American Mineralogist, Volume 90, pages 1032, 2005

Acceptance of the Dana Medal of the Mineralogical Society of America for 2004

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The Dana Medal is a great honor for which I am very grateful to the Mineralogical Society of America, the nominators and the Awards Committee. Receiving an award like this from your peers is a humbling experience. With luck I will continue to live up to its standards. One of the most important benefits is the opportunity to consider the changes in the field that have occurred over a career and the complex interactions among the factors that lead to scientific advancements and successful science. These factors include a great deal of hard work, good fortune, and a local, national and international research environment that promotes scientific excellence. We live in an extraordinary historical period for science, and it has been my great fortune to be able to build my career during that time. When I started, equilibrium thermodynamics was the nearly universal way of thinking about geochemical systems, the electron microprobe was a novel tool, and automated diffractometers were just coming on line. What change there has been! The two parts of my career, the earlier days of crystallization kinetics and igneous petrology and the later days of materials structure and dynamics with NMR spectroscopy and molecular modeling, are reflections of these changes. I must say, however, that I often regret that the petrographic microscope is no longer a daily research tool.

The most important factor in any career, however, is people, and this is certainly true in my case. The most important person is, of course, my wife Carol. Her love and support for more than 20 years has been a great joy. As one of my students once remarked, "Without Carol you wouldn't get done half of what you do." Our children, Greg, Kathy, and Geoff, and now their children have been an equal joy.

My Ph.D. advisor, Dave Anderson who passed away a few years ago, was a very important influence. Dave was able to strike the right balance between close advising and freedom to pursue my own directions. I've tried to follow that model as much as possible with my own students. I especially want to thank my post-doc advisor, Jim Hays, for taking a chance with me when many others did not fully recognize the importance of crystallization rates and processes in understanding igneous rocks. Like Dave, Jim turned me loose to pursue my own ideas. Without doubt, the intellectual environment created by that extraordinary group of faculty, post-docs, and students at Harvard in the mid-1970s also played a very significant role in making that time successful.

We've been doing NMR now for more than 20 years, and I'm most grateful to still be at it. I was fortunate to have started with it at the time when the then new experimental capabilities of high field superconducting magnets, pulse Fourier transform data acquisition, and magic angle spinning were just becoming generally available. We all felt like kids in a candy store. Suddenly, much of the periodic table was open to direct and element-specific structural and dynamical investigation to a scientific depth not previously envisioned. The range of novel and critical questions related to minerals, geochemistry and synthetic materials seemed limitless. It's the kind of thing that, if one is lucky, comes along once in a lifetime. When we first started, my students and I knew little about NMR and it was a significant challenge to learn both the theory and the experimental methods. It's still a tough technique. I have to thank my long-time collaborators Eric Oldfield and Gary Turner as well as several of Eric's students for the patience they showed in helping us get up to speed. Interaction with John Hower, Don Henderson, and Steve Altaner in Geology at Illinois were also key in those early days.

Most of the credit for this award, of course, goes to the outstanding group of students and post-docs with whom I've been fortunate to work over the years. Each one of them has taught me important new science, and it is principally through their efforts that we've been able to keep the program going. I especially want to thank Brian Phillips, who finished his Ph.D. with me in the early 1900s. Brian's transformation from student to colleague took place in record time, and it was a clear case of him teaching me more than I taught him. More recently, we've added computational molecular modeling to our program. Andrey Kalinichev has been the central player in this effort, and our collaboration with Randy Cygan in this area has been essential. These methods have proven to be just the right tool to understand a wide range of spectroscopic observations that were previously ambiguous or down right uninterpretable on a molecular scale. As is the case for many good research directions, the modeling is taking us far beyond this initial objective.

One advantage of being an early adopter of a technique like NMR is the opportunity to collaborate with highly talented people from around the world. Just let me note the deep and productive interactions we have had with Bruce Bunker and Richard Brow on glass science, Alex Navrotsky and Paul McMillan on a wide range of materials, Michael Carpenter and Andrew Putnis on phase transitions, Francis Young and Leslie Struble on cement chemistry, and Randy Cygan on both shocked materials and molecular modeling. Each of these interactions has been both professionally and personally very rewarding.

0003-004X/05/0506–1032$05.00/DOI: 10.2138/am.2005.442