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# A Robot Out of Cyberspace

**A computer designs and builds its own buglike progeny, but it's not quite ready to rule the world**

BY FREDERIC GOLDEN

Picture a toddler playing with Legos or Tinker Toys. Without any instruction, she tries putting them together. Finally, after a lot of trial and error, she assembles a little machine that actually does something. Much to her delight, it chugs along the floor like some fanciful arthropod out of A Bug's Life. As the precocious builder's parent, you would be proud--especially if you were told that what she did on her own has long eluded the world's most powerful computers.

Last week, when scientists at Brandeis University announced that one of their machines had finally designed and built a simple, toylike robot, the news immediately invited scary comparisons with such Hollywood rogue robots as The Terminator and 2001: A Space Odyssey's psychopathic HAL. Some futurists, like Sun Microsystem's chief scientist Bill Joy, even warned that this might be one genie that shouldn't be let out of the bottle.

But if you look a little closer at the work of researchers Hod Lipson and Jordan Pollack, you'd see their robot creation isn't ready yet to rule the universe. Even compared with other robots, it's primitive: using only four basic parts--plastic cylinders and ball joints, simple circuitry and small motors, along with rules for friction and gravity--it designed little self-propelled crawlers, like the toddler's insect.

Other scientists have created similar robots in their computers, to say nothing of systems intelligent enough to play championship chess, but Pollack and Lipson took a giant step out of the virtual world. After they hooked their computer to a $50,000 commercial plastic model-making machine, it produced actual offspring, not just a model on a computer screen. The only human intervention was installing the robot's little motor and computer-programmed microchip ("neurons").

Through repeated design "generations" that the researchers likened to Darwinian evolution, their computer sought the "fittest" offspring--ones that could crawl the farthest in a given time. One creation

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shuffled along like a crab. Another left markings in the sand with its snakelike contractions. The best design turned out to be a pyramidal-shaped creature that pushed itself along with a shovel-like bar.

In their report in Nature, Lipson and Pollack admit their "primitive replicating robot" is far from the mythical medieval humanoid, or golem (after whom they've named their project). For one thing, it doesn't actually replicate--it can't make robots that make new robots--nor does it learn from its environment. But, as Rodney Brooks of the M.I.T. Artificial Intelligence Lab points out, it's a "long-awaited and necessary step" to creating machines that are truly lifelike. END

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