

Abstract Submitted
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The Hydrodynamics of Urination: to drip or jet JONATHAN PHAM, PATRICIA YANG, JEROME CHOO, DAVID HU, Georgia Institute of Technology — The release of waste products is fundamental to all life. How are fluids released from the body quickly and efficiently? In a combined experimental and theoretical investigation, we elucidate the hydrodynamics of urination across five orders of magnitude in animal mass. Using high-speed videography and flow-rate measurement at the Atlanta Zoo, we report discrete regimes for urination style. We observe dripping by small mammals such as rats and jetting by large mammals such as elephants. We discover urination duration is independent of animal size among animals that use jetting. We rationalize urination styles, along with the constant-time scaling, by consideration of the relative magnitudes of the driving forces, gravity and bladder pressure, and the corresponding viscous losses within the urethra. This study may give insight into why certain animals are more prone to diseases of the urinary tract, and how the urinary system evolved under the laws of fluid mechanics.

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