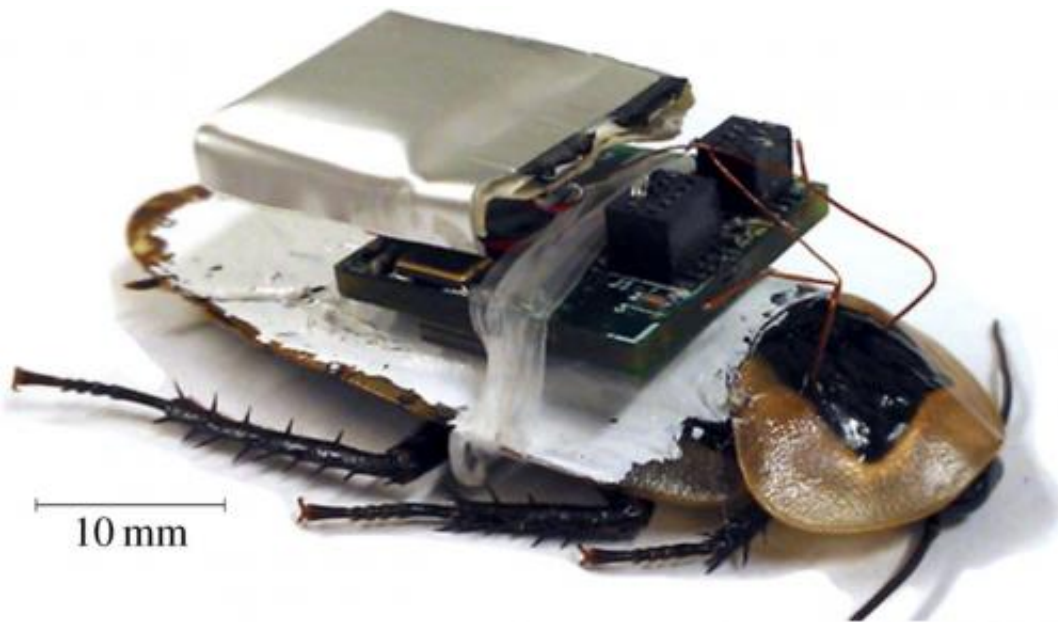


# Cockroaches made to follow directions via wireless nerve stimulation

March 4 2015, by Bob Yirka

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Discoid cockroach with attached electronic backpack (battery on top, board attached to the forewings). The electrodes enter the body through the pronotum. Credit: *Journal of the Royal Society Interface*, DOI: 10.1098/rsif.2014.1363

(Phys.org)—A team of researchers at Texas A&M University has found a way to control the path a cockroach takes as it walks using wireless technology. In their paper published in *Journal of the Royal Society Interface*, the team, made up of mechanical engineers and entomologists, describe how they created little backpacks for the bugs and implanted electrodes to allow for movement control.

Cockroaches are durable, of that there is little question, they live in places where others cannot. That makes them attractive research subjects. In this effort, the researchers sought to duplicate or improve on efforts by other teams attempting to remotely control insects or even rats or mice. In this case, the team created a small backpack and filled it with a very tiny microcontroller, wireless receiver and of course a battery. Next, they inserted [electrodes](#) into the body of a test [cockroach](#) to stimulate the bug's nervous system. After putting the backpack on the cockroach and connecting the electrodes, the team found that they could control the movement of the bug by introducing stimulation to either its right or left side, similar to reins on a horse. That allowed them to direct the cockroach as it moved around in test areas. The approach, was not perfect, of course, the team found that the cockroach responded correctly approximately 60 percent of the time—but that could be enough, because if the bug does not respond correctly the first time, it can be given another jolt to correct its path.

Such studies straddle ethical boundaries, some have noted, if humans create cyborgs to crawl into misbehaving nuclear reactors or skittle around in debris looking for survivors after earthquakes, for them, does that cross a moral line? What if the technology moves to dogs, cats or even monkeys?

There is also the question of how well the technology might work in practice, prior research has found that sometimes the creature under study grows used to the electrode stimulation and begins to ignore it. The team in Texas appears unfazed, they next plan to see if they can achieve the same results with electrodes placed outside the body, avoiding the need for implants.

**More information:** Locomotion control of hybrid cockroach robots, *Journal of the Royal Society Interface*, [DOI: 10.1098/rsif.2014.1363](https://doi.org/10.1098/rsif.2014.1363)

## **Abstract**

Supernatural belief presents an explanatory challenge to evolutionary theorists—it is both costly and prevalent. One influential functional explanation claims that the imagined threat of supernatural punishment can suppress selfishness and enhance cooperation. Specifically, morally concerned supreme deities or 'moralizing high gods' have been argued to reduce free-riding in large social groups, enabling believers to build the kind of complex societies that define modern humanity. Previous cross-cultural studies claiming to support the MHG hypothesis rely on correlational analyses only and do not correct for the statistical non-independence of sampled cultures. Here we use a Bayesian phylogenetic approach with a sample of 96 Austronesian cultures to test the MHG hypothesis as well as an alternative supernatural punishment hypothesis that allows punishment by a broad range of moralizing agents. We find evidence that broad supernatural punishment drives political complexity, whereas MHGs follow political complexity. We suggest that the concept of MHGs diffused as part of a suite of traits arising from cultural exchange between complex societies. Our results show the power of phylogenetic methods to address long-standing debates about the origins and functions of religion in human society.

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