DY 14: Nonlinear Dynamics, Synchronization and Chaos II

Time: Tuesday 15:00–16:00 Location: H44

Invited Talk DY 14.1 Tue 15:00 H44

When the beat goes off — •Holger Hennig — Dept. of Physics, Harvard University, Cambridge, MA, USA

Although human musical performances represent one of the most valuable achievements of mankind, the best musicians perform imperfectly. Musical rhythms are not entirely accurate and thus inevitably deviate from the ideal beat pattern. Nevertheless, computer generated perfect beat patterns are frequently devalued by listeners due to a perceived lack of human touch. Professional audio editing software therefore offers a humanizing feature which artificially generates rhythmic fluctuations. However, the built-in humanizing units are essentially random number generators producing only simple uncorrelated fluctuations. In the first part of this talk, it will be shown that long-range fluctuations as an inevitable natural companion of both simple and complex human rhythmic performances [1]. Moreover, listeners strongly prefer long-range correlated fluctuations in musical rhythms [2]. Thus, the favorable fluctuation type for humanizing interbeat intervals coincides with the one generically inherent in human musical performances. In the second part of the talk I will present new developments and ongoing work in this field. Funding through DFG grant no. HE 6312/1-2 is acknowledged.

[1] HH, R. Fleischmann, A. Fredebohm, Y. Hagmayer, A. Witt, J. Nagler, F. Theis and T. Geisel, PLoS ONE, 6, e26457 (2011)

[2] HH, R. Fleischmann, and T. Geisel, Physics Today 65, 64-65 (2012)

Invited Talk DY 14.2 Tue 15:30 H44

Chimera states and the transition from spatial coherence to incoherence — •Philipp Hövel — Institut für Theoretische Physik, Technische Universität Berlin — Bernstein Center for Computational Neuroscience Berlin — Center for Complex Network Research, Northeastern University, Boston

Chimera states exhibit surprising dynamics in nonlocally coupled systems of identical oscillators. These hybrid states consist of both spatially coherent and synchronized as well as incoherent parts. Initially discovered for phase oscillators, they have been recently found in a large variety of different models and have also been realized in experiments [1]. In my presentation, I will give an overview of the wide spectrum of possible local dynamics and demonstrate that the habitat of chimeras ranges from time-discrete maps via chaotic models to neural oscillators [2]. Furthermore, I will address analytical results on the symmetry and stability of these peculiar states [3].

[1] A. M. Hagerstrom, T. E. Murphy, R. Roy, P. Hövel, I. Omelchenko, and E. Schöll. Nature Physics **8**, 658 (2012).

[2] I. Omelchenko, Yu. Maistrenko, P. Hövel, and E. Schöll, Phys. Rev. Lett. **106**, 234102 (2011).

[3] I. Omelchenko, B. Riemenschneider, P. Hövel, Yu. Maistrenko, and E. Schöll. Phys. Rev. E **85**, 026212 (2012).