American Mineralogist, Volume 68, pages 653–654, 1983

Presentation of the Mineralogical Society of America Award for 1982 to Robert Miller Hazen

CHARLES W. BURNHAM

Department of Geological Sciences
Harvard University
Cambridge, Massachusetts 02138

President Lindsley, Members of the Mineralogical Society of America, and guests:

Every profession has its rewards, and, as many of you know, one of the exciting rewards of teaching is the thrill of catalyzing transformations of graduate students to colleagues and independent scientists. It is particularly fulfilling when original contributions of a young scientist are recognized as noteworthy. Thus it is a special privilege for me to introduce Robert Miller Hazen as this year's recipient of the MSA Award.

I first met Bob in 1970 as he was completing a five-year combined Bachelors/Masters degree program at MIT. Working with Dave Wones, he had synthesized a variety of chemically-distinct trioctahedral micas and was examining changes of cell dimensions and optical properties as a function of composition. That thesis emerged as his first paper and is still widely cited.

Bob moved up the river to Harvard in 1971 and began learning the techniques of structure analysis. At the time, Joe Smyth was setting up equipment for high temperature structure analysis, and Bob immediately recognized the significance of such a capability. Even as they worked together on high-temperature structure analyses of olivine, Bob's motivation was clear: Changes of atom coordinates and cell dimensions had little intrinsic interest, but if the structure analysis would lead to an understanding of why olivine behaves the way it does, then the experiment was worth it. The desire to get at the underlying crystal chemistry drove Bob then, and continues to drive him today.

In the early 1970's Piermarini and Bassett had demonstrated that the miniature diamond cell could be used to carry out structure analyses of single crystals at high pressure. This intrigued Bob, and he proposed to use the diamond cell to carry out such analyses of olivine as part of his Ph.D. thesis. But first, for practice, he examined gillespite and showed that the reversible transformation at 26 kilobars results in just minor buckling of the square-planar Fe^{2+} coordination polyhedron to a very flattened tetrahedron, and does not involve a change in the spin state of Fe^{2+}, which had previously been suggested.

After completing his doctorate in 1975, Bob spent a year at Cambridge University on a NATO Post-Doctoral Fellowship. His ideas regarding the similarity of a structure's response to increasing pressure and decreasing temperature began to take form. His prediction that sanidine ought to undergo a displacive transformation to triclinic symmetry at high pressure was born out by observation, and some empirical generalizations about the temperature and pressure behavior of oxide and silicate structures were published in fruitful collaboration with Charlie Prewitt. The high-temperature and high-pressure structure data that emerged from several laboratories in the mid-1970's provided the ingredients for profitable synthesis and reflection on the underlying crystal chemistry. Bob's ideas were formalized in a 1977 paper on "Temperature, pressure, and composition: Structurally analogous variables."

Upon returning from Cambridge to the Geophysical Laboratory, Bob began a productive collaboration with Larry Finger, Dave Mao, and Peter Bell that continues to flourish and has already seen publication of some 50 joint papers. Just this year he and Larry Finger have reported development of a pressure cell that can also be heated, thus the frontier of crystal structure analysis at high temperature *and* high pressure has now been penetrated.

The common theme of the career we recognize today is the quest for understanding how changes in temperature and pressure affect crystal structures. Every observation contributes to the synthesis of an empirical generalization, generalization leads to prediction, which leads in turn to further experiment. We see a synergistic interaction of experimental prowess and theoretical intuition.

What I have just described would represent for most of us a total effort leaving no time for other serious endeavors, much less any time for pleasure. But—amazingly enough—not for Bob. He continues to carry on two other equally successful careers (and maybe others I don't even know about!).

The same year he completed his Ph.D. thesis he also published a paper on "The founding of geology in America: 1771 to 1818." Continued study on the early history of geology in America has led to several papers and two books. In these efforts he collaborates with the best of all possible collaborators: his lovely wife, Margaret. His spare time is occupied playing the trumpet professionally. I recall fondly some very pleasureable lunch hours spent

0003–004X/83/0506–0653$02.00

enjoying the music of his brass ensemble filling the central hall of Harvard's Busch Reisinger Museum. Bob has performed with the Boston and National Symphony Orchestras, l'Orchestre de Paris; the New York, Boston, and Washington Operas; and the Jeoffrey, American, and Royal Ballets. And—just for the fun of it—he recently published a delightful collection of geologic poetry.

Specialization is at once a thrill and a curse. Many of us, I suspect, wish for wider horizons, and look with envy on those who contribute with competence in several distinct endeavors. In this respect Bob sets an extraordinary standard. Disparate specializations interact, and the whole is distinctly greater than the sum of its parts. It is, therefore, an honor to present to you today a truly synergistic mineralogist as the Mineralogical Society of America Award winner for 1982: Robert Miller Hazen.