

Acceptance of the Dana Medal of the Mineralogical Society of America for 2014

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Distinguished colleagues and friends, it is a pleasure to be the 2014 recipient of the Dana Medal. I am deeply humbled by your many congratulations. In reflecting upon the many people that have made the path to this place possible, I have been continually reminded of the old saying that “If I have seen farther, it is by standing on the shoulders of giants.”

Well, I have had the support of many giants as family, colleagues, and friends. The first were my parents who supported my interest in science. Each year of high school, Mom would transport my science project to the local gymnasium for the local science fair competitions. They also encouraged my papers and presentations at meetings of the Virginia Junior Academy of Science. This was decades before anyone had heard of STEM but our world was full of science and dedicated teachers who gave countless hours of their time.

As a M.S. student at Virginia Tech, I had the good fortune of meeting my first academic giant, Don Rimstidt, a new breed of “low-temperature” geochemist who called upon kinetics and thermodynamics as a powerful toolbox for understanding the environment. We also had Jerry Gibbs, Don Bloss, and Paul Ribbe as a mineralogical triumvirate. I particularly remember that Jerry was working on his 1982 MSA Presidential address. His paper, “Molecules as models for bonding in silicates” (*American Mineralogist* 67, 421–450, 1982) was radical at the time because he combined computational methods with experimental evidence to make the claim that short-range forces control bonding and reactivity in minerals. For me, this suggested a new way to think about mineral-water interactions and formed an anchor point in my experience.

At Princeton, Alex Navrotsky became a pivotal part of my Ph.D. and helped me navigate the last part of my dissertation after my advisor, David Crerar, was disabled by a rare brain disease. She also pointed me to a new NSF Postdoc program that led me to study mineral surfaces with Mike Hochella at Stanford. From that time forward, Alex and Mike became the most important mentors of my career, who both encouraged and admonished me on an as-needed basis. *Thank you, Alex and Mike.*

Over the last 20 years, research in our group has largely focused on understanding the formation of biological minerals. That is, biomineralization, the processes by which animals and plants grow crystals within their tissues to form skeletons and other functional materials.

At this intersection of biology, mineralogy, and chemistry, I have had the privilege of working with fantastic students and colleagues from many different disciplines—biology, chemistry, physics, chemical engineering, materials, and more. In particular, I want to acknowledge my long-time colleague, Jim De Yoreo, now at PNNL. Jim and I continue to work together on many



projects in rewarding collaborations. There is no question that a big part of this recognition should be credited to him.

Finally, Joseph Dove has been more than a giant. He has been my Rock of Gibraltar and I was lucky enough to meet him when we were only undergraduates. Last fall, we celebrated our 33rd wedding anniversary with our two children, Meredith (17) and Emerson (12). Joe has provided unconditional support these many years.

In closing, I would like to remind you that Dana’s classification scheme, first published in 1837, became the basis for categorizing our mineralogical world—from planetary cores to atmospheric nanoparticles. But did you know that Dana was also a zoologist and wrote books about corals and crustaceans? I wonder if he considered the skeletons of these creatures in the context of crystals? The origins of their shapes, compositions, and how they grew? Or how their patterns are controlled by biochemistry through genetics?

Whether he thought of these things or not, I am confident that Dana would be delighted to see biological minerals in the modern scientific landscape. Biology is teaching us a lot of new things about mineral formation. But let’s not fool ourselves. Today’s understanding of biominerals is merely embryonic compared to what our students are going to uncover over the next 20 years.

So there you have it. I dedicate this Dana Medal to all of the giants in our lives. They are the teachers, advisors, and parents who have inspired each of us. This mid-career award is also a reminder of our obligation to pay forward to the next generation. With all of you—whether you are a past or future giant—I humbly share this challenge. Thank you.