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Reversal of Flagellar Wave Propagation Is Controlled by Proximal to Distal Asymmetry in Molecular Motor Dynamics[1] FENG LING, YI MAN, EVA KANSO, University of Southern California — The '9+2' axoneme of the motile cilium/flagellum is an important cellular structure that is highly-conserved among eukaryotic cells. Asymmetries of dynein motors along the flagellum have been identified in a number of organisms, and they have been specifically linked to the reversal in the direction of flagellar wave propagation in certain trypanosomes. Trypanosomes are a class of single-celled parasites that are known to switch their flagellar beating between tip-to-base and base-to-tip waveforms. In this talk, we analyze cilia oscillations and direction of wave propagation in the context of a known geometric feedback model. We introduce proximal to distal asymmetry in the molecular motor dynamics, consistent with recent experiments on trypanosomes. We show that the experimentally-observed reversal of wave propagation is only achievable when sliding-control feedback is dominant. We conclude by commenting on the implications of these results to flagellar waveforms in other organisms, and the feasibility of a universal geometric feedback mechanism for explaining the diverse waveforms in cilia oscillations.

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