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Symmetry breaking of rigid/flexible plates in bluff body wakes generates rotation and drift NICOLAS BROSSE, UGIS LACIS, FREDRIK LUNDELL, SHERVIN BAGHERI, Linne Flow Centre, KTH Mechanics, 10044 Stockholm, Sweden, FRANCOIS INGREMEAU, HAMID KELLAY, Centre de Physique Moleculaire Optique et Hertzienne (UMR 5798 CNRS), Universite Bordeaux I, 33405 Talence, France, ANDREA MAZZINO, INFN and CINFAI Consortium, Genova Section, Via Dodecaneso 33, 16146 Genova, Italy — Bluff body wakes have historically been important for understanding nature and aiding industry. For Reynolds numbers above approximately $Re \approx 10$, a recirculation bubble develops behind the bluff body. If a solid or elastic appendage is attached to the bluff body, it may exert a torque and a side force on the body. We use theory, numerical simulations and experiments to investigate and explain this phenomenon. More specifically, numerical simulations are carried out for a freely falling cylinder with an attached splitter plate for $Re \approx 50$. Experiments of a fixed cylinder with an attached elastic filament are preformed using a vertical soap-film tunnel for $Re \approx 2000$. Both experiments and simulations reveal that if a body has an appendage smaller than or of the same order as the body it is attached to, the body rotates and drifts. We explain our findings with a simple model and discuss the implications for propulsion.

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