Abstract Submitted
for the MAR15 Meeting of
The American Physical Society

Dynamic information routing in complex networks CHRISTOPH KIRST, Center for Physics and Biology, Rockefeller University, MARC TIMME, Max-Planck Institute for Dynamics and Self-Organization, DEMIAN BATTAGLIA, Institute of Systems Neuroscience, Aix-Marseille University — Flexible information routing fundamentally underlies the function of many biological and artificial networks. Yet, how information may be specifically communicated and dynamically routed in these systems is not well understood. Here we demonstrate that collective dynamical states systematically control patterns of information sharing and transfer in networks, as measured by delayed mutual information and transfer entropies between activities of a network's units. For oscillatory networks we analyze how individual unit properties, the connectivity structure and external inputs all provide means to flexibly control information routing. For multi-scale, modular architectures, we resolve communication patterns at all levels and show how local interventions within one sub-network may remotely control the non-local network-wide routing of information. This theory helps understanding information routing patterns across systems where collective dynamics co-occurs with a communication function.

Christoph Kirst
Rockefeller Univ

Date submitted: 13 Nov 2014 Electronic form version 1.4