Professor Thomas Scaffidi makes electric conductance breakthrough

In a new Nature paper, Scaffidi and others describe a new way of driving an electric current through a device.

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Professor Scaffidi is one of the news faculty members in the UCI Department of Physics & Astronomy.

Picture Credit:
Thomas Scaffidi

Professor Thomas Scaffidi, one of the newest professors in the UCI Department of Physics & Astronomy, is a co-author on a new *Nature* paper that reports on a new way of driving an electric current through a device by creating an electron flow that behaves like a viscous fluid and does not follow Ohm's law of resistance. It's a discovery that promises to help catapult the development of next-generation electronic devices, because it reduces the resistance electrons might otherwise face as they flow through circuitry. "What we showed is that we can beat this limit by making the electrons so strongly interacting that they behave like a viscous fluid, in a regime called hydrodynamic," said Scaffidi, who is a co-author on the study that was led by scientists at the Weizmann Institute of Science in Israel and whose team performed the calculations that suggested electrons could behave in such a way. "The viscous flow can smoothly go through the small device without producing a large resistance. This paper was a proof of principle that viscous flows of electrons can beat the quantum limit of conductance." The leap forward became possible thanks to advances in material science, including the development of something called graphene – a one-atom thick material through which electrons can behave viscously. "The next step would be to see how far we can push this," Scaffidi said. "How large can we actually make the conductance? Is there another fundamental barrier one might run into? How can we use this to reduce energy consumption in real-life devices?"

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