

Abstract Submitted
for the MAR16 Meeting of
The American Physical Society

Development as a Factor in the Evolution of Modularity in Biological Systems JESSICA LOWELL, Brandeis University — Biological networks and other systems tend to be modular in structure, with reuse of motifs and the ability to be separated into semi-independent units. The evolutionary forces that produce this modularity are a topic of active research, as modular solutions rarely emerge from models of biological evolution. Through simulations combining evolution and development, I investigate the role that development plays in the emergence of modularity, using a popular metric for network modularity and representing non-network structures as networks in which building blocks are nodes and connections between them are arcs. Preliminary results show that the modularities of structures evolved by an L-systems-based evolutionary developmental algorithm are higher than those evolved by a non-developmental evolutionary algorithm that models evolution in the same way. To ensure that these results are not specific to a single algorithm, I am conducting evolutionary developmental simulations using other methods for simulating development, evolving both networks and building-block structures. This study sheds light on the role of development as a factor in the origin of modularity in biological networks and other biological systems.

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Date submitted: 06 Nov 2015

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