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Wave drag on asymmetric bodies GRAHAM BENHAM, JEAN-PHILIPPE BOUCHER, ROMAIN LABB, MICHAEL BENZAQUEN, CHRISTOPHE CLANET, LadHyX, Ecole Polytechnique — More than a century ago, Michell derived an integral formula for the wave resistance on a body, using the approximation of a slender body in an irrotational, inviscid fluid (Michell 1898). The major shortcoming of this formula is that, due to the reversibility of the steady potential flow formulation, it does not distinguish the difference in wave drag when an object with front-back asymmetry moves forwards or backwards. However, it is well known that an asymmetric body with a sharp leading edge and a rounded trailing edge produces a smaller wave disturbance moving forwards than backwards, and this is reflected in the wave drag coefficient. In this talk, we discuss recent experimental observations investigating the effects of body asymmetry on wave drag, and show that these effects can be replicated by modifying Michells theory to include the growth of a symmetry-breaking boundary layer. We demonstrate that asymmetry can have either a positive or a negative effect on drag, depending on the depth of motion and the Froude number. We discuss the implications and scope of this work in the context of sports physics, including the design of rowing, kayak and canoe boats.

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