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A hairy trick: why geckos can walk on walls

Researchers at Oregon State University have developed a model that explains how geckos, as well as spiders and some insects, can run up and down walls, cling to ceilings, and seemingly defy gravity.

Credit: Bjørn Christian Tørrissen, Oregon State University

Geckos' feet are, by default, non-sticky, but the stickiness can be activated by a small shear force to produce a surprisingly tough form of adhesion.

They defy gravity through a remarkable mechanism in their toes that uses tiny, branched hairs called 'seta' that can instantly turn their stickiness on and off, and even 'unstick' their feet without using any energy, according to recent research published in the Journal of Applied Physics

These extraordinary hairs contribute to the ability of geckos to run, evade predators, and protect its very life and survival.

'These are really fascinating nanoscale systems and forces at work,' said Alex Greaney, an assistant professor in the OSU College of Engineering, an author of the paper.

'It's based not just on the nature of the seta but the canted angles and flexibility they have, and ability to work under a wide range of loading conditions.'

Even more compelling, Greaney said, is the minimal amount of energy expended in the whole process, as a gecko can race across a ceiling with millions of little hairy contact points on its feet turning sticky and non-sticky in a precisely integrated process.

This 'smart' adhesion system allows them to run at 20 body-lengths per second, and, hanging from a ceiling, the forces provided by the seta could actually support 50 times the body weight of the gecko.

The scientists want to find out more about this mechanism to see if more practical uses could be made of it – better

adhesives, for instance, or robots that can use some of these principles for improved performance or use in extreme environments.

Source: Oregon State University