

Morpheus: a Simulation Environment for Multicellular and Multiscale Systems Biology

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場所：学術情報メディアセンター北館3階講習室

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How a fertilized egg develops into a multicellular organism remains one of the most challenging questions in biology. During development, cells migrate, proliferate or differentiate under the influence of complex signaling mechanism. In the effort to unravel the interplay of inductive and morphogenetic mechanism over multiple spatiotemporal scales, mathematical and computational methods are essential to formulate and test specific hypotheses.

In this talk, I will present a new computational environment called Morpheus that is designed to facilitate the modeling, simulation and analysis of multicellular systems. Morpheus implements efficient numerical algorithms for the simulation of well-known mathematical formalisms and allows the user to combine them into multi-scale models in a flexible and intuitive way. Models can be fully specified by means of an easy to use graphical user interface without the need of scripting and programming. The main features of the software will be presented from a user perspective. Moreover, two particular biological applications where the software has shown to be effective will be consider. In particular, the role of intercellular signaling during cell fate decisions in the developing pancreas will be outlined and the mechanisms underlying vascular patterning will be discussed.