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Abnormal high-pressure structural transitions; the curious case of $GaFeO_3$ MOSHE PAZ-PASTERNAK, R. ARIELLY, W.M. XU, G.M. ROZENBERG, School of Physics & Astronomy, Tel Aviv University, R. JEANLOZ, Earth & Planetary Sciences, UC, Berkeley, CA, R.D. TAYLOR, MPA-10, LANL, Los Alamos, NM — High pressure studies have been carried out in the antiferromagnetic-insulator $GaFeO_3$ (SG $Pc2_1n$)to 90 GPa using XRD at RT, Moessbauer spectroscopy, [MS(P,T)], and resistance measurements [R(P,T)]. Both MS(P,T) and R(P,T) studies reveal a *Mott-Hubbard* correlation breakdown, starting at 50 GPa and culminating at 65 GPa, manifested by loss of paramagnetism concurring with a insulator-metal transition. XRD studies reveal a sluggish 1^{st}-order phase transition in the 25 – 38 GPa range characterized by a discontinuous volume change (5%) and formation of a perovskite structure ($Pc2_1n > Pbnm$). At ∼50 GPa an isostructural transition with 3.5% volume decrease is observed, consistent with the MS and R(P,T) findings. At decompression the EOS follows a non-hysteretic curve down to 24 GPa, below which a 1^{st}-order transition occurs forming an ilmenite state ($Pbnm>R3$), with a slight increase in V (∼1%), stable down to ambient pressure. The perovskite stability beyond 25 GPa and the peculiar **perovskite -ilmenite** will be discussed.

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