Penn State participates in Nobel-winning physics project

BY LORI FALCE
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When it comes to physics, Penn State doesn't make waves.

Nope. They help find them and record them.

On Tuesday, the crown jewel of the physics world was announced with the award of the Nobel Prize in physics to Rainer Weiss, of MIT, and Barry Barish and Kip Thorne from Cal Tech. They got the honor for work in gravitational waves, something that used to be just a theory.

But the work that got them there didn’t happen without support, and some of that support came from Penn State.

“The discovery is opening a new and incredibly exciting realm of astrophysics that is
being shepherded in by researchers right here at Penn State. Professors Chad Hanna and B.S. Sathyaprakash, along with graduate student Cody Messick, are members of the international team working on LIGO (the Laser Interferometer Gravitational Wave Observatory) who made and are making significant contributions to this major scientific effort. My hardy congratulations to our outstanding Penn State researchers and to the entire LIGO team for this well-deserved recognition,” said Vice President for Research Neil Sharkey.

So what's a gravitational wave?

“(They) were predicted by Albert Einstein as a consequence of his theory of relativity,” Hanna said. “Basically, he predicted a scenario where if you had very massive, very dense objects like black holes, these things could really dynamically warp space and time.”

Although hard to understand, the concept of gravitational waves is an important advancement that has taken more than 100 years to prove, but as technology develops, more scientists are studying the phenomenon and more waves are being predicted.

The award came just a week after the announcement of another wave detected in August with the combined efforts of LIGO and the European observatory Virgo in Italy. The most recent wave was just the fourth to be proven.

Just four? How hard are these waves to find? How big are the ripples in this universal pond?

“The prediction for how much space is warped is extremely small,” Hanna said. “It's like the height of a human being compared to the entire Milky Way galaxy.”
Researchers at Penn State were among hundreds worldwide working on the project.

“At time of initial discovery, I was co-chair of an astrophysics working group searching for binary black holes, merging black holes,” Hanna said. “I also happened to be somewhat involved in analysis of the data. Other students and post docs here have participated by analyzing data and searching for these gravitational waves in real time, possibly correlating with other observations.”

Sathyaprakash was instrumental in helping figure out what they were looking for.

“Sathya has been a huge player in the field for literally decades. He originally proposed accurate models of what gravitational waves would look like,” Hanna said. “That’s so important. These waves are so hard to detect, if we didn’t know, we could miss them.”

The researchers who won the Nobel prize say the advancement is more than a victory for them.

“It's a win for the human race as a whole. These gravitational waves will be powerful ways for the human race to explore the universe,” Thorne told The Associated Press in a phone interview.

Hanna compared the LIGO project to Galileo’s first telescope, with amazing advancements to come.

“We expect the same sort of evolution for gravitational waves. It seems certain there will be plenty of additional discoveries” he said.

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BY JOSH MOYER
JUNE 14, 2020 08:49 PM, UPDATED JUNE 15, 2020 04:52 PM

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