SOE 6: Award Session: Young Scientist Award for Socio- and Econophysics (YSA)

Time: Monday 15:00–17:00 Location: MA 001

Invited Talk SOE 6.1 Mon 15:00 MA 001

Tipping points and crises in simple macroeconomic models — •Jean-Philippe Bouchaud — CFM, 23 rue de l'Université, Paris, France

We explore the possible types of phenomena that simple macroeconomic models with interactions, frictions and heterogeneities can reproduce. We propose a methodology, inspired by statistical physics, that characterizes a model through its "phase diagram" in the space of parameters. Through this looking glass, we investigate stylized models and find generic phase transitions (or tipping points) between a "good economy" state where unemployment/volatility are low and confidence is high, and a "bad economy" state where unemployment/volatility are high and confidence is low. If the parameters are such that the system is close to such transitions, any small fluctuation may be amplified, leading to a large level of endogenous volatility. This can cause the monetary policy itself to trigger instabilities and be counterproductive. We identify several theoretical scenarios for synchronization and instabilities in large economies that can generate aggregate volatility and acute crises without any identifiable idiosyncratic shocks. This suggests an interesting resolution of the *small shocks, large business cycles* puzzle.

Presentation of the YSA to the Awardee

Prize Talk SOE 6.2 Mon 16:00 MA 001

Network science beyond networks: Information flow models for social and biological systems — •Martin Rosvall — Umeå University, Sweden

To counteract pandemics or comprehend the flows of ideas through social systems, researchers use network flow models. In practice, network flow models have implied memoryless first-order Markov chains on standard networks. However, this conventional approach ignores that the flow direction often depends on more than a single step, that is, where the flows come from or the state of the system. Recent evidence suggests that such higher-order information about real flow pathways is critical for capturing all-important phenomena in the dynamics and function of the system. This evidence exposes a shortcoming of conventional approaches and raises a major scientific question: How can we comprehend the higher-order effects of flow pathways in a barrage of data to understand the continuously changing organization of social and biological systems? In my talk, I will present our work on multilayer and memory networks, which balances under- and overfitting of temporal interaction data with model selection techniques. These techniques allow us to take advantage of today's data explosion for revealing important organizational structures in complex systems and make it possible to address applied research questions in new ways.

After the YSA award session, there is an informal get-together with posters, beer, and pretzels.