

Will We Find Gravity Waves?

Physics professor involved in ground-breaking research

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Summerscales presented her research during the Celebration of Research Symposium at Andrews last month.

By: Danni Francis

The world of science is effectively on the edge of its seat as researchers are close to making revolutionary discoveries in the area of gravity and gravitational waves. Tiffany Summerscales, associate professor of physics at Andrews University, is an active researcher with the Laser Interferometer Gravitational-Wave Observatory (LIGO) collaboration. Additionally, in October Summerscales participated in the seventh annual Celebration of Research symposium, which seeks to highlight the recent and current research of faculty and graduate students at Andrews.

Summerscales explains the basis of this research saying, "Einstein's theory of general relativity posits that mass curves space-time. When the distribution of mass changes, the curvature must also change and that change spreads outwards through space like the ripples on a pond. These ripples, also called gravitational waves, are very faint. Only the most significant events in the

universe, like a supernova (an explosion that briefly outshines an entire galaxy), or massive objects are capable of producing gravitational waves of measureable strength.”

The machine features a laser and mirrors which have recently undergone several upgrades. LIGO is designed to detect these gravitational waves for the very first time. Once these evasive ripples are caught, they will reveal crucial information about the bodies releasing them. Additionally, these waves will allow for the possibility to watch scientific phenomena that have never been observed, such as neutron stars and black holes colliding, seeing into the heart of a supernova, and looking back to the moment of the universe’s creation.

“I’ve been a member of the LIGO collaboration since about the year 2000,” says Summerscales. “I started when I was in graduate school.”

The collaboration in which Summerscales works, the burst working group, is specifically interested in discovering short duration signals such as those from supernova explosions. Research is expected to peak within the next two years as the detectors increase in sensitivity to gravitational waves and decrease in susceptibility to ground motion and other sources of noise.

“When LIGO reaches its full sensitivity within the next year, its going to be 10 times more sensitive than it was originally, it will survey a much bigger volume of space,” she explains. “Our chances of detecting something have gone up significantly.”

Summerscales reflected on her beginnings as a physicist and member of the LIGO research team saying, “When I decided to go to graduate school I was looking around at what kind of research was out there that I found interesting. I had done some work with high-energy physics, so I knew I liked working in collaboration with a lot of other people.”

She continues, “LIGO was just getting started and I really liked Einstein’s theory of relativity, I thought it was really cool. So this was a combination of all my interests.”

Summerscales works with a team of researchers from around the world. Once or twice a year the whole collaboration gets together, with smaller groups like the burst working group meeting weekly, via voice services like TeamSpeak.

As a student, Summerscales was excited about math and physics and conducted research then as well. In her time at Andrews she worked closely with Margarita Mattingly, chair of the Department of Physics.

“Math was my very favorite subject in school and especially high school; I liked science too. I wanted to apply math to science problems. So I thought to myself, what science has the most mathematics in it? And that’s how I got into physics,” she says. “I did my Honors research with Dr. Mattingly. I worked with her on a high-energy physics project and was able to go to Germany with her for further study.”

Now as a faculty member herself, Summerscales imparts her years of research experience to those with whom she comes in contact. One of the benefits Summerscales expresses about being a member of the LIGO team relates to her ability to impact her own students in their studies.

“I do a lot research with my students. LIGO research helps me mentor them with their own research projects. I have students working with me on LIGO and our Andrews LIGO group conducts data analysis, meaning students get to help write and test programs that can extract and characterize the gravitational waves in the data from multiple instruments,” she says. “I also have students working with me on public outreach projects. One student even writes computer games to help get kids excited about gravitational science.”

Overall, participating in the groundbreaking research of the LIGO collaboration has been rewarding for Summerscales.

“I really enjoy working with the LIGO group; it’s exciting research,” she says. “It’s a nice environment where everybody helps each other out and you’re all working together toward this research goal.”

The research project is expected to yield results in the near future.

“We might get lucky very soon and catch something powerful that happens close to us,” says Summerscales. “The hope is that we will see something within the next year or two at the most.”

To keep up to date with the latest LIGO progress, visit ligo.org.

For more information about Andrews University's Department of Physics, visit andrews.edu/physics, email physics@andrews.edu or call 269-471-3430.

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