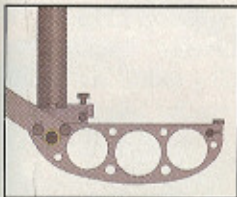
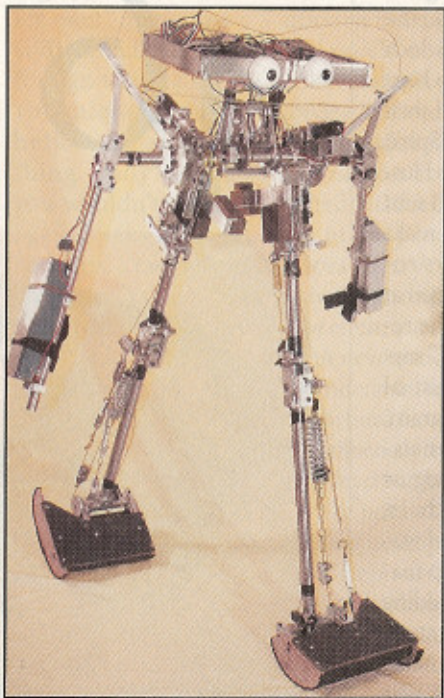


# Humanoid Robots Walk Tall



Most of the joints belonging to a three-foot-tall Cornell University humanoid (right) are not powered like those in traditional robots. Instead, they swing freely in a surprisingly humanlike manner. One of the few powered joints is the ankle (above). When one foot hits the ground, a spring in the other foot is triggered, propelling the robot forward. MIT and Delft University of Technology in the Netherlands have created similar walking robots.



**TECHNOLOGY**—In 2005 a new generation of robots revolutionized the way humanoids walk, one of the greatest challenges in engineering. They followed Honda's ASIMO, which wowed a cheering audience last winter by breaking into a two-mile-per-hour trot. ASIMO is based on technology that is much like that of a shuffling windup toy. Every maneuver is part of a programmed pattern, each posture a frozen moment in time, and an enormous amount of energy is needed to keep the body plugging along in a stiff-looking gait. By contrast, a nameless robot unveiled by engineers at Cornell University in February is modeled after antique toy figurines that make their way down a slope, depending only on gravity. The Cornell robot is the first to use principles of passive-dynamic walking to stroll on level ground, employing electrical energy equivalent to the metabolic energy a human would use. Most of the joints

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swing freely, naturally shifting mass like a pendulum. Another robot, named Rabbit, designed at the University of Michigan and the University of Nantes in France, may be the first to run in strides that look human. Its creators have made it dynamic, balancing on two points—it has no feet—and with the ability to adjust to obstacles and changes in terrain. Unlike ASIMO, which cannot balance in a fluid way, Rabbit can be shoved violently and regain its stability. —Susan Kruglinski