Atomistic Simulations for Deep Planetary Interiors: Machine Learning as a Tool to Break Time and Distance Barriers

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Abstract: Machine learning molecular dynamics has opened up new areas for accurate simulations and predictions for the behavior of Earth and Planetary materials. New methods will be briefly reviewed and a number of current applications will be surveyed, ranging from determining multicomponent phase diagrams and melting relations under extreme conditions to melt and solid properties including thermal and electrical conductivity, viscosity, anelasticity, and glass transitions for oxides, silicates, and iron alloys under planetary core and exoplanetary conditions.

Bio: Dr. Cohen's research focuses on using computational quantum physics to predict and understand material properties, particularly under extreme conditions such as high pressures, temperatures, strain, and electric fields. His work spans applications in planetary science, geophysics, and advanced materials technology. Dr. Cohen earned his Ph.D. in Geology from Harvard University and is a Fellow of both the American Physical Society and the American Geophysical Union. He is a recipient of numerous honors, including the Dana Medal from the Mineralogical Society of America and the International Award of Ferroelectric Materials and Their Applications.