1135-92-2552 **Theodore P. Pavlic*** (tpavlic@asu.edu), ASU - CIDSE, P.O. Box 878809, Room 553, Tempe, AZ 85287-8809. *Distributed Algorithms in Biological Systems: The Diverse Architectures of Natural Computation.*

A popular view of "emergence" in biological systems evokes imagery of murmurations of bird flocks, where macroscopic shapes appear out of a symphony of sufficiently many interacting individuals each following simple rules. However, despite their visual appeal, the macroscopic structures in a cohesive flock of birds or school of fish are only an epiphenomenon; the structures themselves provide no adaptive value to the group. There is no "collective mind" in a school of fish; there are only individuals maximizing local efficiency and minimizing local relative risk. To understand the mechanisms of true distributed computation in nature, it is important to focus on groups for which selection does act at multiple organizational levels. In this talk, several examples from natural systems that do achieve some form of collective computation are given, and the development of novel distributed computing paradigms for engineering systems are discussed. Examples come from socially foraging finches, cooperatively breeding cichlids, and social insects (such as ants) in which computation emerges as an out-of-equilibrium structure that makes use of both regularities in individual behaviors and regularities in the environment to compute solutions to naturally occurring problems. (Received September 26, 2017)