SOE 7: Award Session: Young Scientist Award for Socio- and Econophysics (YSA)

Time: Tuesday 14:00–15:30 Location: GÖR/0226

Topical Talk SOE 7.1 Tue 14:00 GÖR/0226

What's that noise? Why does it make a difference? And why am I thinking about it all the time? — •Dirk Brockmann — Center Synergy of Systems, TU-Dresden, Dresden, Germany

Replication is one of the central processes in biological, ecological, evolutionary and, in more subtle ways, also social systems. Unsurprisingly, many dynamical systems designed to describe such phenomena implement replication in one form or another. Some are even labeled as such, for example the replicator equation, a keystone system whose many variants populate ecological and evolutionary modelling with admirable persistence. Despite their conceptual simplicity, replicator systems have a habit of producing surprises and sit at the center of long-standing controversies. One of these is an apparent paradox: the competitive exclusion principle, often a generic hallmark of replicator dynamics, seems fundamentally at odds with the remarkable diversity of species with very similar ecological functions observed in real ecosystems. Nature, it appears, did not read the textbook. Fluctuating environments and, more generally, noise have been proposed as a way out of this dilemma. Yet models that include noise tend to disagree with one another, leaving the puzzle very much alive. In this lecture, I will discuss how noise can affect replication in qualitatively different ways, why it matters which noise you add and how, how this may help us understand coexistence in ecosystems, and why thinking about all this may quietly reshape how we understand cooperation as a pervasive feature of the biosphere.

Presentation of the Award to the Awardee

Prize Talk SOE 7.2 Tue 14:45 GÖR/0226

How things spread: Complexity and criticality of inhomogeneous spreading models — •Laurent Hébert-Dufresne — University of Vermont, Burlington VT, USA — Santa Fe Institute, Santa Fe NM, USA

Models of how things spread often assume that transmission mechanisms are fixed over space and time. However, the transmission of infectious diseases can depend on local human behaviour or quality of the surrounding infrastructure. Likewise, social contagions like the spread of ideas, beliefs, and innovations depend on local norms or culture, and they can lose or gain in momentum as they spread. Diseases mutate and find subpopulations where they can thrive, just as ideas can get reinforced, beliefs strengthened, and products refined. We study the impacts of these mechanisms in spreading and cascade dynamics. Using different modelling tools, we find that complexity and criticality are the norm: Superlinear relationships between exposure and transmission can emerge from linear interactions and power-law distributions with anomalous scaling can be observed away from any critical point.