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Multiscale Modeling in Biology — The Mathematical and Computational Challenges

New techniques in cell and molecular biology have produced a better understanding of cell-level processes that has in turn led to better cell-level models for problems ranging from biofilm formation to embryonic development and cancer. However this raises the problem of how to incorporate detailed descriptions of individual-level behavior, be it at the cell, tissue or organ level, into population level descriptions. We will illustrate the mathematical and computational challenges involved with an f example from pattern formation in bacteria, and will discuss some of the open problems in this area.