Not-So-Oozy Oobleck

You might know the stuff pictured below as Oobleck—the elementary-school goop that oozes between your fingers if you gently slide your hand into it, but stiffens up if you stir or poke at it. Truth is, Oobleck—made of nothing more than cornstarch and water—is neither fully liquid nor fully solid. Instead, it's something known as a non-Newtonian fluid, a type of substance that has odd properties. What's Oobleck's odd property? It becomes more viscous—more sticky or gummy—the more briskly you stir it.

Left to their own devices, the particles of cornstarch in Oobleck float freely in the water. But when you apply a force to the mixture—specifically, a shear force, which is a force that causes a kind of interior sliding action—the particles bunch together. "There's no space where they can go, so they jam up together and form very long chains," explains John Brady, the Chevron Professor of Chemical Engineering at Caltech and an expert on complex fluids like Oobleck. "That gives rise to the increase in viscosity."

More than 20 years ago, Brady and his colleagues used computer simulations to discover exactly how this so-called shear thickening works; today, Brady teaches his students about shear forces and other physics concepts using a plastic cup of cornstarch that he keeps on hand in his office. All he has to do is add some water to the dried-out mixture and he's ready to go.

Shear-thickening fluids are more than just a neat party trick. Recently, they've been incorporated into Kevlar vests to create a type of experimental liquid armor. The fluid is sandwiched between Kevlar layers, forming a thinner and lighter armor that allows the wearer to move around freely. Faced with an impact, that fluid solidifies—making the armor even more impervious to bullets and flying shrapnel. Score one for Oobleck. —*MW*