

Acceptance of the 2020 Roebling Medal of the Mineralogical Society of America

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Thank you, Mike, for your very generous citation and for your support over many years as I moved fields from “dry” mineralogy to “wet” mineralogy. It is a great honor, totally unexpected, to have been nominated for the Roebling Medal and even more surprising to have been chosen. However, I thank those who have supported my nomination, and I thank the MSA for this most prestigious recognition. Scanning through the list of previous Roebling medalists is a really humbling exercise, but I note that I am the first Australian to be awarded this honor since C.E. Tilley in 1954 and W.L. Bragg in 1948.

My scientific life in Geosciences seems to me to have been a sequence of lucky circumstances, mostly out of my control. Meeting my future wife Christine, who was studying Geology at Newcastle University in Australia while I was messing around with physics and maths, was a major determinant in how the future would unfold. After graduating as school teachers, we moved to London, where I had the good fortune to discover Birkbeck College, which offered evening undergraduate lectures, so I enrolled for another Bachelor’s degree, this time in Geology (as Christine already had the textbooks). Despite four years of teaching Physics by day and being a student by night, Birkbeck and the Scottish field trips with Dick Merriman were great fun, and inspiring teachers like Brin Roberts and Paul Henderson got me hooked on geology and geochemistry and encouraged me to apply to Cambridge. So, I took the plunge to leave teaching and we moved to Cambridge, with two young children, to be a full-time student again.

In Cambridge, Desmond McConnell’s “materials science” approach to mineralogy, phase transformations, and microstructure was an eye-opener and defined my future in the subject. Cambridge was an exciting learning experience, first watching phase transformations in sulfides in an old AEI EM6G TEM and indexing diffraction patterns by hand; studying shocked meteorites with Dave Price and finding and naming wadsleyite; relating microstructures associated with Al,Si ordering in cordierite to NMR spectroscopy with Ross Angel and working with Richard Harrison on microstructures and magnetic properties, just to name a few of the somewhat random projects that took our fancy at the time. There was no real plan except to indulge our curiosity. A chance meeting at a Meteoritical Society conference in Heidelberg somewhat inexplicably led to a substantial funding package over many years to study barite scale formation in North Sea Oil production and to learn about crystal growth and nucleation inhibitors. Meeting Lurdes Fernández-Díaz and Manuel Prieto and their students in Madrid was another lucky event that opened up a new avenue—how solid solutions nucleate and grow from a



multicomponent aqueous solution, a problem which one would have thought was solved by physical chemists a century ago, but not so. The interplay between thermodynamics and kinetics in such an apparently simple situation has yet to be fully understood, especially when the solutions are confined in porous media.

The study of feldspar microstructures was a major pastime in Cambridge, but it was Ian Parsons from Edinburgh who pointed out that the microstructures we see in Nature are largely the result of reactions between minerals and aqueous solutions. I was slow to appreciate the full significance of this, but the opportunity to move to Münster University in Germany in 1995 provided the resources and the environment to allow a marked shift in my research emphasis. By that time, Christine was back into research, after six children, a Ph.D., and various part-time jobs to prop up her husband’s “full-time occupation.” With Mike Hochella’s help, we set up an AFM lab in Münster. Generous research funding from the European Union, the German Research Council (DFG), and the Humboldt Foundation allowed a steady flow of postdocs, students, and international visitors that provided a very lively research and party atmosphere. Being in the same Institute as Klaus Mezger and his dynamic group gave the place a broader philosophical perspective in both teaching and research.

Ian Parsons’s invitation to give a Plenary Lecture at the 2002 IMA in Edinburgh caused me to re-assess my research direction and was a defining point in my career. At around the same time, again by a fortuitous circumstance, I met Håkon Austrheim and Bjørn Jamtveit at a meeting in Norway, and the role of fluids in

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metamorphism, beyond merely speeding up reactions, also became my research focus. Bjørn's annual Kongsberg Seminar held over a few days at the historical silver mine provided plenty of food (and drink) for thought on the Physics of Geological Processes (PGP) and gave me the opportunity to meet a wide spectrum of field geologists, modelers, and experimentalists. Over annual field trips to the most beautiful metamorphic rocks and exposures in western Norway, I started re-training and studying the way that interfacial fluids controlled reactions and deformation.

As Director of The Institute for Geoscience Research (TIGeR) at Curtin University in Perth from 2015–2020 I had the opportunity of working in Australia again and experiencing the fantastic ancient geology of central and Western Australia on field trips with Tom Raimondo and Ben Grguric as well as seeing the

reality of large-scale mining. The annual TIGeR Conference (<https://tiger.curtin.edu.au/conferences/>), partly modeled on the Kongsberg Seminar, attracted geoscientists from around the world and highlighted the themes that continue to be the focus of my ongoing research.

I have been extremely lucky to have had a career that moved smoothly from one project to another and from one country to another, without any great stress, in a well-funded system where I was free to indulge my interests. Of course, having the kind of home support that has also enabled our six children to achieve professional careers also speaks volumes for another cliché'd but true expression – “behind every successful man...”

Once again, I thank the MSA for this great honor that I accept with gratitude.