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Physics

Physicists have worked out how to pour water as quietly as possible

The sound of pouring water into a cup can be tamped down by changing the height of the pour or the diameter of the spout, but physicists have found that changing just one of these never makes it fully silent

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Can you pour without making a sound?
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The key to pouring water very quietly from a teapot is not just holding the spout close to the cup, but creating a perfectly smooth stream of liquid.

Mouad Boudina https://www.researchgate.net/scientific-contributions/Mouad-Boudina-2180885636 at Seoul National University in South Korea drinks tea every morning. Repeatedly pouring tea into a cup from a traditional teapot from his

hometown in Morocco made him wonder what makes this process noisy. To find out, he and his colleagues experimented with pouring water in the lab.

They filled an acrylic cylinder with water dispensed from a nozzle positioned above it, and recorded the process with a high-speed camera on the outside and an underwater microphone inside the cylinder. After testing nozzles with different diameters and placed at varying heights above the cup, the researchers concluded that changing either one or both of these variables was not enough to make the process silent. Instead, it was getting everything about the pour to conspire to make the shape of the stream smooth that made the biggest difference.

Boudina says that it is a common misconception that simply holding a teapot very close to a cup is enough to make the pouring silent because noise happens whenever the poured liquid creates cavities /article/2330947-physicists-calculate-highest-dives-most-humans-can-safely-withstand/ in the partially filled cup. But this cavitation process is especially pronounced when the stream of tea is uneven, resulting in pockets of air forming in the cup and then releasing noisy bubbles /article/2238125-weve-figured-out-why-bubbles-make-a-pop-sound-when-they-burst/ as they collapse, he says.

In their experiments, they found that at a certain height, a stream of water will break up into droplets. But, when water is poured from no more than one-third of this height, the pour will be silent." This height, however, depended on the diameter, shape and smoothness of the nozzle. In the case of tea /article/mg25834372-300-how-maths-reveals-the-best-time-to-add-milk-for-hotter-tea/, it would be different for every teapot.

Michael Buckingham https://mbuckingham.scrippsprofiles.ucsd.edu/ at the University of California, San Diego, says that this investigation of how sound and fluid flow connect could eventually lead to new methods for monitoring blood flow or determining how water and other fluids move through plumbing /article/mg25934510-200-sewage-crisis-the-truth-about-british-rivers-and-how-to-clean-them-up/ just by listening.

These experiments could also help evaluate how realistic sounds of water synthesised on computers for films, virtual environments /article/2401929-ai-can-steal-passwords-in-virtual-reality-from-avatar-hand-motions/ or simulations of industrial processes are, says Doug James https://graphics.stanford.edu/~djames/ at Stanford University in California. "We could pour some water virtually and see if the [synthesised] sound varies with nozzle height or diameter in a way that matches," he says.