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ANDREW HARNIK/ ASSOCIATED PRESS Weiss used a visual aid to announce the detection of gravitational waves in 2016.

He Won the Nobel Prize for Proving Einstein Was Right

RAINER WEISS | 1932-2025

The physicist's detection of gravitational waves was compared to Galileo's invention of the telescope.

BY JON MOOALLEM

THE MIT PHYSICIST Rainer Weiss was never that interested in abstractions. Weiss, who died Aug. 25 in Cambridge, Mass., at age 92, told the podcast "The Searching Conversations" that, confronted with complex equations describing the cosmos, he would try to picture what they actually signified in physical space. He was a hands-on guy, he said; he preferred a universe he could tinker with and touch.

Everywhere Weiss went, in fact, he seemed to be assessing how the things around him worked and repairing the ones that didn't. His daughter, Sarah Weiss, said, "If you had a broken toaster, and he happened to be visiting you, that toaster would go home with him." (Weiss is also survived by his son, Benjamin, and wife, Rebecca.)

Weiss was born Sept. 29, 1932, in Berlin and grew up in Manhattan. As a teenager, he taught himself to hack together surplus military electronics into sophisticated hi-fi receivers.

"That's the beginning," Weiss explained on the podcast. "The whole rest of my life is based on improving the signal to noise."

In 2017, Weiss shared the Nobel Prize with two collaborators, Kip S. Thorne and Barry C. Barish of Cal Tech, for the culmination of his life's work: the first-ever detection of gravitational waves—faint distortions in spacetime whose existence had been predicted by Einstein in 1916.

Weiss and his colleagues had accomplished this by building a mindbogglingly sensitive, exceptionally large-scale scientific instrument called LIGO, the Laser Interferometer Gravitational-Wave Observatory, which Weiss had initially dreamed up a half-century earlier and worked on ever since.

In layman's terms, LIGO was like a giant radio, rigorously tuned to pick up signals from the universe that no one had managed to hear before.

Einstein's general theory of relativity reimagined gravity as an indentation that mass makes in the fabric of spacetime, like a bowling ball settling into a trampoline. Whenever that mass moves, ripples radiate outward.

These disturbances—gravity waves—would be so subtle, however, that Einstein presumed they'd be impossible to detect. Consequently, generations of physicists didn't try.

Weiss hit on his initial design for LIGO as a faculty member at MIT in 1967, during an exercise with his students. In 1972, he fleshed out his thinking in a paper for an internal MIT publication.

Gradually, LIGO grew to comprise more than 1,500 scientists around the world and centered on two colossal observatories in Washing --ton state and Louisiana. Inside each, laser light is sent traveling a set distance between mirrors. Weiss reasoned that a passing gravity wave would stretch or compact that space, causing an infinitesimal— but hopefully discernible—change in the amount of time it took the light to traverse it. LIGO'S first detection was made on Sept. 14, 2015. Two black holes had slammed into each other 1.3 billion years ago, the experimenters determined; LIGO was picking up reverberations of it now. Weiss and his colleagues' breakthrough provided a new way of looking at the universe, observing what was previously unobservable or unknown—a milestone that's frequently compared to Galileo's invention of the telescope.

For Weiss, this was exhilarating, his daughter noted. But, having devoted his long career to opening that new scientific frontier, he also recognized that he didn't have nearly enough life left to satisfactorily explore it himself. "He was absolutely delighted," Sarah Weiss said. "And he was also disappointed that he couldn't be 40 years old again."

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