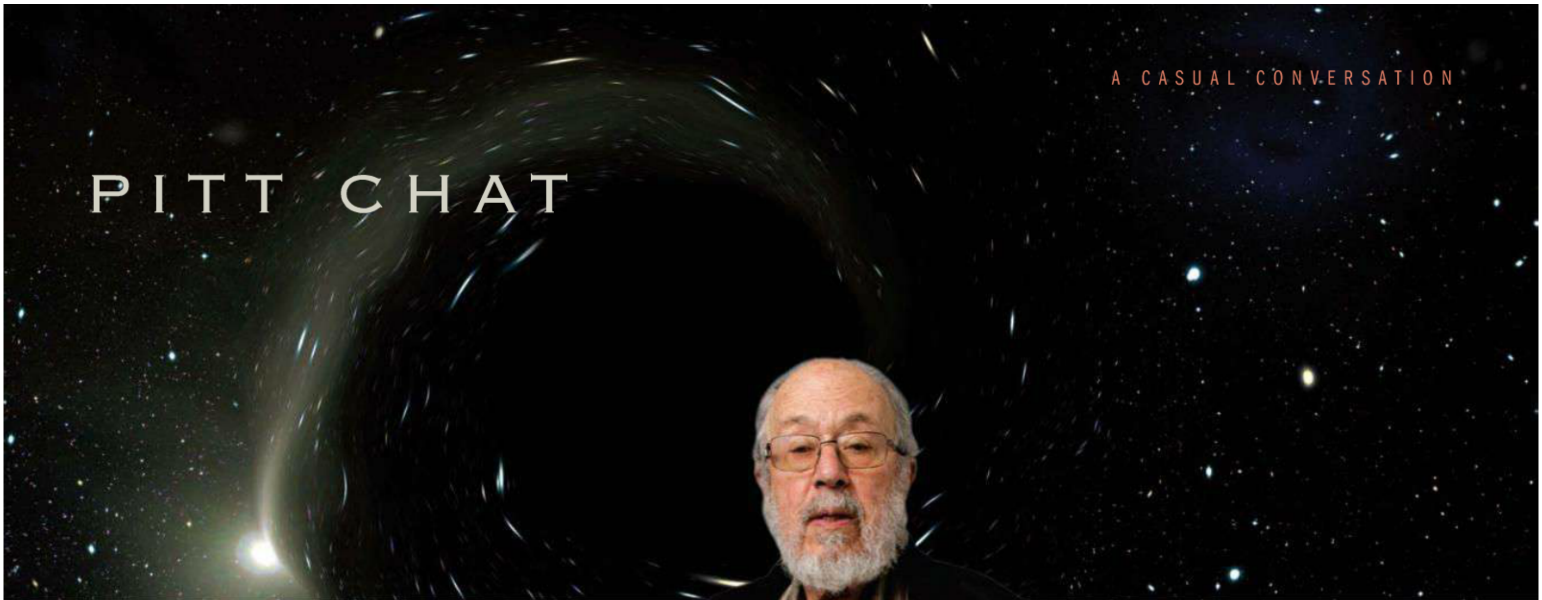
PITT CHAT



INTERVIEW BY LIBERTY FERDA ■ PHOTOGRAPHY BY TOM ALTANY/PITT CIDDE

Eons ago, in a distant galaxy more than a billion light years away, two massive black holes violently collided, sending ripples of the resulting distortions of space speeding out into the universe. Last September, they finally reached Earth. These undulations or curvatures of space are called gravitational waves, and their existence was first proposed by the famous physicist Albert Einstein. Yet, after nearly a century of trying, humans have never been able to detect gravitational waves to prove they exist.

Until now.

Last fall, the gravitational waves caused by that far-flung, colossal collision were observed for the first time in history, using a sophisticated measurement system, the Laser Interferometer Gravitational-Wave Observatory (LIGO), involving a worldwide collaboration of more than a thousand researchers.

Among the many scientists jubilant about this news is Ezra “Ted” Newman. The Pitt professor emeritus of physics was awarded the prestigious 2011 Einstein Prize by the American Physical Society, which described Newman as a “grandson of Einstein” for his trailblazing work in the study of gravity and black holes. He developed a simplification of the notoriously difficult calculations for Einstein’s General Theory of Relativity and discovered a black hole that now bears his name.

What are gravitational waves?

They are ripples in space itself that carry gravitational energy. They result from accelerating masses, particularly from catastrophic events. An illustration of the wave is: Take a large, stretched rubber sheet to represent space. Tap the sheet and you’ll have a wave or distortion propagating from where you hit it. This is the analog of gravitational waves.

Why did it take so long to observe them?

Gravitational waves are very weak. We cannot feel them. If you want to find one, you need an unbelievably sophisticated apparatus to detect the smallest change in distance from the bending and stretching of space from the wave.

Why is LIGO’s detection of gravitational waves significant?

It proves the existence of what we’ve known theoretically for years. The achievement gives physical proof to Einstein’s 1915 General Theory of Relativity, which predicted gravitational waves, among other phenomena such as the bending of light rays by gravity and the expansion of the universe at the speed of light. The interferometer took 30 years to make and is probably the most accurate scientific measurement there is.

What was your reaction to LIGO’s big news?

Absolute excitement. We in the physics community had heard about it for months. If LIGO directors had prematurely announced their finding in September, there would have been a great deal of skepticism. They kept it secret, checking and re-checking for accuracy. What proved it best was that they set up the experiment twice, with two interferometers far apart, in Louisiana and Washington. Both recorded the exact same thing.

What might be some practical applications of the discovery?

None that I can imagine now, but that doesn’t mean there won’t be. No one thought there would be applications of special relativity either, but it led to atomic energy. And a practical application of general relativity that no one had dreamt of is Global Positioning Systems (GPS). On the other hand, the discovery will open a new window into space for astronomers.

Why do you love physics?

I’m retired and could go to the beach, but it’s more fun to come into my office almost every day and play with my calculations and discover things. The exciting part about physics is probing the mystery of why things are so. Einstein said, “The most beautiful thing we can experience is the mysterious. It is the source of all true art and science. He to whom this emotion is a stranger, who can no longer pause to wonder and stand rapt in awe, is as good as dead…”