


# Math Colloquium

USNA Friday April 8, 12:00 PM, Room CH110



## Collective Dynamics: Consensus, Emergence of Leaders and Social Hydrodynamics

Speaker: Eitan Tadmor

Nature and human society offer many examples of self-organized behavior: ants form colonies, birds flock together, mobile networks coordinate their rendezvous, and human opinions evolve into parties. These are simple examples for collective dynamics, in which local interactions tend to self-organize into large scale clusters of colonies, flocks, parties, etc. We discuss the dynamics of such systems, driven by "social engagement" of agents with their neighbors.

We will focus on two natural questions which arise in this context. First, what is the large time behavior of such systems? The underlying issue is how different rules of engagement influence the formation of large scale patterns such as clusters, and in particular, the emergence of "consensus". We propose an alternative paradigm based on the tendency of agents "to move ahead" which leads to the emergence of trails and leaders.

Second, what is the group behavior of systems which involve a large number of agents? Here one is interested in the qualitative behavior of the group rather than tracing the dynamics of each of its agents. Agent-based models lend themselves to kinetic and hydrodynamic descriptions. It is known that smooth solutions of "social hydrodynamics", if they exist, must flock. Do such smooth solutions exist? alignment-based models reflect the competition on resources which may lead to finite-time singularities. We discuss the global regularity of social hydrodynamics for sub-critical initial configurations.



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