No more lumps: Let physics be your guide to making the perfect crepe

Enlarge / Batter must be distributed evenly to get uniform thickness in a perfect crepe.
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Order a crepe from a professional vendor and they'll likely cook it on a blade, a flat heated surface that distributes the batter evenly to get just the right consistency in the final crepe: uniform thickness with no unsightly lumps. But home cooks typically make crepes in a frying pan, which can make the process a wee bit trickier.

Still, no worries, all you home-cooking crepe lovers—physics has come to the rescue. According to the latest experiment results of two scientists, the trick is all in the wrist. They described their research in a recent paper published in *Physical Review Fluids*.

It all started when co-author Mathieu Sellier of the University of Canterbury in New Zealand expressed frustration to his wife that he could never get his homemade crepes to come out just right. "My wife said, 'Being a fluid dynamicist, you should be able to fix this problem,'" he told *New Scientist*. He found a willing collaborator in Edouard Boujo, a physicist at the Ecole Polytechnique in France. They set out

to investigate, conducting multiple experiments making yummy crepes for their respective daughters, who were naturally delighted to participate in the scientific process.

“The key physical phenomena underpinning crepe making involves the interaction of the liquid layer with the substrate kinematics and the solidification of the liquid layer,” the authors wrote. At first, the batter is all piled up in the center of the pan. Then gravity kicks in and pulls it down so that the batter spreads out, gradually becoming (ideally) uniform. Of course, the batter is also heating up and solidifying as this happens. So they devised a model that accounted for how the batter flows around the pan and how its viscosity increases as it solidifies during the cooking process, slowing the flow.

Rock the pan slowly along one axis, and rock it twice as fast along the perpendicular axis.
E. Boujo and M. Sellier

For their analysis, Sellier and Boujo relied on a computational tool called "optimal control theory," allowing them to accurately calculate how crepe thickness depends on pan motion. In this case, the goal is optimal coverage of the batter, resulting in as uniformly thin, perfectly circular crepe with no holes.

"What they find is that just doing nothing does a reasonable job at evening out the batter," said Aatish Bhatia, a physicist and science communicator who wrote about the science of the perfect crepe for Wired in 2012. "However, according to their results, you can do just a bit better with a specific kind of rocking motion, where you rock the pan slowly along one axis, and you rock it twice as fast along the perpendicular axis." This produces a kid of figure-eight motion and a more uniform end result. Of course, "In this model, the rocking never stops," Bhatia adds. "But [in the real world] eventually the crepe heats up and solidifies."

Or, as FYFD's Nicole Sharp sums it up:

> *For optimal crepe-making, add the batter to the center of the pan. Then immediately tilt the pan to one side to spread the batter all the way to the edge. Keeping the pan inclined, rotate once to fill in the full circumference. Then continue the rotation at a slighter incline to fill in any holes until the pan is horizontal and the crepe is cooked through.*

You can still make a decent crepe without applying the precise mathematical model; it's just nice to know that physics is there to explain why this particular motion produces the ideal uniform distribution. Physics is largely silent on the question of the optimal crepe filling, but for the record, Boujo is a purist, opting for chocolate. In contrast, Sellier likes to mix things up with slices of banana and a bit of Nutella.

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