

Leaping lizards! *Jurassic Park* got it right

Velociraptor adjusted the angle of its tail to stay stable when jumping.

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High-speed video footage of leaping lizards supports a 40-year-old hypothesis¹ about how theropod dinosaurs, such as the velociraptors of *Jurassic Park* fame, used their tails to stay stable while bounding around. The finding could be used to inform the design of more agile search-and-rescue robots.

Researchers at the University of California, Berkeley, filmed red-headed agama lizards (*Agama agama*) running down a track and vaulting off an obstacle to reach a shelter on a high platform. When the obstacle's surface was made slippery, the lizards skidded and jumped at the wrong angle. But by lifting their tails up or down, the lizards could adjust the tilt of their bodies, and thus land successfully.

Using these observations, the researchers made a computer model of *Velociraptor mongoliensis* and showed that, muscles willing, the dinosaur could have used its tail in a similar way, “maybe even more effectively than the lizard”, says study leader Robert Full, a biomechanic at Berkeley. The study is published online today in *Nature*².

Swinging appendages have been shown to enable cats to balance on branches³, aid monkey acrobatics⁴ and even stabilize human walking^{5, 6}. In 2008, Full's team showed that geckos use their tails to right themselves when falling from an upside-down position⁷. This led the researchers to wonder what role tails might have in ground-running animals.

Robots with tails

To examine how the lizards use their tails, the team built a lizard-like robotic car with its own tail, which they drove off a ramp that mimicked the lizards' take-off. The robot, named ‘Tailbot’, nose-dived if it didn't move its tail, but could stay stable if it moved it up in response to feedback about body position from sensors. This showed that the lizards must be using feedback from their limbs to carefully control body pitch with their tails. “It looks like the lizards are doing something quite sophisticated,” says Full.

“Tailbot isn't only a model for biology. It also pushes the boundaries of control in robotics,” Full says. Adding tails to search-and-rescue robots might make them more stable as they navigate bumpy terrain, he adds.

Data gleaned from the robot experiment also helped the team to make a computer model of *Velociraptor*, which they used to test the dinosaur tail stabilization hypothesis, put forward in 1969 by American palaeontologist John Ostrom¹. “What this does is show that there’s a lot of credibility in John Ostrom’s idea,” says Paul Barrett, a vertebrate palaeontologist at the Natural History Museum in London.

So *Jurassic Park* wasn’t far from the truth in the scene in which a *Velociraptor* jumps from a balcony onto an *Alamosaurus* skeleton. The way the raptor swung up its tail to avoid it landing face first is just right, says Full.

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