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RKKY interactions and anomalous Hall effect in metallic rare-earth pyrochlores SUNGBIN LEE, ARUN PARAMEKANTI, YONG BAEK KIM, Univ of Toronto — Motivated by experiments on $Pr_2Ir_2O_7$, we consider metallic pyrochlore systems $A_2B_2O_7$, where the A-sites are occupied by rare-earth local moments and the B-sites host 5d transition metal ions with itinerant strongly spin-orbit coupled electrons. Assuming non-Kramers doublets on the A-site, we derive the RKKY interaction between them mediated by the B-site itinerant electrons and find extended non-Heisenberg interactions. Analyzing a simplified model of the RKKY interaction, we uncover a local moment phase with coexisting spiral Ising-like magnetic dipolar and XY-like quadrupolar ordering. This state breaks time-reversal and lattice symmetries, and reconstructs the B-site electronic band structure, producing a Weyl Metallic phase with an intrinsic anomalous Hall effect and an undetectably small magnetization. We discuss implications of our results for $Pr_2Ir_2O_7$.

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