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Presentation of the Mineralogical Society of America Award for 1994 to Ronald E. Cohen

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It is a great pleasure to introduce Ron Cohen as recipient of the 1994 Mineralogical Society of America Award. Mineralogy, mineral physics, earth materials, materials science—these categories overlap, and each term evokes a slightly different flavor and a somewhat different constituency. Ron Cohen speaks to all of them. Quantum mechanics, band theory, density functionals, muffin tins, metallization, lattice dynamics, molecular dynamics—are these legitimate, useful, and exciting concerns for modern mineralogy? Yes they are, and Ron Cohen is in the thick of the excitement.

I am especially honored to introduce Ron to you, since I am not in any way responsible for his early development. Harvard University, and especially Charlie Burnham and Jim Thompson, saw to that and inspired in Ron both a love of mineralogy and a love of rigorous theory. He followed his education at Harvard with several years at the Naval Research Laboratory, where he honed his computational skills and practiced them on perovskites in the nation's service, barium and lead titanate ceramics important as piezoelectrics, dielectrics, actuators, and sensors. There he was also involved with some of the most complex perovskites of them all, the oxide superconductors. But his love of mineralogy drove him back into our field and to the Geophysical Laboratory of the Carnegie Institution of Washington, first in collaborations and then as a full-time staff member.

In the Geophysical Lab, and as part of the Center for High Pressure Research (CHiPR), Ron seeks fundamental explanations and predictions of the behavior of minerals at very high pressure. I cite two examples of his contributions. Since the late 1970s it was recognized that wüstite (FeO) probably undergoes a phase transition near 70 GPa. The nature of this transition was unclear, and behavior at low and high temperature was probably different. Cohen's calculations showed the nature of the distortion brought about by stronger Fe-Fe interactions and identified the essential features of the rhombohedral phase seen in diamond-cell experiments near room temperature. Recent studies in a heated diamond cell by Fei, a colleague at the Geophysical Lab, found another phase at high temperature, the nickel arsenide structure as suggested by shock-wave experiments and by semiempirical correlations (including some of my own predications). Ron's theory helps pull all these observations together into a coherent picture.

Can $MgSiO_3$ perovskite, orthorhombic in quenched samples, become cubic in the lower mantle? This seemingly arcane crystallographic question may have implications for problems as broad as whether the upper and lower mantle have the same bulk composition. The experimental pendulum seems to swing back and forth on this issue, and theoretical guidance is useful. Ron's calculations show a very deep double minimum in the curve of energy vs. distortion, suggesting the cubic phase is energetically prohibitive at any P and T. Right now this issue is a hot topic within the mineral physics community in the U.S. and Japan, and each new stint at the synchrotron brings new data. The interplay of theory and experiment is certainly the right way to make progress in this very difficult field.

Let me close with two vignettes that shed light on Ron's character, which is both hard-driving and generous. Scene one: A few years ago a cross section of the mineral physics community found itself at a secluded conference center in Ise, Japan, when the U.S. started bombing Iraq. CNN was dubbed in Japanese, and we were concerned about what was going on. Ron had his portable computer, figured out how to plug into the phone system, and we were immediately on the information superhighway. Scene two: Two years ago I and a graduate student visited Ron to talk about theoretical approaches to carbonate energetics. Ron spent several hours with us, gave a wonderfully clear and very appropriately pitched tutorial in quantum chemistry to the student, and invited him to come back and collaborate. Though we have since been too involved in difficult experiments to find time to take him up, we cherish the time he spent, and feel the invitation remains open.

In conclusion, ladies and gentlemen, it is a pleasure to present to you Ronald E. Cohen, a first-rate scientist and a real mensch.

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