A biologically inspired tape uses some of nature's tricks to stick

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Insects can run up walls, hang from ceilings, and perform other amazing feats that have for centuries fascinated human observers. Now scientists from the Zoological Institute at the University of Kiel, in Germany, who have been studying these able acrobats, have borrowed some of the insects' tricks to make a dry tape that can be repeatedly peeled off without losing its adhesive properties.

The key to many insects' wall-scaling ability lies in the thousands of tiny hairs that cover their feet and legs. The hairs have flattened tips that can splay out to maximize contact on even rough surfaces. "The main issue for good adhesion is intimate contact with the substrate," explains Stanislav Gorb, a lead researcher on the project. "Due to multiple contacts points (hairs), they can build proper contact with almost any surface." Using the same idea, the researchers manufactured a silicone tape patterned with similar tiny hairs. They found the patterned tape was at least two times harder to pull off of a surface than a flat tape of the same material. The insect inspired tape can also work under water, leaves behind no sticky residues, and can be attached and detached for thousands of cycles without losing its ability to grip. One team member even succeeded in dangling himself from the ceiling using a 20 x 20 centimeter square piece of the new tape.

Bioinspired adhesives have many potential commercial applications, from wall-climbing search robots to industrial pick-and-place machines. And the research group hasn't stopped looking to nature for new inspirations. The team is currently investigating a number of other

natural surfaces, including beetle coverwings, snake skin, and anti-adhesive plants. "From nature we can get rather unconventional ideas," says Gorb. "Not all solutions from nature are doable and not all of them are cheap. But they are numerous."

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