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Using a robot to study the evolution of legged locomotion[1] BENJAMIN MCINROE, HENRY ASTLEY, DANIEL I. GOLDMAN, Georgia Institute of Technology — Throughout history, many organisms have used flipper-like limbs for both aquatic and terrestrial locomotion. Modern examples include mudskippers and sea turtles; extinct examples include walkers such as the early tetrapod *Ichthyostega*. In the transition from an aquatic to a terrestrial environment, early walkers had to adapt to the challenges of locomotion over flowable media like sand and mud. Previously, we discovered that a flipper with an elbow-like joint that could passively flex and extend toward and away from the body aided crawling on dry granular media [Mazouchova et. al. 2013], a result related to the jamming of material behind and beneath the flipper. To gain insight into how an additional degree of freedom of this joint affects flipper-based locomotors, we have built a robotic model with limb-joint morphology inspired by *Ichthyostega*. We add to our previous limb design a passive degree of freedom that allows for supination/pronation of the flipper about a variable insertion angle. Springs at the joints restore the flippers to equilibrium positions after interaction with the media. We study the crutching locomotion of the robot performing a symmetric gait, varying flipper-joint degrees of freedom and limb cycle frequency.

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