1134-18-21 **Dmitry Vagner*** (dv@math.duke.edu), **David I. Spivak** and **Eugene Lerman**. *Algebras of Open Dynamical Systems on the Operad of Wiring Diagrams.*

In this paper, we use the language of operads to study open dynamical systems. More specifically, we study the algebraic nature of assembling complex dynamical systems from an interconnection of simpler ones. The syntactic architecture of such interconnections is encoded using the visual language of wiring diagrams. We define the symmetric monoidal category W, from which we may construct an operad O(W), whose objects are black boxes with input and output ports, and whose morphisms are wiring diagrams, thus prescribing the algebraic rules for interconnection. We then define two W-algebras, G and L, which associate semantic content to the structures in W. Respectively, they correspond to general and to linear systems of differential equations, in which an internal state is controlled by inputs and produces outputs. As an example, we use these algebras to formalize the classical problem of systems of tanks interconnected by pipes, and hence make explicit the algebraic relationships among systems at different levels of granularity. (Received June 07, 2017)