

Contribution ID: 197

Type: **Oral Presentation**

Chemotaxis Modelling for Sperm Motility

Monday, 9 July 2018 11:30 (30 minutes)

An important aspect in the study of reproduction is how sperm are guided toward an egg for fertilization. One such mechanism is the process of chemotaxis, in which the sperm detect changes in concentration (namely of Ca^{2+}) in the fluid environment and utilize these changes to alter the waveform of their flagellar beat. This change in beat form results in changes to the swimming path. We model the swimming sperm using a Kirchhoff elastic rod model coupled with the method of regularized Stokeslets for the fluid motion. In order to simulate the effect of chemical concentrations, we employ a stochastic decision making process.

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Session Classification: From solitary swimmers to coordinated groups: Modelling motion in fluids at very low Reynolds number

Track Classification: Minisymposium: From solitary swimmers to coordinated groups: modelling motion in fluids at very low Reynolds number