1096-34-1334 **Chuan Zhang*** (zhang@math.colostate.edu), Fort Collins, CO 80523, and **Gerhard Dangelmayr** and **Iuliana Oprea**. *Delay induced oscillations in neural networks.*

This presentation summarizes our main results on the storage and retrieval of cyclic patterns in Hopfield-type networks with delayed couplings, including delay induced bifurcations and oscillations in these networks.

First, we formulate and prove conditions for a cyclic pattern under which a network in accordance with the prescribed transitions can be constructed with the pseudoinverse learning rule. We call cyclic patterns satisfying such conditions admissible cycles and show that every admissible cycle is retrievable, i.e. the coupling leads to persistent oscillations in the network. Depending on their structural features, admissible cycles are classified into simple, separable and inseparable composite cycles, and each of these types of cycles gives rise to a specific network topology.

Second, we prove that cyclic patterns satisfying the same transition conditions can be stored and retrieved in the same network. In terms of their structural features, these cyclic patterns are respectively stored and retrieved as attracting limit cycles, unstable periodic solutions and long lasting transient oscillations. We also show that the transitions from fixed points to attracting limit cycles are multiple saddle-node bifurcations on limit cycles. (Received September 17, 2013)