Toward a Propensity Interpretation of Stochastic Mechanism: Lessons from Fitness and Drift

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Abstract

The life sciences are rife with probabilistic generalizations. Mendel discovered that the chance of a hybrid between green and yellow pea plants to produce yellow peas in the F2 generation is .75. In neuroscience, the release of neurotransmitters only results in the successful initiation of electrical activity in postsynaptic neurons about 80% of the time. In evolutionary biology, the evolutionary consequences of genetic mutation are conceptualized in terms of the chance (per unit of time) a gene has of changing from one state to another. A question of significant import to philosophers of science is: what makes these statements true? What in the world (if anything) grounds these probabilistic facts? The answer pursued in this paper is that these probabilistic biological generalizations can be grounded on biological mechanisms that underlie and produce these phenomena-mechanisms which are themselves (in some sense) chancy: *stochastic mechanisms*. In what follows, I draw a few important lessons from recent propensity interpretations of fitness and drift in order to present a novel propensity interpretation of stochastic mechanism (PISM) according to which stochastic mechanisms are thought to have probabilistic propensities to produce certain outcomes over others. This understanding of stochastic mechanism, once fully fleshed-out, will provide the benefits of (1) allowing the stochasticity of a particular mechanism to be an *objective property* in the world, a property investigatable by science, (2) a way of *quantifying* the stochasticity of a particular mechanism, and (3) a way to *avoid committing to the problematic causal role of propensities*.

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