

Abstract Submitted
for the DFD20 Meeting of
The American Physical Society

A New Model for the Hydrodynamic Synchronisation of Helical Filaments¹ MARIA TATULEA-CODREAN, ERIC LAUGA, University of Cambridge — Multi-flagellated bacteria swim by rotating rigid helical filaments organised in coherent bundles. The filaments within the bundle rotate in synchrony, and it has long been postulated that hydrodynamic interactions facilitate this synchronisation. Using a combined analytical and computational approach, we derive from first principles a dynamical system that explains the synchronisation of two rotating helical filaments through hydrodynamic interactions. Our model, the first to explain mathematically a phenomenon revealed by computational studies more than a decade ago, brings to light key biophysical features of synchronisation, in particular the dependence on hook stiffness and flagellar geometry. We also consider the effect of polymorphism and number of flagella on the speed of synchronisation.

¹We gratefully acknowledge funding from the George and Lillian Schiff Foundation (award to MTC) and the European Research Council under the European Union's Horizon 2020 research and innovation programme (grant agreement 682754 to EL).

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Date submitted: 28 Jul 2020

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