Abstract Submitted
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An improved squirmer model for Volvox locomotion TIMOTHY PEDLEY, Univ of Cambridge — We recently used the Lighthill-Blake envelope (or 'squirmer') model for ciliary propulsion to predict the mean swimming speed U and angular velocity Ω of spherical *Volvox* colonies [1]. Input was the measured flagellar beating patterns (a symplectic metachronal wave) of *Volvox carteri* colonies with different radii a [2]. The predictions were compared with independent measurements of U and Ω as functions of a, and proved to be substantial underestimates of both U and Ω, by about 80%, probably because the envelope model ignores the fact that, during the recovery stroke, most of a flagellum is much closer to the no-slip colony surface than during the power stroke. In consequence U and Ω will be proportional to the beating amplitude ϵ not to ϵ^2 as in the Lighthill-Blake theory. A new model is proposed, based on a shear-stress (not velocity) distribution (cf [4]) that is applied at a smaller radius in the recovery stroke than in the power stroke. Agreement with experiment is greatly improved

[1] Pedley et al, JFM 798:165,2016. [2] Brumley et al, PRL 109:268102,2012. [3] Drescher et al,PRL 102:168101,2009. [4]Short et al, PNAS 103:8315,2006.

Timothy Pedley
Univ of Cambridge

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