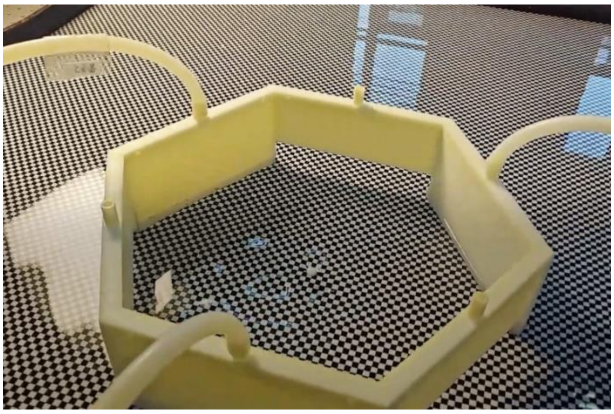
Gizmodo (US)
16 March 2025

Wild ‘Waterbending’ Technique Uses Waves to Steer Floating Objects With Precision

Researchers manipulated water waves to move ping pong balls with a level of precision that seems straight out of a sci-fi movie.



Researchers developed a wave manipulation technique to precisely move floating objects. © NTUsg

By Margherita Bassi

Imagine hopping onto a large floatie in a lake or pool, and then trying to move. We’ve all been there—without paddling limbs, wind-catching sails, or a propelling engine, you’re stuck. But what if we could make the water itself move you?

An international team of researchers has developed a technique to manipulate water and move floating objects with a level of precision that seems right out of a sci-fi movie. Beyond its inherent cool factor, this research could have practical applications, ranging from molecular experiments to the maneuvering of boats across large bodies of water.

The water manipulation technique is driven by waves. After studying computer simulations, the team used 3D-printed plastic structures to generate different kinds of waves in a water tank. One of the structures was a ring with 24 tubes connected to speakers, which produced low-pitched humming sounds that created ripples in the water within the ring.

By playing with the magnitude and frequency of the waves produced by the structures, the researchers generated intricate patterns across the water's surface—such as loops and vortices—allowing them to control the movement of floating objects like foam balls and ping pong balls.

As detailed in a study published in early February in the journal Nature, the researchers used waves to accomplish tricks such as holding the floating objects in place or inducing them to follow circular or spiral paths. They even noted that small external waves did not greatly disturb the pattern and object movement. Overall, the floating objects only ever deviated from their path by less than a fifth of an inch (about 5 millimeters). Despite appearances, the researchers aren't waterbenders—it's all grounded in physics.

"Our findings are the first step in exploring how water waves can be shaped to move objects, with many potential applications in the future," study co-lead Shen Yijie, from Nanyang Technological University in Singapore, said in a university statement.

Yijie is an optical engineer, and the recent study was inspired by his research on light patterns. He and his colleagues had previously shown that light waves could move tiny particles within light patterns, which led him to wonder if water could behave similarly.

"We've shown that water waves can be used to precisely move floating objects as small as rice grains. Future research could study even smaller waves such as those on the scale of cells that are hundreds of times smaller, as well as much larger sea waves that are a thousand times bigger," Yijie added.

On a molecular scale, this technique could bring particles together without direct manipulation. On a larger scale, we could control the movement of boats across bodies of water, though the researchers admit that the impact of strong natural waves would have to be accounted for. Could this technique also move liquids within water? Similar water manipulation techniques might help clean up floating chemical pollutants. It's also worth noting, however, that scientists would likely have to use very large wave-generating structures in large bodies of water.

Given the similarities among water waves, light waves, and electron movement, the researchers suggest that water could provide a more accessible way to study some quantum phenomena. If you think that's wildly futuristic, just wait—future research could even investigate the possibility of using water patterns to store data, according to the statement.

For now, however, the team aims to investigate whether waves can create similar patterns beneath the surface of the water.

Correction: *An earlier version of this story mistakenly claimed that the researchers moved "grains of rice." In reality they moved floating objects as small as grains of rice.*

https://gizmodo.com/wild-waterbending-technique-uses-waves-to-steer-floating-objects-with-precision-2000575111