

# With Eyes towards the Sky: From Puerto Rico to Yale and back again. <sup>[1]</sup>

Submitted by [Sophia Araceli Sánchez-Maes](#) <sup>[2]</sup> on 6 December 2019 - 12:00am



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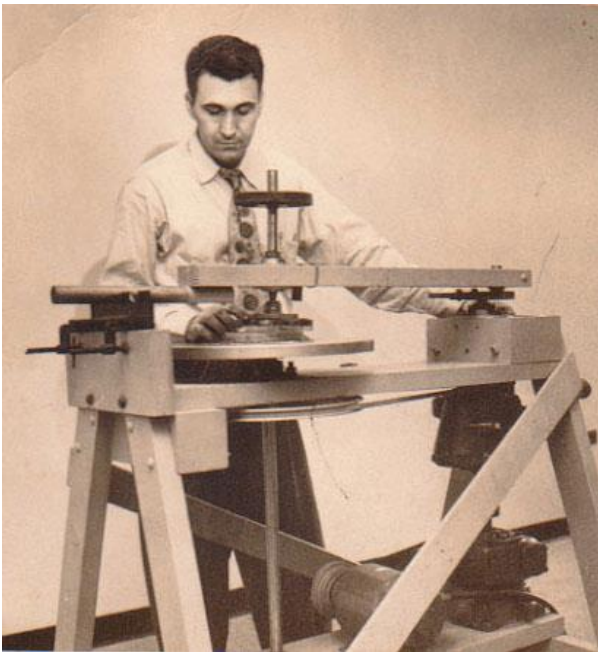
<sup>[3]</sup>

Professor Hector Arce in his office at Yale

When astrophysicist Dr. Héctor Arce returned home to Puerto Rico in October of 2015, it was to bring a handful of Yale astronomy students to [Arecibo Observatory](#) <sup>[4]</sup>, at that time, the largest single dish radio telescope in the world. For Héctor, a professor of astrophysics at Yale University, passion for the stars started at home. When Héctor was young, his grandfather used to build his own telescopes. “I still have them,” Héctor says. Staring through the lenses of those telescopes

with his grandfather opened a universe of possibility for young Héctor.

As a dedicated amateur astronomer, Héctor's grandfather spent countless nights watching the sky with the naked eye and mastering instruments that would allow him a more detailed view. Sharing the hobby with his grandfather sparked Héctor's interest and curiosity—he wanted to know how stars came about and why celestial bodies behaved the way they did. Luckily, his grandfather was a physicist and could help him understand the science behind what he saw. So, while many of Héctor's classmates who excelled in science would default to studying engineering or medicine, Héctor was lucky to see at a young age that majoring in astronomy could help him answer untold questions about the universe. "The fact that there was someone there who I could look up to and that knew that astronomy existed...that helped me," he says.



*Rafael Arce-Blanco, Hector Arce's grandfather*

Héctor remembers the first time he visited the Arecibo radio telescope, the instrument that catalyzed his journey in science and would empower his inquiry at every step. He was on a trip his senior year of high school. "Now they have this nice visitor center <sup>[5]</sup>," he muses, but when he first visited, "you just saw the telescope from the top of a hill. It was still impressive to see it from that high place." Although he only visited once or twice before leaving for college at Cornell, he remembers being inspired by its mere existence. "I knew that it was a possible source of employment for an astronomer; that influenced my decision."

Though still interested in astronomy, Héctor decided to major in physics to keep his options open, but he found, "the astronomers...were way nicer than the physicists." Dr. Martha Haynes, who taught Héctor's first astronomy class, became his undergraduate research advisor. Dr. Ricardo Giovanelli, a Spanish-speaker and former director of Arecibo, was another mentor at Cornell. Both of them influenced his interest in astronomy. At his time of attendance, Cornell administered the National Atmospheric and Ionospheric <sup>[6]</sup> (NAIC), which included the Arecibo Observatory. In his undergraduate years, Héctor traveled to Arecibo to conduct research. This experience influenced his decision of becoming a radio astronomer, completing his Ph.D. at the prestigious Harvard-Smithsonian Center for Astrophysics <sup>[7]</sup>, under Dr. Alyssa Goodman, working to understand the space between stars and how stars are formed. "It was the connection to Arecibo that made me go into radio astronomy," he says. "I was very interested in going back to Puerto Rico and establishing a closer relationship between the to the Observatory and Puerto Rican universities, so that others could benefit from the amazing learning opportunities I had."

Héctor's path is unique; astronomers today tend to focus on the object of study rather than the means of studying it. But Héctor Arce is a radio astronomer, and always intended to be. "I don't think that term is used nowadays," Héctor muses. "Typically, now, people don't say 'you're an optical astronomer' or 'you're a radio astronomer' or whatever you use. You investigate the topic, the phenomena. But certain phenomena are easier to observe with radio or optical signals. In star formation, you're looking at obscure regions, so optical light is not the best signal to use. So I concentrated on electromagnetic signals with long wavelengths, from infrared to radio waves [8]." Héctor's path was first influenced by the Arecibo telescope, and then directed to the phenomena that it could elucidate. "Now I study stellar outflows," he says, the flow of gas that is emitted from a newly created star. Studying outflows helps us understand how stars form and how they impact, in physical and chemical ways, the gas clouds where they are born.



*As stars form in clouds of gas and dust, they shoot powerful jets of gas and other raw material outward, known as stellar outflows. (Imagen de ESO / ALMA)*

After completing his doctorate, Héctor pursued a postdoc at Caltech with the Owens Valley Radio Observatory Millimeter Array [9], whose director at the time was Anneila Sargent. "So, all through my life," Héctor says, "all my advisors in astronomy have been women, from undergraduate to post-doc, which is rare." He selected his second postdoc through a National Science Foundation Astronomy and Astrophysics Postdoctoral Fellowship, because it mandated that sometime be spent on education and outreach, which was very important to him. "I did my postdoc at the American Museum of Natural History in New York City [10]," he recalls. There he worked with several programs in the museum's education department, installing a radio telescope in a school in Harlem, and teaching high school students about astrophysics and computer programming.



At the end of his second postdoc, he set his sights back home. But in 2007, the National Science Foundation declared it was considering cutting funding for the Arecibo Observatory in order to fund newer telescopes. The future of the Arecibo Observatory, suddenly didn't look very promising. Instead of returning to Puerto Rico, Héctor accepted a position as a professor in the Department of Astronomy at Yale University <sup>[12]</sup>, in Connecticut, continuing to work with



scientists in Puerto Rico and taking students to Arecibo for research. “I have always had a desire to return”, he says, “but that has not been possible due to the economic reality in the island and at the University of Puerto Rico (UPR), as well as due to personal circumstances.” Thankfully, the Arecibo Observatory has been able to find funding and remains open <sup>[13]</sup>. “I continue to maintain close ties with Puerto Rico, and I collaborate closely on several projects with astronomers both at the UPR and at the Arecibo Observatory.”

Currently, Héctor is the research advisor to several astronomy majors (last year he mentored two-thirds of the astronomy graduating class!) and is beloved by students. “He is so kind and brilliant and respectful and really listens to students,” says Osase Omoruyi, an ex-mentee. “He is a professor that is honest about what he does and doesn’t know. And if he didn’t know the answer to a question, he always put me in contact with people that could help. He also encouraged me to take my time with research— except during my final year for the thesis, since it was graded,” she laughs. Like his grandfather before him, Héctor keeps looking up at the sky. Like his grandfather, he is changing the lives of those who look up to him in the process.



*Prof. Arce with Yale students, including Adrián Gutierrez, Osase Omoruyi and María José Maureira*

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