Abstract Submitted
for the DFD19 Meeting of
The American Physical Society

How do colonial micro-algae swim towards light? HELENE DE MALEPRADE, University of Cambridge, FREDERIC MOISY, Paris-Sud University, TAKUJI ISHIKAWA, Tohoku University, RAYMOND E. GOLDSTEIN, University of Cambridge — Microscopic algae are commonly found in mud, puddles or lakes, and show great diversity in structural complexity. One of the simplest algae encountered is the unicellular 'Chlamydomonas', exhibiting two flagella whose beating enables them to swim in a breast stroke. One also finds 'Gonium pectorale', a colony made of 16 Chlamydomonas-like cells arranged in two concentric squares, with all flagella on one side of the plate. These colonies are among the first multicellular algae and their study offers an insight into the evolution from unicellular to coherent multicellular behaviour. Algae, like plants, get energy from photosynthesis: Gonium colonies take advantage of their motility to swim towards light, efficiently reorienting within a couple of seconds. However, the mechanism of this phototactic behaviour is not yet understood: how do all 16 cells individually produce a coherent collective response? How are the flagella modulated to create an asymmetry in the swimming pattern, and how does that lead to reorientation? We experimentally investigate the phototaxis of Gonium, analysing their reorientation trajectory towards light. We compare those results to an analytical model and numerical simulations, describing with high precision the reorientation process.

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Date submitted: 29 Jul 2019 Electronic form version 1.4