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Acceptance of the Roebling Medal of the Mineralogical Society of America for 1983

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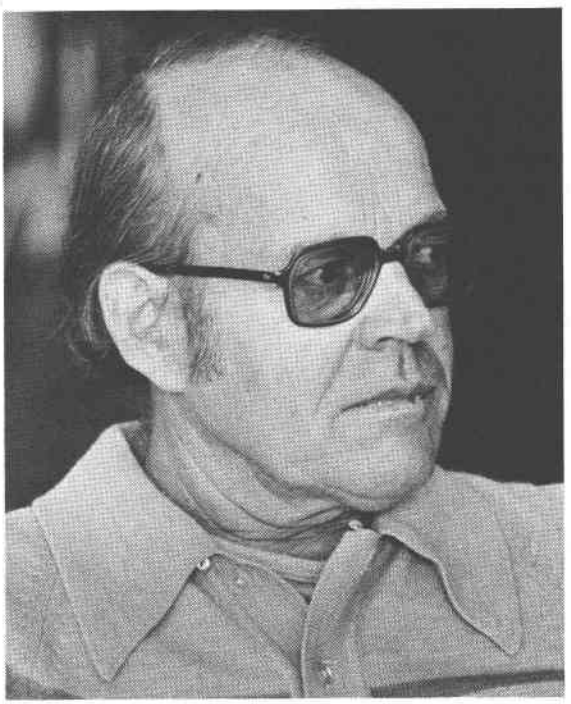
President Roedder, Members of the Society, Guests:

One hundred years ago this spring, a bridge built by John Augustus Roebling, father, and Washington Augustus Roebling, son, was dedicated which to this day connects Brooklyn with Manhattan across the East River. The son, of course, is the reason why I'm privileged to stand before you today and why it is appropriate to use the bridge as the theme of my brief remarks. John Augustus Roebling, or if you permit me to deanglicize his name, Hans-August Röbling, was born in Prussia in 1806. Hans-August was his first name, just like mine is Hans-Peter, shortened for American usage to Hans or John. After studying civil engineering in Berlin he moved to Pittsburgh, where he began to realize his central idea: building of bridges supported by wire ropes or steel cables. Starting with an aqueduct across the Allegheny River, graduating to a combined road-railroad bridge over the Niagara Falls, he finally gave his life to the Brooklyn bridge. He died of tetanus in 1869 after being injured while laying out the supporting towers.



Washington Augustus Roebling completed the bridge and added to the achievements of his father. He had the leisure and means to assemble a remarkable mineral collection and to generously endow the Mineralogical Society of America. Today I am the immediate beneficiary of his generosity. In the early fifties, when we were synthesizing layered silicates, I frequently used his collection, housed in the Smithsonian Institution. I particularly remember specimen R4416, a fine paragonite we used as starting material. During those happy years at the Geophysical Laboratory, I was, in fact, working as a mineralogist, synthesizing minerals and defining their thermal stabilities, chemical and X-ray properties. What I have done since hardly fits the mold of a mineralogist, either of the geometric kind exemplified by my late teacher Paul Niggli, or of the modern TEM type represented by my office neighbor and cocelebrant, Dave Veblen. Why then should I be honored today by the Mineralogical Society, for work in experimental petrology, geochemistry and sedimentology? Aside from the very generous interpretation of their charge by the selection committee, it points to the role of mineralogy as a bridge. Paul Niggli, in one of his philosophical essays, spoke of crystallography and mineralogy as the glue, which binds together the natural sciences through the concept of order in the solid state. Glue or bridge, the architecture of the solid state certainly is a central theme for physics, chemistry, biology and geology and the Niggli message was not lost on me. However, I also belong to the lucky generation of geologists who came into their own after the war. We had new toys and new thoughts and could try anything once and almost everything worked. I agree with Connie Krauskopf that the real revolution in the earth sciences was initiated in the fifties rather than the sixties: the change from a largely descriptive to a quantitative science. I remember buying the 1951 text on igneous and metamorphic petrology by Turner and Verhoogen and taking it into the Canadian bush where it competed for my attention with black flies. Verhoogen's sections baffled me but I couldn't let go. I finally mastered that material years later after I started teaching it at Johns Hopkins. Building a bridge from chemistry to geology became and still is a passion for me, but building bridges depends on having strong anchors and towers in the lands to be joined, as John Augustus

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Roebling knew. My anchor in geology was built while I labored on my thesis, mapping metamorphics in the Alps, and I feel good about it, but my tower in chemistry is another matter. Its foundation, also built in Switzerland, is sound, but it pointed in the wrong direction. I was taught how to analyze rocks, but I never had a course in physical chemistry or thermodynamics and hence those symbols of Verhoogen looked so strange. I am still building and shoring up that structure and I have been lucky to have smart people teaching me during the last 25 years, from Dave Wones to John Weare. Dave was my first student and, although he'll tell you otherwise, he taught me more than I taught him. He got his Ph.D. from MIT and I never had to read his thesis and perhaps that is why we are still good friends. Dave was followed by a string of students too long to mention, but each one helped eradicate another corner of my ignorance.

Just about the time Dave was finishing his thesis, I was asked to review a paper by Charles Milton on the Green River minerals and this started me on a second track which only now is becoming integrated with my earlier interests. I cannot explain my continued fascination with salt lakes. In fact some of my friends gently chided me for escapism and wasting my time. That may be, but it has been an enormous source of fun, excitement and adventure. Initially it was just Blair Jones and I and then Laurie Hardie joined us. Here too, bridges had to be built, from mineralogy to water chemistry to sedimentology and even to organic geochemistry. For our recent study of Great Salt Lake, for instance, Blair and I assembled a dozen specialists to carry out the necessary work and we learned what it means to organize a research team. Clearly both of us prefer one-on-one collaboration.

Although I do not consider myself to be a mineralogist, minerals and mineral assemblages remain near the center of my interests. Looking back over 30 years to the days when Hat Yoder first introduced me to the world of hydrothermal synthesis, I realize that the central theme has been and still is the interaction of minerals with aqueous fluids, from surface waters to geothermal brines to metamorphic fluids to igneous gases; a bridge carrying water just like Roebling's aqueduct over the Allegheny River. Even my newest venture into ore deposits is launched from a watery base.

To thank all those who have helped me in my scientific endeavors would be name dropping and selecting among my teachers, students and colleagues is too difficult. There are three people, however, that I feel compelled to acknowledge. Blair F. Jones, an early student, longstanding friend, colleague and perennial coauthor: You make it look as if it is easy to work with me, a precious illusion not shared by many. Bob Houston, southern gentleman and Indian expert of Laramie, Wyoming: You have prodded me into my new venture; the geochemistry of hydrothermal ore deposits and your friendship and the snow in the Rockies are the reasons for my yearly treck west. Finally, Elaine Koppelman, the James Beall Professor of Mathematics at Goucher College. Those of you who teach are familiar with the five-minute panic, when five minutes before the lecture an equation suddenly looks mysterious and unfathomable. As the clock ticks away and desperation mounts, you consider whether you should declare yourself sick, run away, commit suicide or just brazenly pretend to understand. That's when I call Prof. Koppelman who then calmly clarifies that tricky derivation. During the summer months she acts as my most trusted and capable field assistant, and unhesitatingly follows me to the salt lakes of Africa and the high Andes or the tin mines in China. She is also an excellent cook and, as my wife, makes life worth living. A native of Brooklyn, she is very much connected with the Brooklyn Bridge and hence to the father and son team of J. A. and W. A. Roebling. I accept this medal for both of us and we thank you for this honor and for including us in the brotherhood and sisterhood of mineralogists. Thank you very much.