Abstract Submitted
for the DFD10 Meeting of
The American Physical Society

"Corkscrew" vs. "tank-treading" propulsion of spirochetes. ALEXANDER LESHANSKY, Department of Chemical Engineering, Technion-IIT, Haifa, Israel, ODED KENNETH, Physics Department, Technion-IIT, Haifa, Israel — We consider the potential mechanism of spirochete propulsion driven by twirling of the outer cell surface coupled to counter-rotation of the helical body. We construct a proper slender body theory and use particle-based numerical approach allowing for modeling of locomotion in heterogeneous viscous environment. Depending on the helical pitch angle, two distinct propulsion gaits are identified: corkscrew-like locomotion, similar to propulsion powered by rotating helical flagellum, and surface tank-treading mode relying on hydrodynamic self-interaction of curved helical coils. The latter mechanism is closely related to the considered earlier propulsion of Purcell's toroidal swimmer (Kenneth and Leshansky, Phys. Fluids **20**, 063104, 2008). Significant augmentation of corkscrew propulsion gait in heterogeneous viscous medium anticipated from the numerical model is in accord with experimental observations of enhanced spirochete propulsion in polymer gels.

Alexander Leshansky
Department of Chemical Engineering, Technion-IIT, Haifa, Israel

Date submitted: 06 Aug 2010 Electronic form version 1.4