Giving to the Department of Physics

by Erin McGrath

RAINER WEISS '55, PHD '62

Rai Weiss has established a fellowship in the Physics Department because he is eternally grateful to his advisor, the late Jerrold Zacharias, for all that he did for Rai, so he knows firsthand the importance of supporting graduate students.

Bryce Vickmark

Rainer Weiss, Professor of Physics Emeritus and 2017 Nobel Laureate.

Rainer "Rai" Weiss was born in Berlin, Germany in 1932. His father was a physician and his mother was an actress. His family was forced out of Germany by the Nazis since his father was Jewish and a Communist. Rai, his mother and father fled to Prague, Czechoslovakia. In 1937 a sister was born in Prague. In 1938, after Chamberlain appeased Hitler by effectively giving him Czechoslovakia, the family was able to obtain visas to enter the United States through the Stix Family in St. Louis, who were giving bond to professional Jewish emigrants. When Rai was 21 years-old, he visited Mrs. Stix and thanked her for what she had done for his family.

The family immigrated to New York City. Rai's father had a hard time passing the medical boards because of his inability to answer multiple choice exams. His mother, who Rai says "held the family together," worked in a number of retail stores. Through the services of an immigrant relief organization Rai received a scholarship to attend the prestigious Columbia Grammar School. At the end of 1945, when Rai was 13 years old, he became fascinated with electronics and music. As World War II ended a lot of surplus Navy and Army electronic parts became available. Rai bought some of the equipment and began making ham radio transmitters and an audio system for his school. Then, after a movie theater in Brooklyn had a fire behind the screen, he was able to acquire broken but repairable loud

Rai Weiss (right) in conversation with his MIT Physics mentor Professor Jerrold Zacharias.

speakers and began making high-fidelity equipment. At this time concerts were broadcast via FM radio with high fidelity. Rai invited some family friends to listen to these concerts on his equipment. He was asked to build a comparable system by one of his guests. That began a chain of people via word-of-mouth who all wanted to have such systems. In Rai's senior year of high school he had more orders than he could handle and the beginning of a pretty good business. Eventually he ran into a problem that was past his ability to solve with the "street" electronics he knew: trying to reduce the hissing noise on the shellac phonograph records, then available by using adaptive filters. That problem convinced Rai he would do well to go to college.

Rai attended MIT because of his strong interest in electrical engineering. He admits that MIT scared him when he received the course catalog of everything he had to take, all listed in numbers. When he came to MIT in 1950 there were 400 freshman, and only one was a woman. He picked electrical engineering as a major, but was disappointed since he was not able to do electronics and had to take a number of classes before he was able to get to it. He ultimately choose physics since the curriculum seemed less rigid. At the beginning of his junior year, Rai took a trip to Nantucket and met an interesting woman who was a pianist. He fell for her and followed her to Chicago. He took about two months off from

MIT since he did not think they took attendance and thought he could get by just by taking the exams. He ended up flunking out of MIT.

Rai found a job as a technician in Building 20, which had housed the WWII Radiation Laboratory that had developed radar. It was there that he met Professor Jerrold Zacharias, who Rai says "was the person that had the biggest influence on my life." Zacharias had carried out fundamental measurements of the properties of individual atoms and had used the techniques to develop an atomic clock with unprecedented precision of an error of 1 second in 10,000 years. When Rai joined his lab he was thinking of making an even more precise clock that could measure a prediction of Einstein's that clocks in strong gravitational fields ran more slowly than those in weak fields. It was through Zacharias that Rai was able to get back into MIT and finish his undergraduate degree, and later a graduate degree in physics.

During his graduate years Rai began to study the piano and rebuilt a Steinway grand in a garage where he lived and worked. Also at that time he met his wife Rebecca, a graduate of Radcliffe College, who was working as a botanist for Harvard. Rai and Rebecca have two children, Ben, an art historian, and Sarah, who is an ethnomusicologist. Rai became an assistant professor at Tufts University while still a graduate student but then left to become a postdoc at Princeton University. Then, Zacharias called him and asked if he would come back to MIT to be an assistant professor in MIT's RLE (Research Laboratory of Electronics). So, Rai came back and started a research group in cosmology and gravitation. The group was engaged in experimental research to determine if G, the Newtonian constant, was changing with time, as well as studies of the spectrum and angular distribution of the recently discovered cosmic background radiation. Rai got the idea for LIGO (Laser Interferometer Gravitational- Wave Observatory) when the Physics Department asked him to teach a graduate course on general relativity. He teamed up with Professor Kip Thorne at Caltech and formed a collaboration between MIT and Caltech with the late Scottish physicist Ronald Drever, also with Caltech.

"Anything you can do to help advance students, because they are our future."

After a gravitational wave—a ripple from the distant part of the universe—was detected by the LIGO team, Rai received a number of awards for the discovery. At first, he was not sure what to do with the prize money. He was committed to his grandson's education and he wanted to give back to MIT. He was so grateful for what Jerrold Zacharias had

done for him that in many ways this gift is a tribute to him. Rai also thought about the importance of supporting graduate students. As a faculty member, he would see MIT losing some of the best graduate student applicants to other universities that had the capability of offering graduate student fellowships.

Rai decided to establish a fellowship in the Physics Department and to name it the Barish–Weiss Fellowship. It was important to Rai to include Barry Barish in the name since he was instrumental in the success of LIGO by knowing how to make the transition from "table top" to the large-scale physics required to detect gravitational waves.

On October 3, 2017, Rai Weiss won the Nobel Prize in Physics along with Emeriti Professors of Caltech, Kip Thorne and Barry Barish. They were honored for their "decisive contributions" to the Laser Interferometer Gravitational–Wave Observatory (LIGO) detector and the observation of gravitational waves.

Rai is happy that he had the opportunity to give back to MIT. He is eternally grateful for all that Jerrold Zacharias did for him, and that MIT has allowed him to still work in the Department. He works every day, even on Saturdays, because he loves his work and being involved with students. When asked what he would say to encourage others to support MIT, he replied, "Anything you can do to help advance students because they are our future."

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