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Gravity Governs the Gecko's Strong Grip

By [Ibby Caputo](#)

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Put a gecko on a level piece of glass and it might slip all over the place. Tilt that glass about 10 degrees and it will stay in place. This is because the gecko's grip is triggered by gravity, a recent discovery made by scientists at the University of Calgary and Clemson University in South Carolina and published in *Proceedings B*, a biological research journal.



The pads on a gecko's toes have thousands of hairlike grippers called setae. (By M. Moffett)

"They actually don't respond to how slippery a surface is -- they only respond to the angle of the surface," said Tim Higham, an evolutionary biologist at Clemson.

Geckos, which are lizards found in warm climates, are known for their ability to scale the walls and ceilings of almost all surfaces. But unlike most animal adhesion systems, which involve claws or sticky residue, the gecko's adhesion system uses a reversible molecular attraction, according to an earlier study.

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"When you touch the gecko pad it's not sticky. It's not like tape," Higham said.

The gecko species studied by scientists -- and only a few out of thousands have been studied, according to Higham -- have pads on each of their toes. The pads are made of hundreds of thousands of setae, which are hair-like structures that elongate and are invisible to the naked eye. When activated on a surface, their adhesion is extremely strong.

"It can hold more than just the weight of the gecko," Higham said. "You could hang people on the gecko's foot, if the foot wouldn't come off."

Higham said one hypothesis for the gecko's super-strong grip is so it can withstand extreme forces, such as the winds of a hurricane.

But before the discovery by Higham and co-researcher Anthony Russell, a zoology professor at the University of Calgary, no one knew when the gecko would use its grip.

"What we found out really was something quite surprising," said Russell in a [YouTube video](#) explaining the findings. "Body orientation rather than any interaction with the surface is what triggers when this system is switched on." He said the central nervous system of the brain and ear probably plays an intensive role in the gecko's internal trigger.

One way that the gecko may protect its special ability is by using it only on an incline, Higham said.

"Something in their system tells them to turn it on at 10 degrees," Higham said. "If you only use it when you need it, then you are not going to subject it to damage."

There are advantages for the lizard to not use its adhesive system on level surfaces, Higham said -- mainly to run faster.

"Having that extra speed can help them run away or catch something," he said.

Higham suggested that the study of the gecko's grip could lead to the development of



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military and other applications, including gloves and shoes that could adhere to a variety of surfaces and allow people to scale walls. In the YouTube video, Russell proposes surgical applications to close wounds and picture hangers that would not require a sticky residue. The study could also lead to a robot made in the gecko's image.

"In a bomb scare or military-type situation, where having humans go in might not be really safe, you can send in a little robotic gecko and explore a dangerous situation," Higham said.

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