

Living Robots: Xenobots

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Context: Scientists Combine AI With Biology to Create Xenobots, the World's First 'Living Robots'

- The term “xeno” comes from the frog cells (*Xenopus laevis*) used to make them.
- A team of scientists has repurposed living cells – scraped from frog embryos – and assembled them into entirely new life-forms.
- The robots are constructed from heart cells, which spontaneously contract and relax like tiny pistons, and skin cells that provide more rigid structure.
- The xenobots were created using an evolutionary algorithm using AI, which mimics natural selection by generating potential solutions and then repeatedly picking and mutating the most promising ones. The algorithm conjured thousands of random configurations of between 500 and 1,000 skin and heart cells and each one was tested in a virtual environment. Many were useless lumps. But those that showed potential—such as being able to move—were tweaked and used to seed the next generation.
- Xenobots are less than 1mm long and made of 500-1000 living cells. They have various simple shapes, including some with squat “legs.” They can propel themselves in linear or circular directions, join together to act collectively, and move small objects. Using their own cellular energy, they can live up to 10 days.
- **Advantages**
 - While these “reconfigurable biomachines” could vastly improve human, animal and environmental health,
 - They can also repair themselves after being damaged

- Some speculate they could be used to clean our polluted oceans by collecting microplastics.
- Similarly, they may be used to enter confined or dangerous areas to scavenge toxins or radioactive materials.
- Xenobots designed with carefully shaped “pouches” might be able to carry drugs into human bodies.
- Future versions may be built from a patient’s own cells to repair tissue or target cancers. Being biodegradable, xenobots would have an edge on technologies made of plastic or metal.
- they raise legal and ethical concerns.