THE PAST PRESIDENTS' MEDAL FOR 1997 TO MICHAEL E. FLEET

Mike Fleet is one of the leading Earth scientists in Canada today, and his expertise spans an unusually wide range of sub-disciplines within Earth Sciences. He began his career as a geochemist, but rapidly acquired expertise in crystallography, and it is this synergy of different approaches that has characterized his work over the past 25 years. Mike is an adventurous scientist; his work is characterized by the unusual approach and the unconventional interpretation, and consequently he has produced significant advances in several areas. He is now hitting the peak of his career, and his reputation in the scientific community has skyrocketed over the past few years as people have realized the worth of his imaginative approach to science.

The most consistent thread running through Mike's research is his interest in all aspects of sulfur and sulfide minerals (particularly pyrrhotite, pyrite and related phases). I must state that this was quite difficult work, particularly in the early stages when there was not the wide variety of experimental techniques that we have today. This interest has continued to the present time. In the middle 1970s, he began to work both on the synthesis and stability of the sulfide minerals, and on chemical and textural aspects of their occurrence, particularly in important ore-deposits. His work on both these topics continues today. Mike has pioneered experimental work on the distribution of platinum-group elements using the latest spectroscopic and analytical techniques. He also has an extensive program of detailed analytical and textural work on the distribution of platinum-group elements and minerals in (primarily Canadian) ore deposits. Again we see this complementary aspect of the different directions of his work, the experimental laboratory work to find out what happens in the simple system, and the analytical field work to test the lab results against the more complex natural systems observed in the field.

An interest in thermodynamics grew out of Mike's experimental work on sulfides, and then took on a life of its own with work on silicate thermodynamics starting in the 1970s. However, Mike's predilection for complementary approaches asserted themselves here as well, and he began crystallographic and spectroscopic work on the characterization of order in minerals. I must mention here the work with Bancroft and Osborne on next-nearest-neighbor effects and partial quadruple-splittings in spinels; this is a classic piece of work, in my opinion some of the best Mössbauer spectroscopy ever done on minerals.

In the mid-1980s, Mike became interested in the structure of silicate glasses, a very intractable topic to say the least: (1) the preparation of good glass samples (*i.e.*, without separation or incipient crystallization) is quite difficult; (2) the experimental techniques are usually "non-standard", and Mike has been very energetic in initiating collaborations with other scientists who have the necessary instruments; (3) the interpretation of the experimental approach has really borne fruit. The combination of X-ray scattering, Raman, Mössbauer and X-ray absorption spectroscopies on the same material has allowed the derivation of short-range structural results that would not have been possible by using just a single technique. His interest in glass structure also sparked another research direction: the structure and phase relations of Al–Si–Ga–Ge–O systems of framework structures as long-range analogues of glass structure. While contributing significantly to our understanding of Al/Ga–Si/Ge ordering in glasses, this work has also been of great interest to our understanding of long-range order in crystals.

Mike Fleet's combination of experimental, theoretical and field work is unusual, and yet is the ideal approach to science. Mike has maintained (even increased) a high level of enthusiasm for science over the last 25 years. He is a "hands-on" person who is still in the laboratory in the evenings and on weekends, and it is because of this enthusiasm and curiosity that he has produced an outstanding body of work.

Fred J. Wicks
Past President

Thank you Fred for your generous citation. The prestige of the MAC Past Presidents' medal is built on a mineralogical community in Canada that is second to none in the world and on the scientific excellence of previous recipients. I am profoundly honored that the Association has selected me as this year's recipient.

As Fred has indicated, my research interests are a bit eclectic. I am occasionally asked if I am an X-ray crystallographer or a geochemist, and which do I like doing best. However, the mixing of crystallography and geochemistry is not an unnatural alliance. V.M. Goldschmidt was, in fact, an early X-ray crystallographer, and the first to study germanates as

analogue materials for silicates. I suppose that the natural bridge between these two disciplines, and the one developed by Goldschmidt, is crystal chemistry, although many years ago I decided that what I really practised was earth-materials science. Within the limitations of a fading memory, I can give you a brief account of how this division of my speciality arose and, along the way, acknowledge some of those who have been instrumental in defining my career.

My early years in science were not driven by mission, but by chance and circumstance. Initially an unmotivated student, my interests at Manchester University drifted from physics, to mathematics, and geography (I took science courses in just about everything except chemistry). Alex Deer accepted me into the Geology programme, largely on the basis of my mark in an elementary crystallography course. In the department of Deer, Howie and Zussman, my education in mineralogy and petrology was built around "the book": our undergraduate courses were dry runs for some of the chapters and, later, the galley proofs were a fertile source of research tidbits, although most of the better journals were on loan and in Deer's office. In spite of this excellent preparation in hard-rock geology, I elected to research a topic in low-temperature geochemistry. My Ph.D. supervisor, Geoffrey Nicholls, suggested that I do experiments on redox equilibria and sorption in clay mineral – water systems. My experimental apparatus consisted of a few mason jars, magnetic stirrers, and pH and Eh electrodes, and the scientific inspiration was to come from the landmark textbook of Robert Garrels. There were two problems: first, I had to wait until the following budget year for funds for the equipment, and, second, I knew absolutely nothing about chemistry. Therefore, I spent the hiatus studying chemistry, starting with the textbook *College Chemistry* by Linus Pauling. I graduated with a self-taught background in electrochemistry and analytical chemistry, and was hired at Western as a low-temperature geochemist. However, having been educated in the university of William and Lawrence Bragg, it had not escaped my attention that in order to study minerals and mineral reactions at the atomic level of resolution, I had to turn to X-ray diffraction techniques. So, armed with the textbooks of Martin Buerger, using locally available X-ray diffraction facilities, and building on prior experience with iron sulfides, I underwent a continuous transformation over the next few years, from low-temperature geochemist to X-ray crystallographer, specializing in ore minerals.

My research has benefitted greatly from the close relationship between the Departments of Chemistry and Earth Sciences at Western. In particular, collaboration with Michael Bancroft introduced me to chemical spectroscopy and quantum theory. Many of the jigs and jags in my research interests have resulted from working with graduate and undergraduate students and post-doctoral fellows. Continuing collaboration with former students has also been extremely rewarding, as has collaboration with colleagues at Western and scientists elsewhere.

I thank my wife and our three children for their patient and understanding support, and for providing a stable platform for my selfish scholarly pursuits. Given that the tangible fruits of my labors are research papers written in scientific mumbo jumbo, it requires a lot of faith on the part of family members to rationalize absences and chores left unattended.

Finally, I thank our country, Canada, for the opportunity to pursue an academic career. I know that I am too much of an unconformist and too single-minded to have prospered in any other country. Ours is indeed a country of diversity and tolerance. Although I obtained my formal qualifications to practise science in Britain, I actually became a scientist in the competitive research milieu of North America. I am deeply grateful to NSERC, and that means also to my peer group, for supporting my curiosity-driven research over this extended period of time. Thank you all very much.

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