.O.: Many of us were inspired to pursue science by our high school teachers. What were your chemistry teachers like at school?

J.H.B.: I went to a large private school in Melbourne—none of my chemistry teachers particularly enthused me (I really liked the Latin master but not his subject, since I always managed to score only 50 or 51 out of 100!). If I worked hard, it was easy to get good marks in chemistry (in those days you learned by rote) and the practical work was interesting. I remember on one occasion we had a snap half-term exam in chemistry (year 10) and I failed resoundingly! The chemistry master for that year informed me that in his opinion I should drop chemistry for the penultimate year at school. I revisited the school some 15 years later after I had received my first appointment. Unfortunately the chemistry master had died, but the Latin master remembered me.

R.A.J.O.: What made you choose science for your tertiary education?

J.H.B.: I did science because it was assumed by all my family (and myself) that I would become a science teacher in a secondary school, as school teaching was a tradition on my mother's side of the family. In the event, I did set out to do this but transferred from secondary teaching at the fourth year at Melbourne in order to do a higher degree.

R.A.J.O.: What was your first research experiment in chemistry?

J.H.B.: My first real research experiment was the characterization of an organic compound—a disubstituted naphthalene I think—during a project in the third year of my B.Sc. course.

R.A.J.O.: Did it work?

J.H.B.: It was a beautifully crystalline colourless compound, and I managed to work out the structure using mainly infrared spectroscopy: I think this impressed the Senior Lecturer in charge of the third year laboratory: a very formidable lady (with a heart of gold, as I learnt later) who terrified chemistry undergraduates at Melbourne for many decades.

R.A.J.O.: What was the B.Sc. honours program like in 1959?

J.H.B.: It was the first (qualifying) year of the Masters degree. There was a large course work component: I still have my hand-written lecture notes—aromatics, heterocycles, natural products including carbohydrates and quinones. There was absolutely no mechanistic organic chemistry; everything was rote learning. The nearest we got to a mechanism was when Professor (Bill) Davies drew a lasso around OH and H, when water was known to be a product of the reaction. Graduate work at that time was shared with six months national service. The main thing I learned from national service was never to volunteer for anything. Everyone was on the active list for five years following national service. I came off that list just before the Vietnam war.

R.A.J.O.: You did your M.Sc. work with Dr. Cooke at Melbourne on the 'Colouring Matters of Australian Plants'. What analytical techniques were used to solve the structures of these natural products?

J.H.B.: Ray Cooke had the first Infracord in the Department. He kept it with great pride in his office, would not let anyone else touch it, and he ran spectra for all members of his research group. That was all we had. I recall that IR was wonderful because it identified *peri*-HO groups in quinones! The first time I saw mass and NMR spectrometers was in Nottingham in 1961.

R.A.J.O.: You moved to the U.K. on a Commonwealth United Kingdom Fellowship to do a Ph.D. Why did you choose Nottingham?

J.H.B.: Because Professor Alan W. Johnson (the Jesse Boot Professor at Nottingham) was the Chemical Society Lecturer in 1960. He gave an exciting lecture in Melbourne, I liked his work on porphyrins, and I knew immediately that I had to work with him. I asked him after the lecture if I could do a Ph.D. with him. He said yes if I could get funding.

I was fortunate to get one of the first Commonwealth U. K. Scholarships.

R.A.J.O.: What did you learn from your time in Nottingham?

J.H.B.: Nottingham has always had a strong research school in chemistry. I was given my research projects (in natural products chemistry) and access to all required facilities, and then left to fend for myself. I had little supervision and my supervisor first saw my thesis when I submitted it for examination. That was the British system at the time. It was hard, and only the most persistent were really successful. In retrospect, it was good training for a future academic. I was also married in Nottingham: That was a very new experience for me and a very stabilizing influence.

R.A.J.O.: Upon graduation, you had two post-doctoral offers. You accepted an ICI fellowship with Lord Todd in Cambridge in 1964. Did Todd have a big influence on your research at Cambridge?

J.H.B.: I saw quite a lot of Todd. He was one of the top chemists of the 20th century: a Scot of giant stature and corresponding intellect, and it was a great privilege to work with him. I did not learn much specific chemistry from Todd; that I got from his lieutenant Don Cameron (later Professor of Organic Chemistry at Melbourne) who looked after me. Todd was very approachable and the first thing I learnt from him was that the famous were no different from anyone else. Todd considered himself to be a founder of Molecular Biology—it was his view (in 1964) that Organic Chemistry was going to be central to biology in the next half-century and that an organic chemist would always be well placed to be involved in interdisciplinary research. Both he and Don Cameron had a profound influence on my career. Don is a perfectionist, including in the experimental side of research. He was the perfect supervisor, full of good ideas, always interested, always with a word of encouragement when things were tough, always congratulations when you had a good result. I have always tried to base my own supervision of graduate students on what I learnt from him.

R.A.J.O.: You also ended up collaborating with Dudley Williams at Cambridge on the use of NMR and MS on structure assignment and on gas-phase fragmentation reactions occurring in the mass spectrometer. Given the huge output of research publications then, can you describe these exciting times and how they influenced your decision to make gas-phase ion chemistry a major part of your research career?

J.H.B.: No-one has influenced my career more than Dudley Williams. I worked weekdays with Don Cameron and nights and weekends with Dudley (with Don's permission). My wife also presented me with a son during this period! There is always a golden period in your life, and for me it was my two years at Cambridge. Dudley came to an academic position at Cambridge (from Carl Djerassi's research group in Stanford) at almost the same time I arrived as a postdoc. I had never before met anyone like Dudley. A Yorkshireman with an almost Australian dislike of authority, who simply bubbled enthusiasm and ambition. A veritable maelstrom of energy. Dudley had access to a wide variety of samples, many from Sven-Olaf Lawesson from Denmark (who later collaborated with me, sending me hundreds of samples), and the four of us: myself, Ron Grigg, Graham Cooks, and Mel Sargeant.* We ran the mass spectra and the mass measurements and helped with the interpretations, and Dudley wrote all the papers. The resulting avalanche of papers came at the time when organic mass spectrometry was in its infancy; some of these papers remain the most cited in this field.

R.A.J.O.: When did you decide that you wanted to pursue a career in academia?

J.H.B.: When I transferred from the Education Department to graduate training at the University of Melbourne. I never really considered anything else.

R.A.J.O.: How did you get you academic appointment at Adelaide?

J.H.B.: When I was in my first year as a post-doctoral fellow with Todd, I applied for a lectureship at Adelaide. Todd advised me that in his view, Adelaide, at that time, had the best organic chemistry department in Australia (then led by Geoffrey Badger, soon to be succeeded by Athel Beckwith), and that is where I should go. He also said that two other of his people were there, Harold Rodda and George Gream. I was appointed with Todd's support. How different to the complex procedures for appointment of academic staff today! All I did was write a letter stating my interest, provide my meagre CV, and name Todd and Johnson as referees. Within six weeks I received a letter of appointment—no interview or grilling by the whole department!

R.A.J.O.: Given your initiation into mass spectrometry at Cambridge, how did you continue pursuing these studies at Adelaide? Did the department have a mass spectrometer at that stage?

J.H.B.: I was appointed to Adelaide as a natural product chemist, but Athel Beckwith had obtained an Hitachi RMU 7D mass spectrometer and, serendipitiously, this instrument had an excellent negative-ion capability. So I commenced research as an ion chemist, and it was not until the early 1990s that I returned to work on the peptide and quinone chemistry that I had commenced three decades earlier at Nottingham and Cambridge.

R.A.J.O.: I remember starting my honours with you the year that the ZAB 2HF was installed. There was a lot of excitement about the new instrument and we were all keen to run experiments on it. Was it a challenge to get funding to purchase the various mass spectrometers at Adelaide over the years?

J.H.B.: Quite difficult in one of the less-populated states in Australia. Not making an academic case on merit, rather all the political manoeuvring necessary to get the institution(s) to give the application a high priority and to support the application financially. I can't complain however—I have been generously treated by the ARC over all the years.

R.A.J.O.: While there is no ideal mass spectrometer, do you have a favourite?

* Myself, Ron, and Mel were postdocs from Nottingham, Graham was a Ph.D. student of Peter Sykes.

J.H.B.: It depends what sort of work you are interested in. A combination of a Finnigan LCQ and a Micromass QTOF2 for proteomics work is unrivalled in my experience. But my major interest has always been fundamental ion chemistry, and the now much modified and ageing VG ZAB 2HF, which we obtained in 1985, is a beautiful research instrument particularly for negative-ion work and for our current stellar chemistry interests. This instrument is however temperamental and my friend and colleague Tom Blumenthal has kept the ZAB operational for nearly 20 years.

R.A.J.O.: What do you enjoy about your work?

J.H.B.: Teaching and research (particularly research) is both my hobby and my occupation, sometimes to the disadvantage of my family. My students are always doing something new and getting fascinating results. A new reaction, a fresh insight into the mechanism of a reaction, the isolation and identification of a new peptide (what is its sequence, what is the three-dimensional structure, is it a neuropeptide, a pheromone, a hormone or an anticancer agent, and if so, how does it work?). I have been greatly privileged to have so many talented graduate students working with me over the years and constantly challenging me. I enjoy their enthusiasm, and it keeps me feeling young (even when I am not!). There is great satisfaction in following the successes of all of my former students.

R.A.J.O.: I was fortunate to have been one of your students that you encouraged to travel overseas to collaborate with Professor DePuy during my Ph.D. How important do you regard collaborations?

J.H.B.: I think it is very important for a Ph.D. student to have the experience of working collaboratively in another laboratory as part of their course. This widens their horizons and significantly enhances their maturity. Collaboration is advantageous but not essential in the ion-chemistry area, because that is my area of expertise. In contrast, collaboration is absolutely essential for the interdisciplinary work we are currently doing in biological chemistry. The senior collaborators have expertise I completely lack: everything from solid-state NMR through zoology to oncology.

R.A.J.O.: Do you have a favourite piece of work that you have been involved in?

J.H.B.: That is a very difficult choice, so let me choose four. (a) The isolation and characterization of the aphin quinones in 1964 with Todd and Cameron in Cambridge.[11] (b) The first time (1974) Tom Blumenthal and I succeeded in obtaining charge-reversal spectra of organic negative ions with the Hitachi RMU 7D spectrometer.[12] (c) The isolation and identification of the first anuran aquatic male sex pheromone (splendipherin), by Paul Wabnitz (in 1998), the most painstaking and beautiful piece of work ever done by a graduate student of mine.[10] (d) The work Steve Blanksby did in 1999 to substantiate the conversion of linear C_4 to rhombic C_4 in the gas phase.[8]

R.A.J.O.: You played an active role in administration at Adelaide as Dean of Science, Chair of the Executive Committee, Pro-Vice Chancellor in charge of institutional mergers, and also acting Vice Chancellor. How did you manage to keep a thriving research program during these times?

J.H.B.: In the 1980s and early 1990s these positions were part time, and I seem to be a reasonable organizer of my time. I also had postdocs looking after my group at this time. In the latter part of that period Suresh Dua did this for me, and he was quite outstanding. Administrative positions like these are now full time. To do them you really have to make a career change and give up teaching and research. Administration at the highest level is quite interesting, rewarding, and challenging, but I would never have been willing to give up research. That is why I stood down from administration in 1991.

R.A.J.O.: How have administrative burdens on academics changed over the years?

J.H.B.: The problem is now that there are so few of us (28 tenurable academic staff in chemistry at Adelaide in 1966, 8 in 2003, and we are not unique in this regard). We all have no alternative but undertake significant administration loads, otherwise the Department would not function. I don't recall having any substantive administrative responsibilities for the six years following my first appointment.

R.A.J.O.: We talked about what you enjoy about your work. What about dislikes?

J.H.B.: The advantages of an academic career far outweigh any disadvantages. Few other professions actually pay you for indulging your hobby! However, I do not enjoy the never-ending problem of having to get funding to sustain the research of my group: It is however necessary, since failing to obtain external funding for research in Australia (and elsewhere) generally means no research. There is ill feeling and low morale in academia worldwide at present (very much more than in the past) because of the strained financial situation, the related lack of support for tertiary education from politicians of most persuasions, and the consequent climate of change within universities. Within the system some of this ill feeling is directed at senior and successful academics. I can understand that. It is a disgrace that younger colleagues are still so badly treated by the current funding systems in this country. Anyone who has ever written or reviewed an ARC application knows how difficult it is for a recent appointee to make a case for a substantive track record.

R.A.J.O.: Were you ever tempted to move overseas to take up an academic appointment in the United States or Europe?

J.H.B.: In the early 1970s I had several invitations to full professorships in the United States and it would have been the right time for me to move. I decided not to go mainly because I preferred to have my children educated in Australia. Everyone has family and career responsibilities and there will always be a time when they collide. It was a very difficult decision for me because facilities and opportunities in the U. S. were always going to be better than any available to me in Australia. Even so I would still make the same decision if I had my time over again.

R.A.J.O.: Which scientists from history would you like to meet?

J.H.B.: Heisenberg and Darwin.

R.A.J.O.: What would you ask them?

J.H.B.: Heisenberg—Does he think his uncertainty principle could have any bearing on the origin of the universe and of evolutionary theory? Darwin—Does he think that his theory of evolution of species can explain the complex but beautiful chemistry of life? (Some tutorials in the biorganic chemistry of RNA, DNA, and proteins might need to precede such a question.)

R.A.J.O.: Why do you think the general public fears science?

J.H.B.: The public certainly fears some of the outcomes of science and they have reason to do so. The why is obvious and it is not just a matter of education. However, there is no doubt that that the public is interested in science and realize that our standard of living is significantly linked to scientific and technological endeavour, even if there is a downside with chemical pollution, et cetera. Scientists working in perhaps specialized, yet fundamental areas often have difficulty in communicating their work to the general public: I find that myself. Yet those who are excellent communicators have a very high public profile indeed; like the physicist Paul Davies and (my colleague and collaborator with the amphibian work) Michael Tyler. Tyler has an exceptional media image, and he is constantly on television advertising the necessity of caring for and saving our environment. I have seen Davies address, and enthral, 2000 people in the main University Hall, with hundreds standing outside listening to the outside broadcast.

R.A.J.O.: What are the ultimate goals for chemists?

J.H.B.: I need to restrict that to academic chemists because I am not competent in other areas. (a) Teaching. As far as teaching at secondary and tertiary level, and as a matter of urgency, to revise the school and undergraduate syllabi to make chemistry more "relevant" yet still teach the central themes of chemistry. The numbers of school students taking science may well reach crisis (low) proportions within a few years unless firm steps are taken to deal with this problem, and to enhance the education and standard of the teachers who train those school students. (b) Researchers: Research hasn't changed that much over the 40 years I have been involved—sure, the sophistication of instrumentation and methods have changed, and research is more expensive, but the basic tenets remain. I am still convinced that the best research is carried out in individual research groups and by collaboration between individual researchers. Although there is a place for national priorities in research and for collaborative research centres, these should not be at the expense of fundamental research in other areas.

John's comments reflect several traits which his students and colleagues admire deeply, especially his love of science and the credo that research is fun. Despite his many accomplishments, he remains unpretentious (it took a lot of arm twisting to get John to agree to this Festschrift!), exceedingly generous in sharing credit and incredibly supportive as a mentor. From all of John's students and colleagues: John—we thank you and wish you a happy 65th birthday!

References

[1] Other aspects of John's research career have been published elsewhere: (*a*) R. J. Best, *Discoveries by Chemists: A History of the Chemistry Departments of the University of Adelaide 1885–1984*, **1987** (University of Adelaide Foundation, Adelaide); (*b*) J. H. Bowie, *Org. Mass Spectrom*. **1993**, *28*, 1407.

[2] This interview was inspired by an online interview of John Bowie by David Bradley: http://chemweb.com/alchem/alchem98/person/prold/pr_980605_bowie_full.html.

[3] Bimolecular Reactions of Nucleophiles in the Gas Phase (JHB paper #186). J. H. Bowie, *Acc. Chem. Res.* **1980**, *13*, 76–82.

[4] The Gas Phase Negative Ion Chemistry of Organosilanes (JHB paper #234). C. H. DePuy, R. Damrauer, J. H. Bowie, J. C. Sheldon, *Acc. Chem. Res*. **1987**, *20*, 127–133.

[5] For a review see: The Fragmentations of $(M-H)^-$ Ions Derived from Organic Compounds. An Aid to Structure Determination (JHB paper #292). J. H. Bowie, in *Topics in Mass Spectrometry* (Ed. D. H. Russell) **1994**, Vol. 1, pp. 1–38 (Plenum: New York, NY).

[6] For a review see: A Comparison of the Skeletal Rearrangement Reactions of Even-Electron Anions in Solution and the Gas Phase (JHB paper #346). P. C. H. Eichinger, S. Dua, J. H. Bowie, *Int. J. Mass Spectrom. Ion Processes* **1994**, *133*, 1–12.

[7] For an overview see: Formation of Neutral Molecules of Potential Stellar Interest by Neutralization of Negative Ions in a Mass Spectrometer. The Application of Experiment and Molecular Modelling in Concert (JHB paper #465). J. H. Bowie, S. Peppe, S. Dua, S. J. Blanksby, *J. Molec. Graph. Model.* **2003**, *21*, 357–364.

[8] Conversion of Linear to Rhombic C_4 in the Gas Phase. A Joint Experimental and Theoretical Study (JHB paper #439). S. J. Blanksby, D. Schröder, S. Dua, J. H. Bowie, H. Schwarz. *J. Amer. Chem. Soc.* **2000**, *122*, 7105–7113.

[9] For a review see: Host Defence Antibacterial Peptides from the Skin Secretions of Australian Amphibians. The Relationship between Structure and Activity (JHB paper #426). J. H. Bowie, K. L. Wegener, P. A. Wabnitz, B. C. S. Chia, J. A. Carver, J. C. Wallace, M. J. Tyler. *Protein Peptide Lett.* **1999**, *6*, 259–269.

[10] Aquatic Sex Pheromone of a Male Tree Frog (JHB paper #427). P. A. Wabnitz, J. H. Bowie, M. J. Tyler, J. C. Wallace, B. P. Smith, *Nature* **1999**, *401*, 444–445.

[11] Haemolymph Pigments of Aphids (JHB paper #12). J. H. Bowie, D. W. Cameron, J. Findlay, J. A. K. Quartey, *Nature* **1966**, *210*, 395–397.

[12] Electron Impact Studies. XC. +E Collision Induced Mass Spectra from Negative Ions (JHB paper #138). J. H. Bowie, T. Blumenthal, *J. Amer. Chem. Soc*. **1975**, *97*, 2959–2962.