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Simulation of Red Blood Cells by the Lubricated Immersed Boundary Method in 2D THOMAS FAI, CHRIS RYCROFT, Harvard University — The flow of red cells through capillaries involves near-contact between structures, including both cell-cell and cell-wall interactions. The thin fluid layers that arise during near-contact are difficult to resolve by standard computational fluid dynamics methods based on uniform fluid grids. Motivated by this fluid-structure interaction problem, we have developed an immersed boundary method that uses elements of lubrication theory as a subgrid model to resolve the thin fluid layers between immersed boundaries. In contrast to methods based on adaptive mesh refinement, our approach does not impose additional restrictions on the timestep. We have applied this lubricated immersed boundary method to 2D flows of increasing complexity, including a single red cell near a wall in shear flow and a suspension of red cells. We find that our method gives accurate results and reduces numerical artifacts.

Thomas Fai
Harvard University

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