

Abstract Submitted
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How the velvet worm squirts slime¹ ANDRES CONCHA, PAULA MELLADO, Adolfo Ibañez University, BERNAL MORERA-BRENES, Universidad Nacional de Costa Rica, CRISTIANO SAMPAIO, Universidade de Sao Paulo, L. MAHADEVAN, Harvard University, JULIÁN MONGE-NÁJERA, Universidad de Costa Rica — The rapid squirt of a proteinaceous slime jet endows the ancient velvet worms (Onychophora) with a unique mechanism for defense from predators and for capturing prey by entangling them in a disordered web that immobilizes their target. However, to date neither qualitative nor quantitative descriptions have been provided for this unique adaptation. Here we investigate the fast oscillatory motion of the oral papillae and the exiting liquid jet that oscillates with frequencies $f \sim 30 - 60$ Hz. Using anatomical images, high speed videography, theoretical analysis and a physical simulacrum we show that this fast oscillatory motion is the result of an elastohydrodynamic instability driven by the interplay between the elasticity of oral papillae and the fast unsteady flow during squirting. Our results demonstrate how passive strategies can be cleverly harnessed by organisms, while suggesting future oscillating micro-fluidic devices as well as novel ways for micro and nano fiber production using bioinspired strategies.

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