Not too big, not too small: Goldilocks analogy found in maze navigation

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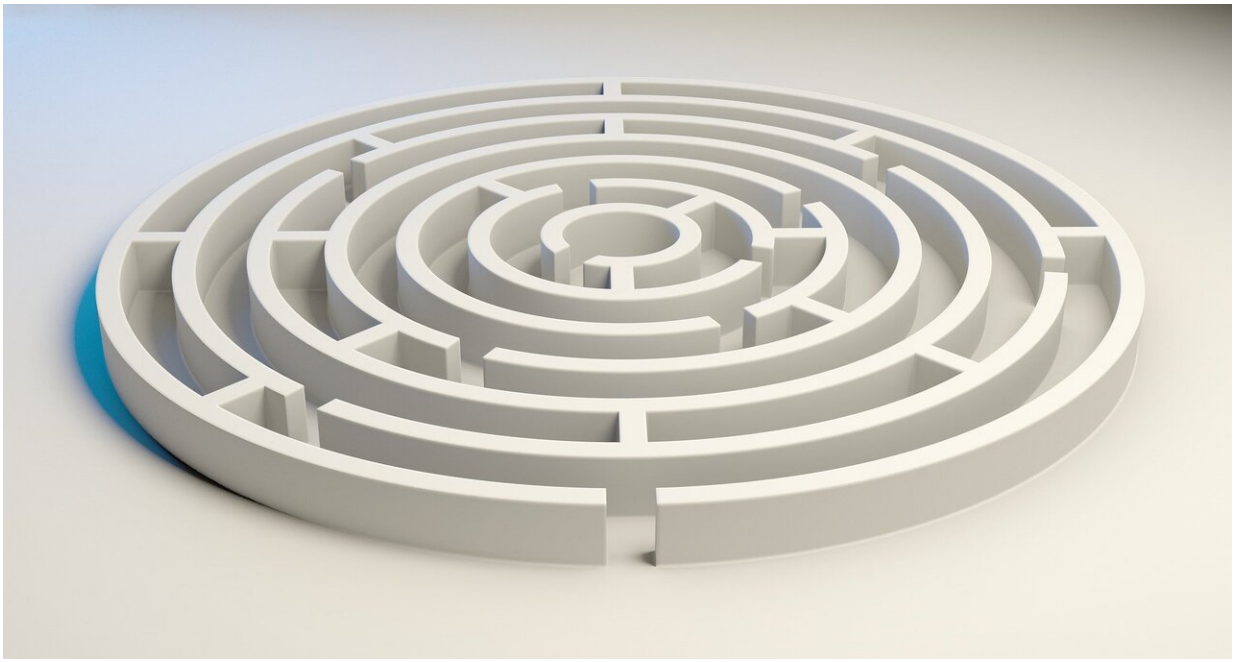

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New research from the Okinawa Institute of Science and Technology Graduate University (OIST) has found a surprising randomness for how fluids choose their path around obstacles that depends on their spacing. This has important implications for a range of scenarios—from oil recovery and groundwater remediation, to understanding the movement of fluids through biological systems. The research was published in

Physical Review Letters.

Scientists from OIST's Micro/Bio/Nanofluidics Unit created a tiny set up comprised of two microscopic cylinders, each around the width of a human hair, placed side-by-side in a channel. This created a choice of three possible paths for a fluid to take past the pair of obstacles. A viscoelastic fluid, which is like that found in regular shampoo and conditioner, was run through the set-up at a constant rate and the path it chose around the cylinders was mapped.

"We found this nice goldilocks analogy," said lead author Dr. Cameron Hopkins. "If the central gap between the cylinders was too small then the fluid would avoid this gap and randomly choose one of the two side paths to go around the cylinders. If the central gap was too large, then the fluid would go through the center and avoid the two side paths. It was only when the gap was just the right size, that the fluid would randomly choose between the three available paths."

Ultimately this research has revealed insights into the complexity of fluid path-selection and the findings can be extended to help understand fluid transport in larger, real-world systems.

More information: Cameron C. Hopkins et al. Tristability in Viscoelastic Flow Past Side-by-Side Microcylinders, *Physical Review Letters* (2021). DOI: 10.1103/PhysRevLett.126.054501

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