

SÉMINAIRE PhLAM
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CERLA

« Multiscale modeling of cellular differentiation : mathematical and computational approaches »

Par

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I will introduce mathematical and computational approaches used over the last 30 years to model cell differentiation, with a focus on the immune response and cancer growth. The objective is to describe the dynamics of cellular processes that can span several hours or days, in an organ or the whole body, while being triggered by genetic dynamics whose characteristic times are minutes or hours. Mathematically, partial differential equations have been used to couple these potentially very different scales (temporal, physical) and dynamics. More complex models, based for instance on agent-based methods, have been introduced to avoid reducing the dynamics of one of the physical scales involved in the description of the cellular process. After introducing and discussing these methods in applied settings that allow to highlight their advantages and limitations, I will focus in more details on two recent results on the CD8 T cell immune response and neuroblastoma growth in organoids.