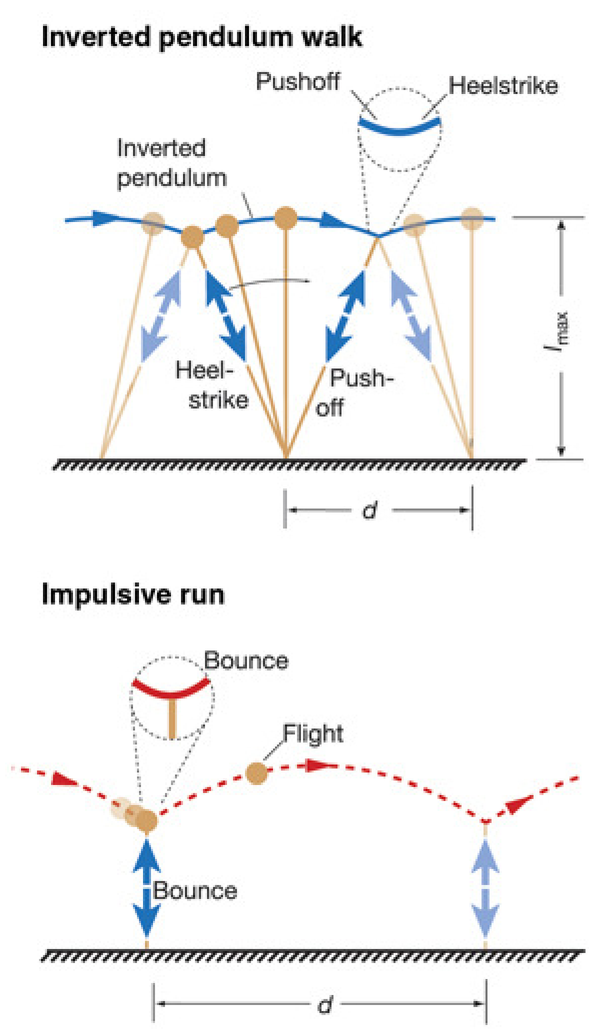
Silly Walks Aren't Worth the Effort

Bad news for Monty Python's Ministry of Silly Walks: the classic one-two stride isn't going to fall out of fashion. Humans prefer the familiar paces known as "walking" and "running" because they require the least energy to move at a given speed, according to a new study.



Walk this way. To conserve energy, the "inverted-pendulum" stride and the bouncing "impulsive run" are the way to go.

Human legs can move in many directions and at many speeds, but in practice, our locomotion tends to be pretty straightforward. When a person wants to amble, he strikes the ground with his heel and then pushes off, his body arcing over each step like an inverted pendulum. And when he wants to speed up, he's liable to run in a series of bouncy parabolic arcs.

Why these should be the gaits of choice is less obvious--for one thing, they involve colliding with the ground rather than gliding across it. One possible explanation is greater efficiency, says biomechanician Andy Ruina of Cornell University in Ithaca, New York. To quantify how much mechanical energy different gaits require, Ruina and graduate student Manoj Srinivasan designed a computer model that reduces a person to a simple walking machine, with regular steps, infinitesimally small feet, and no springy tendons. The most cost-effective solutions were three collisional gaits, depending on speed and step length. Two of those were the classic descriptions of walking and running, the researchers report 11 September in *Nature*.

The model also predicts an intermediate energy-efficient gait, or

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"pendular run", not generally observed in the real world. That could be because the model lacks tendons, which can dissipate energy inside the body, Ruina says. The researchers tried to reproduce that gait in the laboratory, with only moderate success: Older, less-in-shape subjects could approximate it, perhaps because their bodies are less springy, he adds.

Such optimization models of human locomotion could help doctors predict how people with prosthetics might move, or even help design better computer graphics, Ruina says. Moreover, the study has some far-reaching implications, says biomechanician John Bertram of the University of Calgary in Alberta, Canada: It implies that organisms are fundamentally constrained by basic mechanics.

--CAROLYN GRAMLING

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