Evolutionary Dynamics of Cooperative Behavior

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Abstract
More than 200 years after the birth of Darwin and 150 following the publication of the "the origin of species", several fundamental questions of evolution remain unanswered. Among these, the problem of the evolution of cooperation and emergence of collective action, traversing areas as diverse as Biomathematics, Theoretical Biology, Economics, Political Science or Psychology, is perhaps one of the most interdisciplinary challenges that science is facing at present. Throughout their life, individuals often engage in cooperation dilemmas in which the tragedy of the commons threatens the possibility of reaching the optimal solution associated with global cooperation. Such problems occur at all scales and levels of complexity. From a theoretical point of view, Life is often a matter of payoffs, fitness and competition (just like a game), which makes (evolutionary) game theory one of the best tools to study conflicts of interest in populations of different types and scales. Using such techniques borrowed from evolutionary game theory, but also from stochastic processes, dynamical systems and graph theory, in this seminar I will discuss several mechanisms recently identified as promoters of cooperative behavior. In particular, we shall analyze key aspects in the foundations of collective action, such as the effects of reciprocity and reputations, kin and group relationships, and the role played by the intricate nature of modern social networks in the emergence of cooperative behavior.