POLITECNICO DI TORINO

DISMA Dipartimento di Scienze Matematiche G. L. Lagrange

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Politecnico di Torino, DISMA, Aula Buzano (third floor)


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# Scaling limits for Stochastic Chemical Reaction Network Dynamics

Prof. Enrico Bibbona introduces the seminar


### Abstract

In the domain of systems biology, the dynamics of arbitrary networks of chemical reactions are often modelled by mass action kinetics. At the microscopic level, these models consist of stochastic processes on discrete spaces, called jump Markov processes. When the volume of the reactor is large, i.e., in the limit of a large number of molecules, such stochastic dynamics converge to the solutions of a set of algebraic ordinary differential equations (called the fluid limit). Fluctuations around the asymptotic trajectories can in principle be studied through large deviations theory in path space, also called Wentzell-Freidlin (W-F) theory.

In this talk, Dr Agazzi will first review the class of models under investigation and their large-volume scaling properties. He will then highlight connections between the structure of the network and the asymptotic behaviour of their fluid limit trajectories. Finally, he will formulate some relevant theorems in W-F theory, giving sufficient conditions for their application.

This is joint work with Amir Dembo and Jean-Pierre Eckmann.


### Biography

Andrea Agazzi is Research Associate at Duke Univerisity. Andrea received a Bachelor Degree in Physics from the ETH Zurich in 2012 and a Master Degree in Theoretical in Mathematical Physics from the Imperial College in 2013. In 2017, obtained a PhD in theoretical physics at the university of Geneva in collaboration with Stanford University. During this period he studied the mathematical aspects of mass action kinetics models.