

A condition to better understand the emergence of novelty in biology

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ABSTRACT

We will revisit the concept of « biological individuation » invented by a French philosopher, Gilbert Simondon, in his doctorate thesis: « l'individuation et sa genèse physico-biologique » (1964). Individuation occurs when a « structural potential » is generated. A « structural potential » is not the ability for a physical system to change of states, but its ability to change its structure. Strictly speaking, individuation is not a simple physical state. It is a state that expresses the limits of a determinative physical structure. Following Simondon, it is through individuation that novelty already appears in open physical systems. Simondon also states that we go from physical to biological individuation through a recursive procedure (“récurrence de causalité”). He assumes that, when such a procedure is applied, we are moving away from a simple singular event of individuation in a physical system, towards a system in which all biological events are singular and occur in a “theatre of individuation”. We will compare this assumption with the concept of “extended criticality” developed by Bailly, Longo and Montévil. It explains why novelty doesn't appear simply point-wise in a biological system. On the contrary, novelty is continually generated. And it can be amplified or repressed through regulatory devices. We will provide an example at the molecular level: the SOS box in the bacterium genome.