Synchronization of Swimming Microorganisms  GWYNN ELFRING, ERIC LAUGA, Department of Mechanical and Aerospace Engineering, University of California San Diego — Flagellated eukaryotic cells (such as spermatozoa) have been observed to synchronize their flagella when swimming in close proximity. Using a 2D model, we find that hydrodynamic interactions alone can lead to synchronization if the waveforms of the flagella display front-back asymmetry. Depending on the nature of the asymmetry, the phase-locked conformation can minimize or maximize the energy dissipated by the co-swimming cells. We show that due to kinematic reversibility, this front-back asymmetry is necessary for synchronization in a Newtonian fluid, and discuss the differences in a non-Newtonian fluid.