

Physics of Multicellularity

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One of the most fundamental issues in biology is the nature of evolutionary transitions from single cell organisms to multicellular ones. Not surprisingly for microscopic life in a fluid environment, many of the processes involved are related to transport and locomotion, for efficient exchange of chemical species with the environment is one of the most basic features of life. This is particularly so in the case of flagellated eukaryotes such as green algae, whose members serve as model organisms for the study of transitions to multicellularity.

In this talk I will summarize recent theoretical and experimental work addressing a number of interrelated aspects of evolutionary transitions in the Volvocine green algae, which range from unicellular *Chlamydomonas* to *Volvox*, with thousands of cells. Phenomena to be discussed include allometry of nutrient uptake, phenotypic plasticity, flagellar synchronization, hydrodynamic bound states, and the dynamics of adaptive phototaxis.