Topological phases in $\text{R}_2\text{Ir}_2\text{O}_7$ GANG CHEN, MICHAEL HERMELE, CU Boulder — We construct and analyze a theoretical model for the pyrochlore iridates $\text{R}_2\text{Ir}_2\text{O}_7$ with $\text{R} (= \text{Pr}, \text{Nd}, \text{Sm}, \text{Gd}, \text{Tb}, \text{Dy}, \text{Ho}, \text{Yb})$ magnetic. The electrons on trivalent rare earth ions $\text{R}^{3+}$ form local Ising doublets due to the local crystal field. Based on a space group symmetry analysis, we write down the generic Kondo coupling between the Ising spin at $\text{R}$ sites and the effective spin at $\text{Ir}$ sites. Besides this interaction, we also include direct electron tunneling between $\text{Ir}$ sites and indirect electron tunneling via intermediate oxygens for $\text{Ir}$-$\text{Ir}$ coupling. This simple minimal model gives a rich phase diagram with broad regions of topological semi-metal and axion insulator phases. Based on these findings, we propose $\text{R}_2\text{Ir}_2\text{O}_7$ to be one of the most promising candidates to realize the topological semi-metal and axion insulator phases. Implications for existing and future experiments are discussed.