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Some philosophical remarks on the use of complex modelling in biology

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Mathematical models and computer simulations have recently become widespread in biology. My goal in this talk is to discuss their different roles in the analysis and explanation of complex biological phenomena. I will focus on three issues that are particularly interesting from a philosophical point of view. First, I will describe the historical tension we see in biology concerning the use of simplified mathematical models to represent and explain complex phenomena. While some biologists have defended their use for a long time, many have remained highly sceptical. This reflects different explanatory styles in scientific practice. A second related point concerns the differences between models developed to address particular scientific questions and models whose goal is to formulate general principles. A third question, which has received diverging answers in recent debates, is whether it is legitimate to consider computer simulations as a kind of experiment. This issue is central to better grasping the contribution of computational modelling to biology.