

Bipedal Bugs, Galloping Ghosts and Gripping Geckos: Bioinspired Computer Animation, Robotics, Artificial Muscles and Adhesives

Integrative biology is providing inspiration to disciplines such as animatronics, animation, mathematics, medicine, robotics and space exploration. In return, these disciplines supply biologists with novel design hypotheses, algorithms and measurement devices. One example is in the area of BioMotion. Comparing the remarkable diversity in nature has led to the discovery of general principles. Animals are amazing at legged locomotion because they have simple control systems, multifunction actuators and feet that allow no surface to be an obstacle. Extraordinarily diverse animals show the same dynamics - legged animals appear to bounce like people on pogo sticks. Force patterns produced by six-legged insects are the same as those produced by trotting eight-legged crabs, four-legged dogs and even running humans. Rapid running cockroaches can become bipedal as they take 50 steps in a single second and ghost crabs seem to glide with aerial phases. Yet, the advantage of many legs and a sprawled posture appears to be in stability. Mathematical models show that these designs self-stabilize to perturbations without the equivalent of a brain. Control algorithms appear embedded in the form of the animal itself. Muscles tune the system by acting as motors, springs, struts and shocks all in one. Amazing feet permit creatures such as geckos to climb up walls at over meter per second without using claws, glue or suction - just molecular forces. These fundamental principles of animal locomotion have inspired the design of creations in computer animation (A Bug's Life, Pixar), new control circuits, artificial muscles, self-clearing dry adhesives, and autonomous legged robots such as Ariel, Sprawl, Sitckybot and RHex will spawn the next generation of search-and-rescue robots.

Tuesday, April 1st, 2008, 5:30pm

355 Jennings Hall (MBI Auditorium)

Lecture is free and open to the public

A reception with complimentary food and drink will follow



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Professor Full directs the Poly-P.E.D.A.L. Lab which studies the Performance, Energetics and Dynamics of Animal Locomotion (PEDAL) in many-footed creatures (Poly). His internationally recognized research program in comparative physiology and biomechanics has shown how examining a diversity of animals leads to the discovery of general principles of locomotion. Robert Full completed his undergraduate, graduate, and doctoral studies at SUNY Buffalo. In 1986 he joined the faculty of the University of California at Berkeley as an Assistant Professor of Zoology. He was promoted to Associate Professor of Integrative Biology in 1991, and to Full Professor of Integrative Biology in 1995, a position he holds today.

