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Self-Organization of Networks Via Synchrony-Dependent Plasticity JACK WADDELL, MICHAL ZOCHOWSKI, University of Michigan - Physics — We employ an adaptive parameter control technique based on a previously developed measure that detects phase/lag synchrony in the system to dynamically modify the structure of a network of non-identical, weakly coupled Rössler oscillators. Two processes are simulated: adaptation, under which the initially different properties (such as frequency) of the units converge, and aggregation, in which coupling between units is altered and clusters of interconnected elements are formed based on the temporal correlations. We show that adaptation speed depends on connectivity and topology, with more global connections resulting in greater temporal order and faster convergence of adaptation. We find that aggregation leads to unidirectional clusters, and that asymmetric aggregation (with differing rates for increasing or decreasing coupling strength) has an optimum ratio of rates to make denser clusters that maintain their selectivity. Combining adaptation and aggregation results in clusters of identical oscillators with bi-directional coupling. An optimum ratio of process rates results in stable coupling between the units. Change from this ratio may result in annihilation of the network for slow aggregation, or more numerous, denser, and more transient clusters for faster aggregation.

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