Causal Order & Two Kinds of Robustness

Arnon Levy*[1]

[1]Van Leer Institute, Jerusalem (VLJI) – 43 Jabontinski St., Jerusalem 91040, Israel

Abstract

Session: Models & Mechanisms: Extending the Framework
Participants: Brett Calcott, Stuart Glennan, Tom Polger, Arnon Levy [organizer]

Chair: Carl Craver

Machine analogies play a prominent part in proximate biology. But their specific content is often left under-specified and so is the relation between machines and mechanisms. I suggest an account of what makes a system machine-like, relying on a notion of causal order. Orderly systems have parts with distinctive and interdependent roles, and their internal dynamics are relatively predictable. On this way of thinking, some mechanisms are more machine-like than others, because they exhibit more underlying order. Machine-like systems are more amenable to decompositional explanation and to related cognitive-epistemic methods.
Thinking in terms of causal orderliness isn't only of conceptual significance. It can also help us explore empirical questions. I will illustrate this by looking at one important attribute of biological systems – robustness. Two kinds of robust behavior will be distinguished: one consisting of orderly causal interactions, the other disorderly. Orderly robustness utilizes feedback loops and certain modes of backup. Disorderly robustness consists in aggregative stability, arising from numerous interactions amongst stochastically independent elements. There are reasons to expect these two forms of robustness to differ in their characteristic developmental timing and in their evolutionary potential.

*Speaker