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Search for superconductivity and novel phenomena in natural minerals RENXIONG WANG, XIANGFENG WANG, Department of Physics, University of Maryland College Park, J.R. JEFFRIES, Lawrence Livermore National Laboratory, S.R. SAHA, R.L. GREENE, J. PAGLIONE, Department of Physics, University of Maryland College Park, C. SANTELLI, J. POST, Department of Mineral Sciences, Smithsonian Museum of Natural History — In a unique venture in collaboration with the Smithsonian Institution's National Museum of Natural History, we present ongoing work from a project focusing on the search for superconductivity in mineral specimens provided by the Department of Mineral Sciences. Including magnetization and transport studies of Bornite(Cu5FeS4), Berthierite(FeSb2S4), Nagyagite(Pb5Au(Te,Sb)4S5-8) and other related compounds, we report low temperature physical properties and ab initio calculations of electronic structure of these compounds, including several unreported magnetic transitions and unconventional transport properties. We focus on an in-depth study of transport and structural properties of Sperrylite (PtAs2) under high pressures up to 120 GPa utilizing a designer diamond anvil cell, as well as artificial synthesis using chemical substitutions to tune structural and electronic properties. We will discuss the evolution of resistivity, from semiconducting to metallic behavior as a function of applied pressure and substitution, with indications that superconductivity is induced at the highest pressures.

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