The mechanics of foot travel

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With so many silly gaits to choose from, why have we adopted so few? Despite having the bones and muscles to perform a variety of gaits, human beings have developed an overwhelming preference for just two: walking and running. Now, computer analysis that allows simulation of infinite two-legged locomotions has shown our favored modes of bi-pedal travel use the least amount of energy.

Indeed, in an article published in the current online edition of the British journal Nature, Cornell engineers Andy Ruina and Manoj Srinivasan compare the mechanics of walking and running with "many other strange and unpractised gaits." They used a set of computer models that simulated physical measurements such as leg length, force, body velocity and trajectory, forward speed and work.

"We wish to find how a person can get from one place to another with the least muscle work," they report. "Why do people not walk or even run with a smooth level gait, like a waiter holding two cups brim-full of boiling coffee?"

The engineers' computer simulations conclude that walking is simply most energy efficient for travel at low speeds, and running is best at higher speeds. And, they report, a third walk-run gait is optimal for intermediate speeds, even though humans do not appear to take advantage of it.

The findings help to explain why the possible--but preposterous--gaits in the Monty Python sketch, "Ministry of the Silly Walks," have never

caught on in human locomotion. The researchers add that extensions of this work might improve the design of prosthetic devices and energy-efficient bipedal robots.

Source: NSF