

Transport in cells and tissues

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Transport in cells and tissues comprises an intricate interplay between diffusion with obstacles, convective flow and ballistic motion along filament / vessel networks, which are themselves dynamically reorganized on large scales. The quantitative description of this interplay is a challenging theoretical task and addresses various collective phenomena: How do T-cells organize the transport of various organelles (mitochondria, cytotoxic vesicles, etc.) to the immunological synapse during activation and killing? How do different calcium storing and -transporting organelles cooperate to open CRAC (calcium release-activated calcium) channels? What are the physical determinants of oxygen and drug transport within a growing tumor? We discuss and analyze these problems with theoretical models that are developed and applied in collaboration with experimental studies.