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Presentation of the Mineralogical Society of America Award for 1983 to David Rodli Veblen

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

It is a special privilege for me to introduce David Veblen as this year's MSA Award winner. In a certain sense I consider Dave to have been my first student; he was beginning his sophomore year at Harvard College when I arrived to begin my teaching career in 1966. So, for better or for worse, he is the student over whose career I may have had the earliest influence. More than once he has chided me about this seniority matter, yet I remain in his debt for demonstrating, in short order, that indeed there would be keen interest and talent attracted to mineralogy and crystal chemistry, even among undergraduates.

The spring of 1969 was a tumultuous one at Harvard, as those who were there will undoubtedly recall with anguish. Yet through the upheaval—physical, mental, and spiritual—Dave interwove with remarkable agility and mature perspective a crystallographic study of two hedenbergitic pyroxenes with the intense distractions of Vietnam and institutions in turmoil. I remember fondly the respite of a Mineralogical Association of Canada conference in Montreal at which Dave delivered his first paper, a report of his senior honors thesis on the crystal chemistry of these pyroxenes, which had led to his graduation *magna cum laude* with highest honors in geology in June, 1969. From Montreal Dave headed for western Canada and a stint at The University of British Columbia; it was to be four years until our paths would once again merge.

Fortunately for Harvard, Dave returned to pursue graduate study in 1973. Those of you who follow the history of silicate crystal chemistry will perhaps recall Jim Thompson's perceptive observations about toy pyriboles, which soon influenced Dave's choice of thesis topic. The fact that the straighter of the two kinds of tetrahedral chains in both enstatite and anthophyllite violate a kind of parity that ought to obtain if the structures were ideal apparently offended Jim's sensibilities, so he was very persistent with both Dave and me that we really should explore the possibility that the observed structures were averaged artifacts with the wrong apparent space group. If we were to look in the right place, such as a suitable metamorphic terrain where much time for low temperature structure equilibrium had been available, would we not find orthopyriboles with lower symmetry, and from Jim's standpoint, better sense about how an orthopyribole structure ought to behave? Well—the blackwall zone of the old Chester (Vermont) quarry seemed like a good site, and light tan crystals that were presumed by Jim to be anthophyllite (having previously been presumed by Harry Hess to be enstatite) were judged the appropriate candidates. The first precession photographs Dave developed showed instead the 45Å **b**-axis repeat of what became known as chesterite, the first recognized example of a chain silicate with an ordered alternating sequence of two tetrahedral chain types—in this case doubles (as in amphiboles) and triples as Dave soon afterward discovered in what he named jimthompsonite. The elusive low-symmetry orthoamphiboles remain undiscovered.

Dave's Ph.D. thesis, completed in 1976, did more than just characterize thoroughly the mineralogy and crystal structures of these new minerals. It laid the sound crystal chemical basis for an entire new and potentially very extensive mineral group. Johannsen's term *biopyribole*, coined in 1911 perhaps to avoid the potential embarrassment of tricky field identifications of pyroxenes, amphiboles, and dark micas, now took on a new and much more siginificant meaning. While Thompson had showed the usefulness of considering amphiboles as built up of alternating pyroxene- and mica-like slabs, Dave Veblen now demonstrated that these slabs need not come in a 1:1 ratio. Instead there exists a real mechanism to construct large numbers of phases ranging almost continuously in both chemical composition and structure from pyroxenes to sheet silicates.

Recognizing that single-crystal photographs of the new biopyriboles exhibited diffuseness in the slab stacking direction, and being very aware of the remarkable capabilities of high-resolution transmission electron microscopy demonstrated by Peter Buseck and his colleagues at Arizona State University, Dave relished the opportunity to explore biopyribole microstructures. Since his first high-resolution TEM studies were reported in 1977, he has kept up the assault on our simplistic perceptions with a continuous saga of extraordinarily complex stackings, a kaleidoscope of planar defects, and photographic evi-

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dence for a plethora of solid state reaction mechanisms. Twice Dave's handiwork has adorned the cover of *Science* magazine. The question as to whether a newly observed stacking sequence is a legitimate polytype or simply a statistical accident was nicely handled in a paper that illustrated two jimthompsonite polytypes with slab repeats of 81Å and 189Å. These are, unfortunately, intermediate reaction products with probabilities of 2×10^{-8} and 6×10^{-17} of occurring randomly. Dave has shown us serpentine in which the flat layers of lizardite pass continuously into rolled chrysotile fibers. And he has recently shown us for the first time exsolution in mica, specifically talc exsolving from the Na-rich mica wonesite, in lamellae inclined some 35° from the structural layers parallel to (001).

The beauty and power of Dave's papers lie partly in his remarkable photographs that give us such stark insight as to the true goings-on inside biopyriboles, but perhaps more significantly they also lie in the bringing to bear a combination of experimental prowess, theoretical insight, and plain crystal chemical sense. Read his papers and you will be taken on an exciting tour into an atomistic world that is at once frustrating in its complexity but comforting in its revelation that all the ways we might have thought silicate modules could be assembled probably do occur somewhere.

The Johns Hopkins extravaganza we witness here today was made possible when Dave moved to Baltimore in 1981. Those of you who have had the intellectual pleasure and stimulation of being associated with Dave either as his student or his colleague will understand when I say how much I appreciate having had the opportunity to teach and advise him and to watch him develop, explore, and prosper. His achievements, both those we recognize today and those that will surely follow, are truly his own, yet inevitably they are a source of pride to his teachers as well. It is, therefore, with great pleasure and gratitude that I present to you as the 1983 Mineralogical Society of America Award winner a young mineralogist whose structural insights have already stongly influenced our perceptions of the inner workings of silicate minerals: David Rodli Veblen.