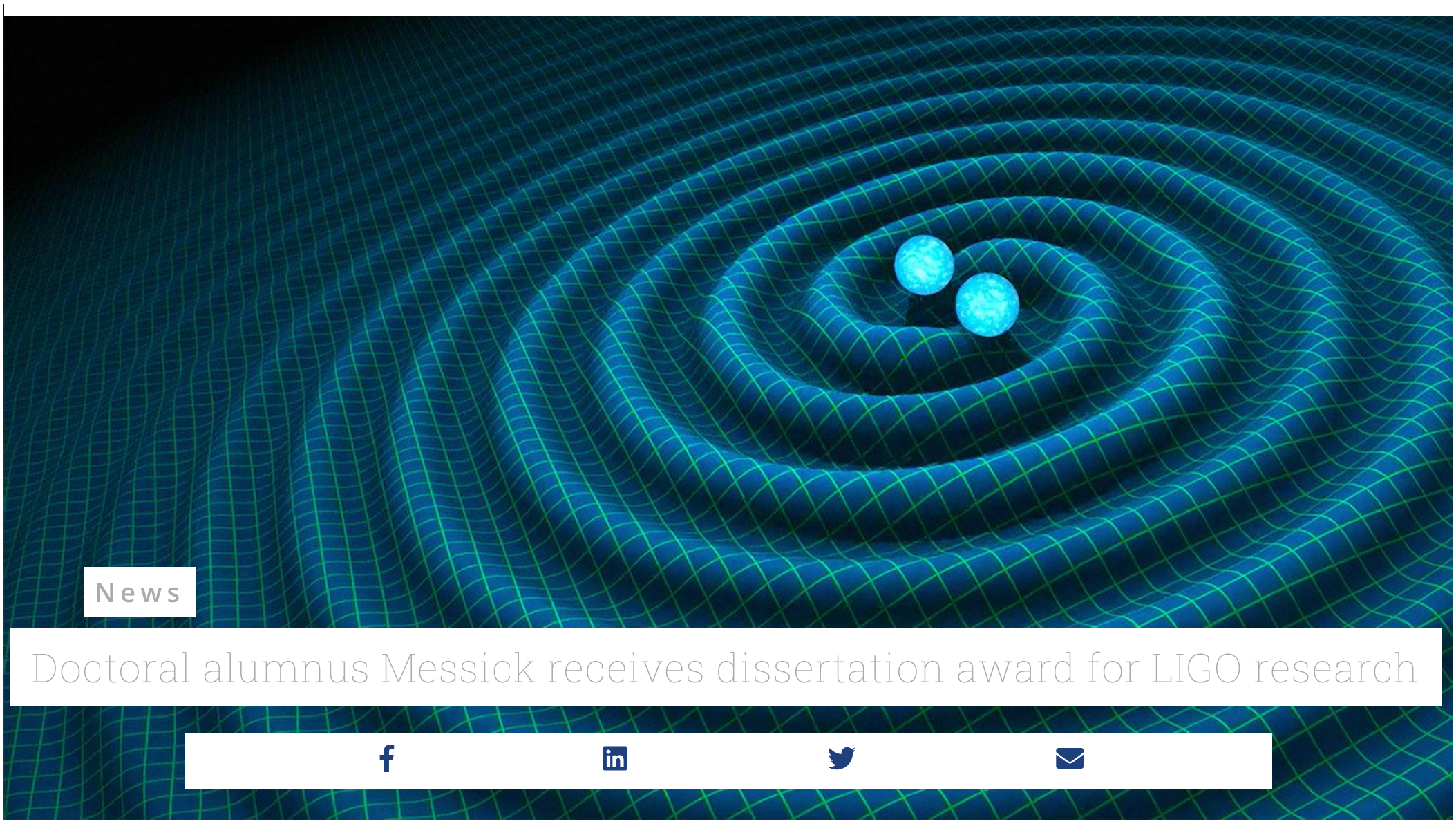

News

Doctoral alumnus Messick receives dissertation award for LIGO research

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Cody Messick, who earned a doctorate in physics from Penn State in 2019, was honored with the Northeastern Association of Graduate Schools' 2023 Doctoral Dissertation Award. The annual award recognizes one outstanding dissertation that has been produced by a doctoral candidate at one of its member institutions.

Cody Messick, who received a doctorate in physics from Penn State in 2019, was recognized for his outstanding dissertation by the Northeast Association of Graduate Schools. Image provided.

"It's exciting and incredibly validating to receive an award like this," said Messick, now a postdoctoral researcher at the Massachusetts Institute of Technology. "I set out to write my dissertation from scratch instead of combining papers, because I wanted more control over the way I presented the story of my research. Receiving an award like this makes that effort feel seen, and, while I originally took the route, I did it for myself, and it's an honor to receive recognition for it."

Messick's pioneering research focused on gravitational waves, which are ripples in space that were first hypothesized by Albert Einstein. Messick's work led to the first-ever discovery in 2015 of gravitational waves using a highly sophisticated measurement device known as the Laser Interferometer Gravitational-Wave Observatory (LIGO), which uses lasers to measure miniscule changes in space occurring from distant astronomy events, such as a supernova. Today, LIGO and similar gravitational-wave detectors are used by an international research team, known as the LIGO-Virgo-KAGRA

BACK TO TOP

For his doctoral dissertation, "Detecting Gravitational Waves for Multi-Messenger Astronomy," Messick developed algorithms for sifting through large amounts of data produced by LIGO to identify subtle signals of a distant astronomical event. Messick's innovations led to the identification of 11 separate gravitational wave signals, as well as the ability to detect signals in real time.

"The most exciting of these detections occurred on Aug. 17, 2017. I was the first person in the world to see that our analysis had identified a signal that went through our detectors within two seconds of an extremely energetic burst of electromagnetic radiation called a gamma-ray burst. We were able to confirm that these two events came from the same astrophysical source: two neutron stars colliding roughly 130 million light-years away," said Messick. This work was recognized as Science's Breakthrough of the Year in 2017.

Messick's work helped to pave the way for LIGO's data to be an integral part of multi-messenger astronomy, which leverages signals from different sources, such as neutrinos and electromagnetic waves, to create a deeper understanding of the universe.

"Gravitational wave astronomy is now a bona fide field of physics due, in no small measure, to the contributions of Cody Messick while he was a graduate student at Penn State, working on the Laser Interferometer Gravitational-Wave Observatory (LIGO)," said **Doug Cowen**, professor of physics and astronomy and astrophysics at Penn State. "His analysis techniques were central to the detection and subsequent localization of the first triply-detected gravitational wave, followed very shortly afterward by the first binary neutron star merger discovery, which led directly to the first coincident gravitational wave plus gamma-ray detection. Together, these momentous discoveries have elevated gravitational waves to a preeminent position in the nascent field of multi-messenger astronomy."

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