Nanotech in Nature: The Lotus Effect

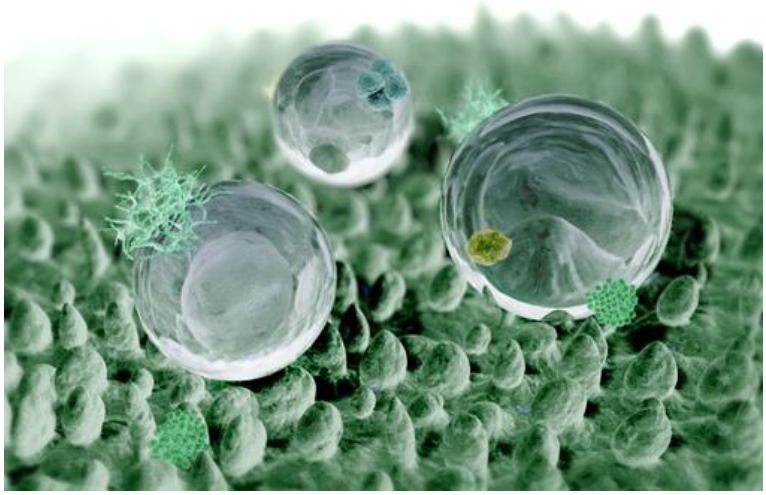
This exhibit dedicated to generous Little Free Museum supporters Tod & Linda Hirsch

Try It Out

Take a lotus leaf out and lay it flat. Using a pipette, place a few droplets of water onto the leaf. Pick the leaf up to observe more closely. What do you notice?

What's Going On

The lotus effect is a self-cleaning, water repellant property found in some plants. Remarkably, despite constant exposure to dust, dirt, rain and other elements, the leaves of the lotus plant remain clean and dry. This is because the surface of each leaf contains nanometer-sized waxy bumps that prevent dirt and water from adhering. Because the valleys between the bumps are too small for dirt particles to get into, the dirt stays suspended on the tops of the bumps. When a water droplet falls on the leaf, it is also suspended on top of the waxy bumps, creating a lot of surface tension.



Computer graphic of a lotus leaf surface. (Image: William Thielicke)

Normally, surface tension affects only the top of a water drop—the bottom sticks to whatever material the water is sitting on. But the nanoscale bumps on the surface of the leaf prop the drop up, so it is almost entirely surrounded by air. This creates surface tension on all sides, making the water bead up even more and stick to the leaf even less. In fact, the water adheres so loosely to the leaf that the tiniest movement causes the beads of water to roll smoothly off, taking any dirt particles with them. This makes the leaves self-cleaning.

Why It Matters

Engineers have duplicated this "nano-mountain" structure in a product called Lotusan paint. Buildings painted with Lotusan self-clean every time it rains. The surface of the building stays dry due to the lotus effect, preventing leaks. Similar nano-engineering forms the basis of other products such as Nanotex fabric, which repels water and helps prevent stains.

While You Walk...

What other engineering feats can you spot in nature?

Based upon material developed by the Materials Research Science and Engineering Center on Structured Interfaces at the University of Wisconsin-Madison with funding from the National Science Foundation under award numbers DMR-1121288, DMR-0520527, DMR-0079983, and EEC-0908782. Any opinions, findings, and conclusions or recommendations expressed in this report are those of the authors and do not necessarily reflect the views of the Foundation.