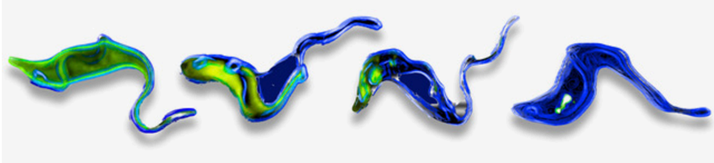

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Elastic Bistability and the Geometry of Cellular Neighbourhoods in Choanoflagellates and Green Algae

Elastic Bistability and the Geometry of Cellular Neighbourhoods in Choanoflagellates and Green Algae

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This talk will describe two recent advances in understanding the physics of cellular organization in simple multicellular organisms. The first part concerns the fluid dynamical and elastic properties of the recently discovered [1] multicellular choanoflagellate *C. flexa*, which dynamically interconverts between two hemispherical forms of opposite curvature. The swimming and filter-feeding properties are described [2] within a simple model of a raft of spheres with associated stokeslets to represent the action of the flagella. An elastic model based on linear elasticity of the microvilli of adjacent cells that adhere to each other is shown to support bistability at the organism level as a consequence of the presence of numerous pentagonal neighbourhoods in the raft. In the second part I will first review the recent findings [3] that the cellular neighbourhood volumes in both lab-evolved and extant multicellular species, obtained by Voronoi tessellations based on the cell locations, are accurately described by gamma distributions, suggesting a hitherto unrecognized "universal" aspect of noise in cellular packing. Here we propose an explanation [4] of those observations by considering the very simplest models for stochastic ECM generation by somatic cells and show that they define Poisson point processes whose Voronoi tesselations are demonstrably governed by gamma distributions. I summarize by proposing a link between the two parts of the talk.

References

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