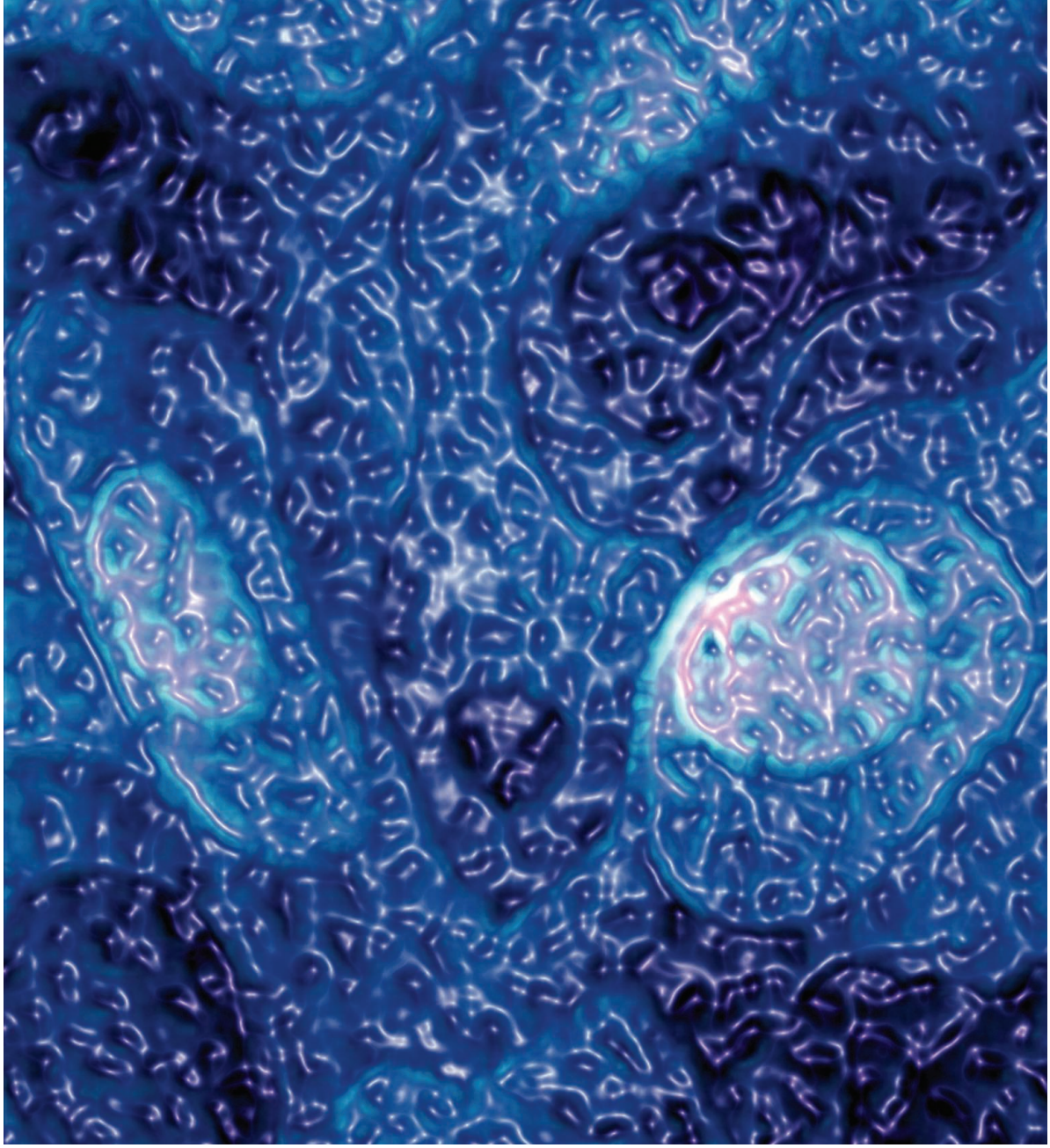


1st Rough Waters

PLACE: Seth B. Darling Argonne National Laboratory · Steven J. Sibener University of Chicago

Don't take the title literally. The ripples Seth Darling of Argonne National Laboratory and Steven Sibener of the University of Chicago, both in Illinois, captured with an atomic force microscope may look like the surface of an ocean, but they are a mere nanometer deep, and there's not a drop of water in sight.

The rich shades of turquoise and indigo are artificial, but the choppy waves are real. They are formed by millions of molecules arranging themselves on a gold surface. These "self-assembled monolayers" come with a head that clings to the surface and a tail that sticks out into the environment. Darling compares it to dumping a bowl of wet spaghetti on the floor and "all of a sudden it stands up as if it were uncooked spaghetti on end. That's kind of a weird thing to happen."

The ripple effect in the image is caused by two similar molecules, synthesized by Dong-Chan Lee and Luping Yu of the University of Chicago. Each molecule has sulfur at the head, but one has carbon and hydrogen at the tail whereas the other has carbon and fluorine, which leads to their heights differing by about 0.2 nanometers. Darling captured them at the moment they began separating. He hopes to find out if surfaces like these will form larger "islands" of short and tall molecules or if they will remain blended together. Eventually, Darling says, scientists hope to use such monolayers to adjust the properties of a surface.

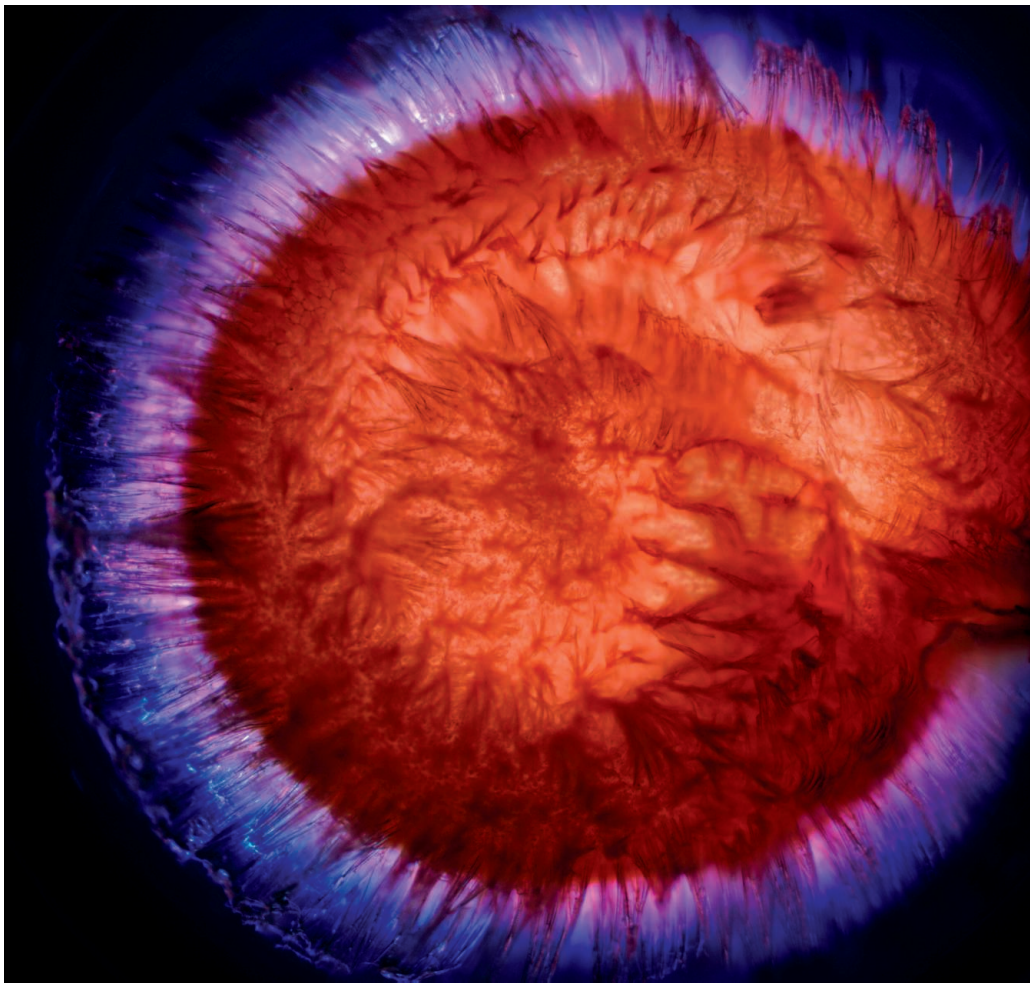
Winning entries need good art and good science, says panel of judges member Alisa Zapp Machalek, and this photo had both. "The science was amazing, and the image was—wow."

Published by AAAS

HONORABLE MENTION (tie)

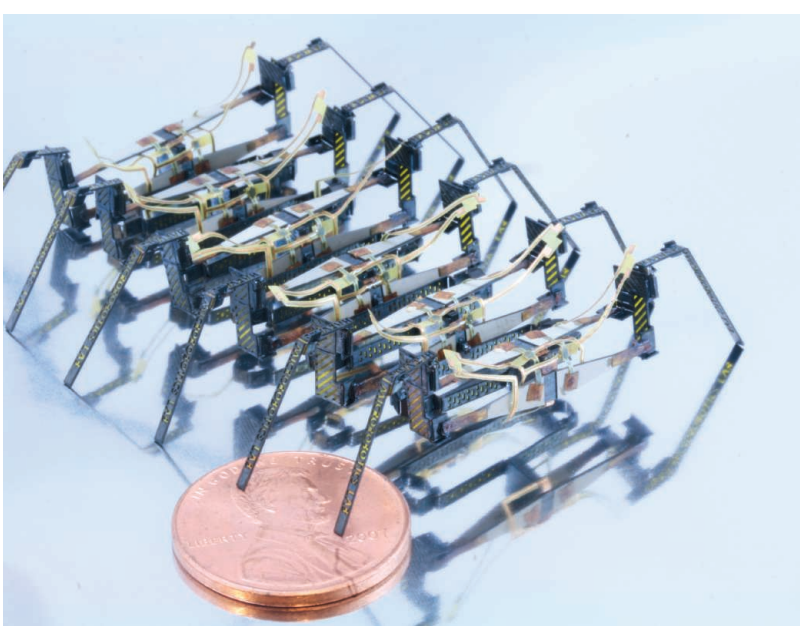
TRICHOMES (Hairs) on the Seed of the Common Tomato

Robert Rock Belliveau



Tomato seeds have hair. Not the ordinary, dead protein that hangs limply off human scalps. These trichomes secrete an insect-repelling, flavor-inducing mucus that helps give tomatoes their signature taste while acting as a natural bug spray. Robert Rock Belliveau took this photo of a 2-mm × 3-mm tomato seed last April. The color contrast comes from the polarizing microscope he uses, which has both transmitted and reflected light capabilities. The thinner parts at the edge of the seed (purple) are viewed with transmitted light while the trichomes on the top of the seed (red) are viewed with reflected light.

The pathologist has been taking microscopic photos of plants ever since he retired 10 years ago. He started with desert wildflowers, but when a drought in Las Vegas temporarily wiped out his subjects, he switched to vegetables. Anything, from ovaries to leaves to pulp, is fair game. "Every once in a while," he says, "you see something that's so bizarre, it is startling!"



Centipede Millirobot

Katie L. Hoffman · Robert J. Wood
Harvard University

Imitating insects is all the rage in robotics right now. Graduate student Katie Hoffman based this 12-legged, segmented robot on the body morphology of a centipede. The top view shows the actuators that control each leg, the reflection shows the flexible connections between the segments, and the penny gives a sense of the robot's size. Hoffman says most robots that size mimic cockroaches, which have only six legs and much more rigid bodies. By modeling a centipede, she hopes to study how flexibility and body undulations enhance locomotion.

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