



Popcorn gymnastics

The sight and sound (not to mention the smell) of popping corn kernels are familiar to most everyone. But as Emmanuel Virost and Alexandre Ponomarenko at École Polytechnique, Grenoble University, and Pierre and Marie Curie University show, the popping process, which lasts only about 100 ms, illustrates a surprising amount of physics.

The photo sequence here is from a high-speed camera that recorded the popping of individual kernels placed on a hot plate. A kernel's hull ruptures at a temperature of about 180 °C, when internal water vapor reaches a critical pressure. Many plants use similar fractures to explosively project their seeds. In a corn kernel, the fracture allows starch granules to adiabatically expand into spongy flakes that, like a gymnast's legs, propel it into somersaults. With about 20 μJ of initial kinetic energy, a kernel can reach a height of about a centimeter and rotate up to 500°.

Surprisingly, the popping sound comes after the hull ruptures; the researchers hypothesize that fractures cause pressure drops that excite acoustic modes inside the kernel. (E. Virost, A. Ponomarenko, *J. R. Soc. Interface* **12**, 20141247, 2015; photographs by Alexandre Ponomarenko and Emmanuel Virost.)

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