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Synchronization of Eukaryotic Flagella with an Imposed Periodic Flow GRETA QUARANTA, MARIE-EVE AUBIN-TAM, DANIEL TAM, TU Delft — The eukaryotic cilia and flagella are subcellular structures able to beat in synchrony for long periods of time. Recent studies have characterized the dynamics of flagellar locomotion and have focused on the physical mechanisms driving synchronous beating and especially on the importance of hydrodynamic interactions. We explored the possibility to control the beating of the two flagella of a single *C. reinhardtii* cell by imposing an external periodic hydrodynamic force. We do so by generating an oscillatory background flow around a single cell. Our study shows that flagellar beating can be phase locked to an external hydrodynamic forcing of non-biological origin and the synchronization transition is well represented by a low-order stochastic model. Remarkably, the hydrodynamic forces needed to synchronize the flagella and the background flow are considerably larger than the forces typically experienced in physiological conditions. Our results suggest that the importance of hydrodynamics in flagellar synchronization may be limited.

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