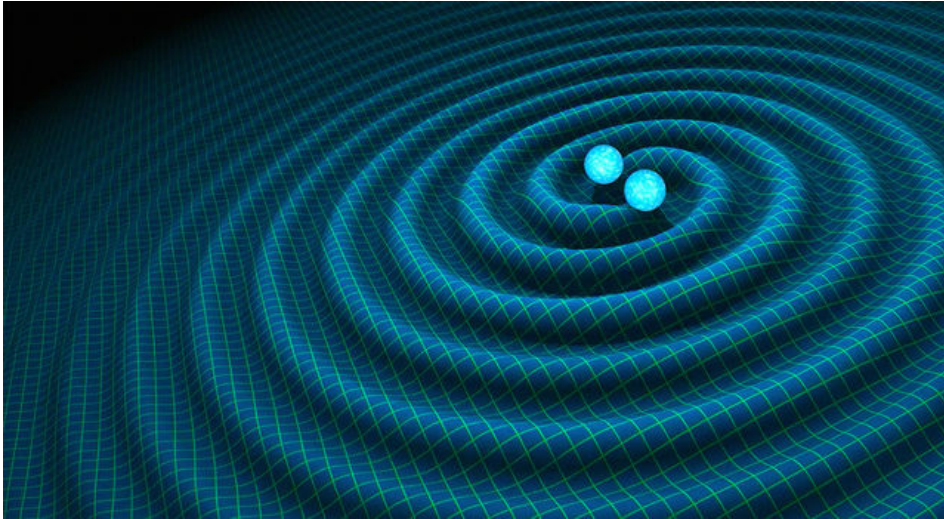


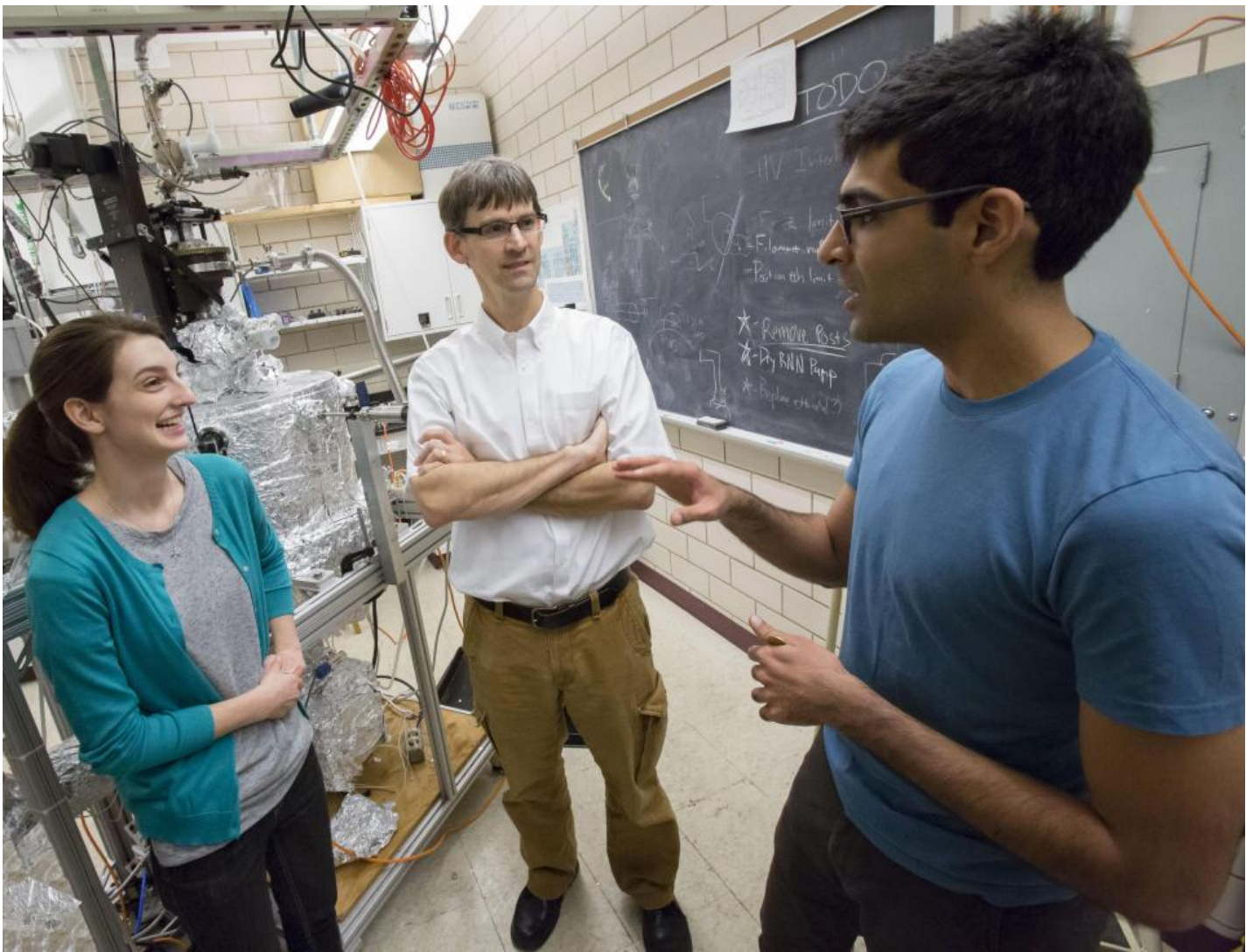
# NEW FORM OF MATTER, EXCITONIUM, FINALLY PROVEN TO EXIST AFTER 50 YEARS OF SEARCHING

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After 50 years of theories and frustrated attempts, scientists have finally demonstrated the existence of a new form of matter. The condensate never before detected is called excitonium, a name coined for the first time in the 1960s by the theoretical physicist of Harvard, Bert Halperin. Halperin is now 76 years old. Peter Abbamonte, the physicist responsible for the discovery, saw him recently at a party; Halperin was apparently excited.

"It's the closest thing to" proven "that can be achieved in science," said Abbamonte, a professor of physics at the University of Illinois at Urbana-Champaign, *Newsweek*. "You can never really prove anything, but, well, people find it compelling."



L. Brian Stauffer, University of Illinois at Urbana-Champaign

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Excitonium is a condensate, which means that the researchers found it to be solid. Excitonium is composed of particles called excitons, in the same way that, for example, solid aluminum is composed of aluminum particles. However, exciton particles are not created through such an intuitive process.

Let's start with something a little more conventional to compare, like hydrogen. The hydrogen particles are composed of an electron and a proton. The particles of Exciton, then, are formed by an electron that escaped and the negative space that it left when it did. The hole really acts like a particle, attracting the escaped electron and joining it; they orbit one another in the same way that an electron and a proton would.

As much as previous scientists suspected excitonium existed, they never had a good enough way to prove it. What Abbamonte and his colleagues did was to invent an electron scattering technique to detect the final result of the exciton particles, excitonium. They started with a clean surface of the material in vacuum – without air or anything else – and then dispersed the electrons from their surface to form waves, like hitting the middle of a trampoline.

The particular way in which the waves spread allowed them to detect those electrons escaped in their final form, excitonium. It is not different from the way in which the legendary Higgs boson was detected. They called the spectroscopy technique of electron energy loss resolved by impulse, or M-EELS. A document explaining the discovery was published in the journal *Science*.

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