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Daniel B Cooney*, Fine Hall, Washington Road, Floor 2, Princeton, NJ 08540. *PDE Models of Multilevel Selection: The Evolution of Cooperation and The Shadow of Lower-Level Selection.*

In this presentation, we will discuss PDE models for multilevel selection, with an emphasis on studying the evolution of cooperation when there is reproductive competition both between individuals and between groups. We focus on the derivation and analysis of the long-time behavior of the two-level replicator dynamics, a nonlocal hyperbolic PDE describing deterministic birth-death competition for both individuals and groups. When interactions consist of the Prisoners' Dilemma, we show that whether the within-group advantage of defectors or the between-group advantage of groups with many cooperators wins out in the long run depends on the relative selection strength at the two levels. A notable finding is that lower-level selection casts a long shadow: if groups are best off with a mix of cooperators and defectors, then there will always be fewer cooperators than optimal at steady state, even in the limit of infinitely strong selection strength at the group level. (Received February 10, 2020)