# Acceptance of the 2016 Roebling Medal of the Mineralogical Society of America

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President Lange, Friends, and Colleagues:

What a thrill to be here today, celebrating mineralogy. And Rus. Thank you for those most kind remarks. Your unwavering support, both professional and personal, has played a significant role through most of my career, and I am more grateful than I can easily express.

Receiving a medal named for Washington Roebling has special meaning for me, as I feel a kinship with the great engineer in at least two significant ways. First is our mutual love of mineralogy. My passion for minerals was kindled in eighth grade, when I was fortunate to have Wilfred Welsh as my science teacher. Bill Welsh was a soft-spoken, engaged, but initially unassuming teacher. He lined his classroom with glass cases and filled them with beautiful minerals. He observed me lingering after class, examining one specimen after another, and he offered to teach me more. He gave me a starter collection of 100 specimens, mineral field guides, and mimeographed directions to Paterson and Franklin, New Jersey (favored haunts of Washington Roebling, by the way).

I visited those great localities again and again, including a memorable Franklin, New Jersey, date with Margee in 1966—50 years ago. We still have fluorescent specimens collected that night. Needless to say, I was hooked—both by mineralogy and by Margee, who has shared in every step of this journey.

Fast forward to freshman year at MIT, where my arrival coincided with that of the ebullient, passionate David R. Wones—my mineralogy teacher and subsequent Masters Thesis adviser. What an inspiration Dave was! I had gone to MIT toying with the idea of becoming a chemical engineer, but within a few weeks of enrolling, experiencing Dave Wones' enthusiasm and commitment, the way he bounded across outcrops, equally at home explaining rocks, identifying birds, and quoting poetry, I knew that the mineralogical life was my calling.

Dave Wones taught me the basics, but Charlie Burnham nurtured and focused my passion and gave me the chance to grow as a researcher. Charlie was a great mentor and friend—and I'm thrilled that he and Mary Sue are here today. He was always available to help when I asked, but he also gave me the space to make mistakes, to learn on my own, and to gain confidence as a young scientist. Together we figured out how to do high-pressure crystallography on a 4-circle diffractometer, and that technique became the focus of my early career.

A year after my Ph.D. I found myself at the Geophysical Laboratory, where Larry Finger was the master crystallographer. It was a match made in mineralogical heaven: Larry loved to write code, build machines, and analyze data; I loved to mount crystals, run the diffractometers, and write papers. Our collaboration of two decades was amazingly rich, productive, and fun. I would not be here today were it not for Larry's unique and lasting contributions to mineralogy, and this award is as much his as it is mine. And I'm utterly delighted that you are here today, Larry.

In 1996, 20 years after coming to the Geophysical Lab, I changed directions and began to think about interactions between life and minerals. With Carnegie colleagues George Cody and Hat Yoder we started an experimental program to understand how rocks might have played key roles in life's origins. And shortly thereafter I began my long collaboration with Dimitri Sverjensky at Johns Hopkins to study the interactions of organic molecules with mineral surfaces in the context of Earth's early geochemical environments. Those studies of the literal interface between the mineralogical and biological worlds paved the way for mineral evolution.

The last decade has seen the shift to what I think are really fun new areas of study—mineral evolution, mineral ecology, and the network analysis of minerals—all made possible by the curation, integration, statistical analysis, and visualization of "big data." And here I owe so much to the pioneers of mineral data—Jolyon Ralph at mindat, Kerstin Lehnert at EarthChem, and, most importantly for me, Bob Downs at the University of Arizona.

I've known and worked with Bob for almost a quarter century, and have watched him mature into an extraordinary leader. Bob Downs has nurtured an exceptional team of colleagues, and his rruff data project is transforming the way we do mineralogy. None of my recent work would have been possible without Bob's contributions.

It should be obvious to all of you by now that my career has been built to an unusual degree by an openly acknowledged reliance on the knowledge and expertise of others. I have never been a solitary researcher; my path to understanding has been, and continues to be, a journey shared by many scientists far more capable than I.

Which brings me to the second characteristic I hope that I share with this medal's namesake, Washington Roebling. I, too, am passionate about building bridges. My principal scientific interest and desire is to find connections among disparate fields
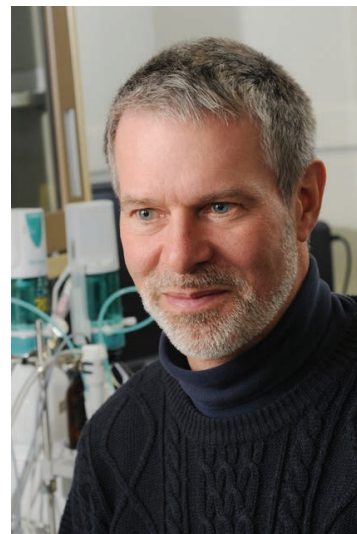
of study—bridging the sometimes yawning divides between geology and biology, sociology and mineralogy, even science and the arts.

My approach—one I recommend to all my colleagues—is to read as widely as possible, keeping your mind open to previously unrecognized connections and opportunities. Who knows when an article on lexicology, or proteomics, or island biogeography, or the network of Facebook friends might trigger a new idea—a link that opens new doors to knowledge.

And here I must thank two magnificent foundations. The Alfred P. Sloan Foundation, who has underwritten the Deep Carbon Observatory, is an amazing organization. They are committed to multidisciplinary science, and they have invested upwards of $50 million in the DCO, which now has 1000 collaborators in 45 countries. The opportunity to participate in this global venture, and to put some of my ideas about multidisciplinary science to the test, continues to be one of the defining ventures of my career.

I am also deeply indebted to the W.M. Keck Foundation, the sponsor of our Deep-Time Data Project, which focuses on the co-evolving geosphere and biosphere. Both the Sloan and the Keck Foundations have embraced our quirky approaches. And, perhaps most importantly, these programs have given me the opportunity to work with the most extraordinary team of early-career scientists, each of whom brings fresh ideas and expertise far beyond my own.

And so I want to conclude these remarks by looking to the future and recognizing these exceptional colleagues—young scientists who will carry these ideas forward. And might I ask each of you to stand, and remain standing, as I mention your names. Working with you over the past years, and anticipating the years to come with you as collaborators, has been one of the greatest privileges of my scientific career. Mathematician Grethe Hystad at Purdue; Dan Hummer at the University of Southern Illinois; Xiaoming Liu at the University of North Carolina; Chao Liu and Mike Meyer at Carnegie's Geophysical Lab; Shaunna Morrison, Joshua Golden, Alex Pires, and Derek Hoffman at the University of Arizona; and Marshall Ma from RPI. Thanks to all of you for making this science so exciting and fun.

And finally, I can't help but remarking that, in spite of the Roebling Medal's caché as an award conferred at the end of a distinguished career, I desperately hope that my most creative years lie ahead. We are watching the emergence of a new age of big-data mineralogy—a transformation that is only just beginning to come into focus. I pledge to continue to be an enthusiastic participant in this amazing adventure for as long as I am able.

And so I thank the Mineralogical Society of America, and accept this great award as a sobering challenge as well an inspiring honor. Thank you!