

Abstract Submitted  
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**Effects of Geometry and Kinematics on Animals Leaping Out of Water**<sup>1</sup> BRIAN CHANG, Virginia Tech, JIHYE MYEONG, Seoul National University, EMMANUEL VIROT, Harvard University, HO-YOUNG KIM, Seoul National University, SUNGHWAN JUNG, Virginia Tech — Leaping out of water is a phenomenon exhibited by a variety of aquatic and semi-aquatic animals, such as frogs and whales. In this study, we aim to elucidate the effects of geometric and kinematic conditions on the propulsive and drag force required for an animal to jump through the water interface. A simple mechanism was designed to measure the propulsive thrust produced by a flapping appendage. In a separate experiment to measure the opposing drag, simplified models of animals are 3D printed and fitted with pressure sensors. The model is accelerated from rest and covers a range of Re from  $10^3$  to  $10^5$ . Using a high-speed camera and pressure sensors, we observed a deformation of the free surface prior to water exit, and correlated this to the drag force. Finally, we discuss a scaling law to describe the general physics which allow animals to leap out of water.

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Brian Chang  
Virginia Tech

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