Abstract Submitted
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Energy Consumption of Actively Beating Flagella[1] DANIEL CHEN, Department of Physics, Brandeis University, DANIELA NICASTRO, Department of Biology, Brandeis University, ZVONIMIR DOGIC, Department of Physics, Brandeis University — Motile cilia and flagella are important for propelling cells or driving fluid over tissues. The microtubule-based core in these organelles, the axoneme, has a nearly universal "9+2" arrangement of 9 outer doublet microtubules assembled around two singlet microtubules in the center. Thousands of molecular motor proteins are attached to the doublets and walk on neighboring outer doublets. The motors convert the chemical energy of ATP hydrolysis into sliding motion between adjacent doublet microtubules, resulting in precisely regulated oscillatory beating. Using demembranated sea urchin sperm flagella as an experimental platform, we simultaneously monitor the axoneme's consumption of ATP and its beating dynamics while key parameters, such as solution viscosity and ATP concentration, are varied. Insights into motor cooperativity during beating and energetic consequences of hydrodynamic interactions will be presented.

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