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OBITUARY

Alexander George Harrison (1931–2018)

Alex G. Harrison, Professor Emeritus at the University of Toronto, passed away on September 7, 2018, at the age of 87. He was an eminent mass spectrometrist, a distinguished educator, and an esteemed colleague in the international scientific community.

Alex was born in Peterborough, Ontario, Canada, on April 1, 1931, and spent his early years on farms near Lakefield and Watford, Ontario. He was intrigued by science and enrolled in a chemistry curriculum at the University of Western Ontario; he earned his B.Sc. in Chemistry in 1952 and his M.Sc. in Physical Chemistry in 1953. Alex performed his doctoral research at McMaster University under the direction of Harry Thode, a pioneer in mass spectrometry. After receiving his Ph.D. in 1956 with his thesis entitled "Isotope Effects in the Reduction of Sulphur Compounds," Alex carried out postdoctoral studies both at McMaster University and later with Fred Lossing at the National Research Council in Ottawa. He was then appointed as a Lecturer in the Chemistry Department at the University of Toronto. In 1960, Alex assumed a tenure track position as Assistant Professor at the University of Toronto, and he was promoted to Full Professor in 1967. Alex was named Professor Emeritus in 1993.

Alex's contributions to science were both profound and diverse. His earlier research focused on the reactivity and mechanisms of gas-phase organic ions, their detailed structures, and their precise thermochemistry. He was instrumental in the development of new techniques and in the analytical applications of ion chemistry. After his appointment as Professor Emeritus, he embarked on new studies of peptide fragmentation, including the structures of b-type fragment ions. This seminal work resulted both in landmark papers as well as insightful collaborations with computational chemists. Alex is a highly cited author with more than 280 publications, including his classic 1983 text on *Chemical Ionization Mass Spectrometry*.

Throughout his career, Alex received many distinguished honors. He was awarded an Alfred P. Sloan Fellowship (1962–1964), the Noranda Lecture Award from the Chemical Institute of Canada (1971), the Killam Research Fellowship (1985–1987), and the Award of Excellence from the Canadian Society for Mass Spectrometry (1995). A Graduate Fellowship in

Analytical Mass Spectrometry at the University of Toronto was named in his honor in 2005. An 80th Birthday Special Issue of the *International Journal of Mass Spectrometry*, containing 36 research papers from colleagues and friends, was dedicated to Alex in 2012.

Alex also provided extensive service to the scientific community over many decades. He served on the Editorial Advisory Boards of *Organic Mass Spectrometry*, *Mass Spectrometry Reviews*, the *International Journal of Mass Spectrometry*, the *Journal of the American Society for Mass Spectrometry*, and the *Journal of Mass Spectrometry*. Moreover, he served as Associate Editor for the *Canadian Journal of Applied Spectroscopy*, as a Member of the Board of Directors for the American Society for Mass Spectrometry, as a Member of the Council of the Chemical Institute of Canada, and as President of the Canadian Society for Mass Spectrometry.

On a personal note, Alex was a loving husband, devoted father, and proud grandfather. He is survived by his wife of 63 years, Barbara (nee Smith), his two daughters, Jane (Charlie Trainor) and Ann (Michael Hrycusko), and four grandchildren, Matthew, Emma, Kathryn, and Andrew.

Electronic supplementary material The online version of this article (https://doi.org/10.1007/s13361-019-02278-4) contains supplementary material, which is available to authorized users.

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Memories from Colleagues and Friends

Keith Jennings

I first met Alex Harrison when we were both postdoctoral fellows at the National Research Council, Ottawa, in the late 1950s before I became active in mass spectrometry. We immediately formed a friendship which we were able to renew once I began attending ASMS meetings in 1966 and which lasted throughout his lifetime. I always looked forward to our spending some time together at meetings in Europe and North America, discussing our latest research and catching up on news of mutual friends, and when the day's work was over, Chris and I enjoyed the occasional evening relaxing with Alex and Barbara. I was impressed by his wide knowledge of mass spectrometry and ion chemistry and by the care with which his work was presented—his dry sense of humor enlivened many a discussion. He will be remembered not only for his scientific contributions but also for his many personal qualities.

Raymond March

I met Alex Harrison in 1958 at the University of Toronto; Alex was a new Lecturer and I was a PhD student with John Polanyi. In 1975, Alex hosted a visit of my graduate class to his laboratory; the students were highly impressed. Alex wanted to organize a conference for graduate students, and the first conference was held at Trent in 1977. Alex and other faculty listened to students giving the first account of their researches. In 1985, Alex, Bob Boyd, and I were awarded NSERC funds to purchase a BEqQ hybrid instrument of reverse geometry (BE), quadrupole collision cell (q), and quadrupole (Q) analyzer. Leaving nothing to chance, we three flew to the Manchester factory floor of VG Analytical to test this extraordinary instrument. It worked beautifully. Thank you, Alex, for all your contributions and teaching and wisdom. There are all too few such as you. For more detailed comments, please see the attached Supplementary Information.

Veronica Bierbaum

It was in June 1974 at the NATO Advanced Study Institute in Biarritz where I first met Prof. Alex Harrison. As a graduate student, I was in complete awe to meet this famous scientist, and I was immediately impressed by both his brilliance and his kindness. I was always delighted when our paths would cross, and I'll reminisce about just two interactions. Alex was a Visiting Professor at the University of Colorado in 1989, and we enjoyed many discussions and experiments together; this work resulted in a *JACS* paper on the bond dissociation energies in ethylene and acetylene, our only collaborative manuscript, but my most-cited work. A second memory is presenting—with co-editor Bela Paizs—the *IJMS* Special Issue to Alex on the occasion of his 80th birthday; it was an honor to organize this tribute to a truly exceptional scientist, colleague, and friend.

Michael Bowers

I cannot remember when I first met Alex, but whenever it was, he was smoking his pipe! I do remember him arriving at a NATO ASI meeting, I believe in La Baule in 1978, and about all he had was his pipe as his bag did not make it. I think he eventually took to taking a shower with his clothes on since his bag did not arrive until the day before the meeting ended (those were 2-week meetings!). He was such a good sport to take all of the teasing, and it showed a lot about his character and his patience and traits that helped define him as a person and as a scientist. I came into mass spectrometry through the side door and, other than Keith Jennings, the person I learned most from was Alex. My last personal encounter with him was in Vancouver in 2012 when, as Editor of *IJMS*, I was honored to be in attendance when Ronnie and Bela presented him with a special issue of the journal. Thanks, Alex, for your leadership and friendship.

Bela Paizs

I first met Alex at an Informal Meeting on Mass Spectrometry in Fiera di Primiero in the early 2000s, but well before that, I had been a great admirer of him. Alex, as a freshly retired Professor Emeritus, published several ground-breaking papers in *JASMS* in 1995–96 on peptide fragmentation. At this time, our understanding of the topic was rather limited, the role of the ionizing proton was just suspected, and the first papers on the "mobile proton" model had just appeared. Alex made the critical proposal that peptide b fragments might be oxazolone derivatives, an idea that could explain many mysteries of peptide sequencing by collision-induced dissociation (CID), the critical reaction that makes proteomics work. He used not only carefully designed experiments to prove the oxazolone structure but also theoretical calculations to show the stability of these species. I still remember my excitement when reading his paper, the joy of diving into the peptide fragmentation literature and doing my first calculations on peptides, which have demonstrated that oxazolone isomers can be easily formed from protonated peptides. Alex was keen to collaborate with theoreticians and we soon started working together on the structure and formation of a and b ions; this collaboration culminated in our joint work on sequence scrambling upon CID. Many thanks, Alex, for the great years and all the exciting research; you are missed very much.

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