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Numerical Computation of Mass Transport in Low Reynolds Number Flows and the Concentration Boundary Layer NICHOLAS A. LICATA, NATHANIEL J. FULLER, University of Michigan-Dearborn — Understanding the physical mechanisms by which an individual cell interacts with its environment often requires detailed information about the fluid in which the cell is immersed. Mass transport between the interior of the cell and the external environment is influenced by the flow of the extracellular fluid and the molecular diffusivity. Analytical calculations of the flow field are challenging in simple geometries, and not generally available in more realistic cases with irregular domain boundaries. Motivated by these problems, we discuss the numerical solution of Stokes equation by implementing a Gauss-Seidel algorithm on a staggered computational grid. The computed velocity profile is used as input to numerically solve the advection-diffusion equation for mass transport. Special attention is paid to the case of two-dimensional flows at large Péclet number. The numerical results are compared with a perturbative analytical treatment of the concentration boundary layer.

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