

**AUTOCATAKINETICS, THE 4TH LAW OF THERMODYNAMICS (LMEP), AND THE RISE,
DEVELOPMENT, AND COLLAPSE OF SOCIOECONOMIC SYSTEMS**

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ABSTRACT

Roughly 30 years ago my colleagues and I identified and elaborated the Law of Maximum Entropy Production (“LMEP”, or “4th Law of Thermodynamics”) as the physical selection principle that accounts for the opportunistic ordering that fills the world around us; a world populated by the origin, development/growth, and collapse of auto-catakinetic systems (“ACK systems”) including the origin and evolution of life on Earth. Not long after, my colleague Michael Turvey and I were able to account, with these and additional principles, for the origin and nature of cognitive systems (or sometimes “perception-action systems”); “cognition from first principles”; the two, “the cognitive” and “the living”, on this view, being co-extensive. Life was understood as an epistemic autocatakinetic process governed and driven by LMEP. ACK systems (from the non-living to living, to ecosystems at all scales) are characterized by genericity including, for example, the selection of macro from micro, symmetry breaks at origin events from indeterminate micro fluctuations to macrodeterminate ends (“progressive determinism”) with reduction of the degrees of freedom of the microcomponents. Such systems tend to get hollowed out, more brittle with size and age (“old”) and increasingly vulnerable/unstable (the specific entropy production goes down) to partial or full collapse again from seemingly small perturbations, or micro events. Forest ecosystem succession (or ecosystem succession in general) is an example. A small spark, microscopic infestation can bring the entire end-stage succession forest down. Socioeconomic systems (“cultures”, “civilizations”) are another example. The principles are briefly reviewed and discussed. It is impossible to avoid looking at the current rapid onset or the COVID-19 pandemic in this context and ask to what extent this is a wakeup call, or to what extent the train has or is pulling out of the station?

Keywords: autocatakinetic system, socioeconomic system, entropy, evolution