

DICCA SEMINARS

May 18th 2023, 4pm

Location: conference room "SALONE NOBILE" (Villa Cambiaso)



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Cytoplasmic Streaming and the Swirling Instability of the Microtubule Cytoskeleton

Cytoplasmic streaming is the persistent circulation of the fluid contents of large eukaryotic cells, driven by the action of molecular motors moving along cytoskeletal filaments, entraining fluid. Discovered in 1774 by Bonaventura Corti, it is now recognized as a common phenomenon in a very broad range of model organisms, from plants to flies and worms. This talk will discuss physical approaches to understanding this phenomenon through a combination of experiments (on aquatic plants, *Drosophila*, and other active matter systems), theory, and computation. A particular focus will be on streaming in the *Drosophila* oocyte, for which I will describe a recently discovered "swirling instability" of the microtubule cytoskeleton.

Short bio:

Professor Ray Goldstein is Schlumberger Professor of Complex Physical Systems in the Department of Applied Mathematics and Theoretical Physics (DAMTP) at the University of Cambridge. Goldstein's research focuses on understanding non-equilibrium phenomena in the natural world, with particular emphasis on biological physics. Much of his current research involves physical aspect of multicellularity and the role of flagella-driven flows in the evolutionary transition from unicellular to multicellular organisms. His research has been published in leading peer reviewed scientific journals including Proceedings of the National Academy of Sciences of the United States of America, Physical Review Letters, and the Journal of Fluid Mechanics. He has won numerous awards in recognition of his findings, including a Wellcome Trust Senior Investigator Award. Goldstein was elected a Fellow of the Royal Society (FRS) in 2013 and, in addition, he is a Fellow of the American Physical Society, the Institute of Mathematics and its Applications and the Institute of Physics. He was awarded the 2016 Batchelor Prize of the International Union of Theoretical and Applied Mechanics for his research into active matter fluid mechanics., and the Institute of Physics Rosalind Franklin Medal and Prize for revealing the physical basis for fluid motion in and around active cells.