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Hillsdale College Physics Alumni, Professor Participate in Groundbreaking International Research Work on Gravitational Waves

HILLSDALE, Mich. — Hillsdale College Associate Professor of Physics Timothy Dolch and two physics alumni co-authored a study that discovered the existence of gravitational waves that oscillate slowly — some with a frequency of years or even decades. These gravitational waves, which were first hypothesized by Albert Einstein in his general theory of relativity, were observed in data acquired by the North American Nanohertz Observatory for Gravitational Waves (NANOGrav). As part of their research, the Hillsdale colleagues reviewed, recorded, and analyzed the NANOGrav data.

NANOGrav researchers studied 15 years of data collected from the radio signals of distant pulsars. Pulsars are small, dense stars that rotate – rapidly and consistently —while emitting radio waves, much like a lighthouse, and can serve as “cosmic clocks.” These new findings open up a hitherto hidden part of the gravitational wave spectrum at low frequencies, in which these waves stretch and bend spacetime several times per year. This complements the detection of high-frequency gravitational waves in 2015 by the Laser Interferometer Gravitational-wave Observatory in which spacetime vibrates hundreds of times per second.

“It took centuries for physicists to detect radio waves. Those discoveries paved the way for the recent and groundbreaking discovery of the gravitational wave sky,” said Dolch. “Through NANOGrav data, we uncovered a previously undetected, low-frequency species of gravitational waves. Though the immediate consequences are still unknown, this discovery will serve undoubtedly as another key in unlocking the vast mysteries of the cosmos.”

Dolch began working with NANOGrav in 2011 as a postdoctoral researcher and became a full member in 2012. His research has focused on how the hydrogen in our galaxy affects gravitational wave signals, and he has been a regular NANOGrav observer with Arecibo Observatory and the Green Bank Telescope. Since 2019, he has chaired or co-chaired the Education and Public Outreach Working Group through which he has helped involve undergraduate researchers in NANOGrav science.

Now pursuing doctoral degrees in physics and astrophysics, respectively, two Hillsdale College alumni, Cody Jessup ('16) and Laura Salo ('19), assisted in the collection and analysis of the 15-year dataset. They are co-authors on one of the papers published in the Astrophysical Journal Letters to present NANOGrav's findings: "The NANOGrav 15-year Data Set: Observations and Timing of 68 Millisecond Pulsars."

Three other Hillsdale College alumni, Daniel Halmrast ('17), Joshua Ramette ('17), and Michael Tripepi ('17, now assistant professor of physics at Hillsdale College) were co-authors on previous NANOGrav papers that analyzed 11-year and 12.5-year datasets. Alumnus Sashabaw Niedbalski ('21) is currently a graduate student in astronomy at Cornell University, working with NANOGrav-related research. He is an associate member of NANOGrav.

"When people think of Hillsdale College or the liberal arts, they don't often think of physics," said Dolch. "Physics has been a part of the liberal arts from the beginning. Our students who have worked on NANOGrav data have gone on to study physics and related fields at the highest level — at places like MIT, Oxford, Cornell, Ohio State, University of California Santa Barbara, the University of Minnesota, and Montana State University. We take physics seriously here."

NANOGrav's findings will be presented via livestream on Thursday, July 29 at 1:00 PM ET. The livestream link can be accessed [here](#).

For headshots of Dolch, Jessup, and Salo, along with photos from NANOGrav, click [here](#).

To read NANOGrav's full statement, click [here](#).

For a high-resolution copy of the Hillsdale College clocktower logo, click [here](#).

Brief Timeline on Gravitational Wave Theory and Research

- **1916:** Albert Einstein predicts gravitational waves in his general theory of relativity
- **1932:** Karl Jansky detects radio waves coming from stars in the Milky Way Galaxy
- **1974:** Russell Hulse and Joseph Taylor discover a pair of neutron stars that seemed to behave in a curious pattern, providing the first indirect evidence of gravitational waves
- **2015:** Advanced LIGO reports the first direct detections of high-frequency gravitational waves resulting from the merger of stellar-mass black holes
- **2023:** NANOGrav directly detects low-frequency gravitational waves resulting from two supermassive black holes orbiting one another

About Hillsdale College

Hillsdale College is an independent, nonsectarian, Christian liberal arts college located in southern Michigan. Founded in 1844, the College has built a national reputation through its classical liberal arts core curriculum and its principled refusal to accept federal or state taxpayer subsidies, even indirectly in the form of student grants or loans. It also conducts an outreach effort promoting civil and religious liberty, including a free monthly speech digest, *Imprimis*, with a circulation of more than 6.4 million. For more information, visit hillsdale.edu.

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