Odell native heads to Harvard for Ph.D.

■ By Trisha Walker
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Carlos Marquez

Carlos Marquez credits his aunt, Maura Rosa Cody, with setting him on his career path. When he was 7, Aunt Rosa died of heart disease, and that impacted him greatly.

"To me, it just didn't make sense," he said. "How does the person with the biggest heart pass away from heart disease?"

Marquez, born and raised in the Hood River/Odell area, is a recent graduate of Rensselaer Polytechnical Institute (RPI) with a bachelor's degree in biomedical engineering.

"Biomedical engineering is just applying creative principles of engineering to solutions in healthcare," Marquez said.

But he's not done yet.

In March, Marquez was accepted to the Harvard School of Engineering and Applied Sciences Ph.D. program in Engineering Sciences: Bioengineering — part of the 5.7 percent of applicants accepted this application cycle. While there, he will be part of a team working to create a functional human heart. Classes start in early September.

Marquez has spent a lot of time in research labs, which he called the "buildup to Harvard." He graduated from Hood River Valley High School in 2016 and he began his college career at Oregon State University. Although ultimately not a good fit, the experience did lead him to two different labs at Oregon Health and Sciences University (OHSU).

The first featured computational modeling on a computer. "We're looking at finding a new way to design aortic valves for patients who have aortic valve abnormalities," Marquez said. "So what I was doing is modeling this new way to make aortic valves and using those models to see if it was viable at all."

His next lab had him looking at ways to develop a biomaterial for patients in need of new vasculature.

"When people have plaque buildup or an artery gets injured or damaged, they will need a replacement artery, and sometimes what they do is take tissue from that person from somewhere else — from maybe their leg — to another place where they need it more," he said. "But that's difficult with some patients because (they) don't have viable tissue to transplant, so we were looking at making a new kind of material to do this, to build these small-diameter vascular grafts."

In 2018, Marquez transferred from OSU to RPI, located in upstate New York, and in 2019, earned an internship through the Harvard Stem Cell Institute. While there, he worked to develop accurately mature cardiac tissue that "we can then look at understanding how the physiology of the cardiac tissue in certain disease states actually works," he said.

His latest experience was last spring, working in the Center for Modeling, Imaging and Simulation in Medicine at RPI. "I was trying to build computational tools for the lab to make this kind of new way to detect disease and classify disease," he said. "They're trying to use Optical Coherence Tomography to classify certain disease tissues and healthy tissues and compare those two, and I was building models to help them do those computations."

At Harvard, Marquez is looking forward to his own research projects.

"The reason Harvard attracted me so much is because I want to branch out from cardiac kind of problems and also do other things," Marquez said. "... There's a big relationship with the medical schools and all the hospitals there, and it will allow me to build a general background in those subjects.

"One of my primary interests, outside of the cardiac field, is helping glaucoma patients. These patients have elevated pressure within their eyes that leads to the death of optic nerve cells, ultimately leading to vision loss. Within this context, I'm interested in gene therapy, to lower the pressure causing harm in these patient's eyes, and optic nerve regeneration, to repair any harm already done," he said. "In addition, I'm also interested in tackling inflammatory bowel disease (IBD), such as Crohn's Disease and Ulcerative Colitis. IBD patients suffer from inflammation within their gastrointestinal tract that causes extreme pain and discomfort. I'm interested in developing disease modeling platforms to increase the efficacy of treatment for patients and investigating the physiology and underlying genetics of IBD."

In addition to his acceptance into the Harvard Ph.D. program, Marquez has earned three fellowships: Harvard Graduate School of Arts and Sciences Graduate Prize Fellowship, the GEM University Fellowship, and the National Science Foundation Graduate Research Fellowship.

That last one was awarded to 2,000 students in a pool of 12,000 applicants, and anyone from any scientific, technological or mathematical field could apply. "I was the only student from my university, who is still a student there, to get one," he said. "There were some alumni who were working at other jobs who got it."

The GEM fellowship seeks to increase the participation of underrepresented groups in engineering and science master's and doctoral programs; the Harvard Graduate School of Arts and Sciences fellowship seeks to increase diversity on campus.

The fellowships, while providing financial support for his research, have an additional purpose: "I can put that in my resume and its shows a prowess in grant writing," he said. "... That's really important because my end goal in pursuing a Ph.D. is to one day lead my own lab and do my own experiments at a research university. So that helps establish me already as someone who can write grants well and earn one."

Marquez is very modest about his accomplishments, but hopes his story will inspire other students. "Growing up here was really influential to me — I'm proud to say that I grew up here," he said. "... My parents came here from Mexico, worked in the orchards and built everything up for us, for me and my sister. We could never complain about anything, really — we had food on the table, a roof over our heads. I kind of think it's a common thing here.

"I don't think my story is special at all — a lot of students here experience that," he said.

He particularly appreciates his time at Wy'east Middle School, saying, "I give it more credit to the kind of person I am and the work ethic I have.

"When I was going to school here, I had a lot of teachers — I may not have learned a lot in terms of academic things, that wasn't their fault, it was my fault because I was just a rowdy kid at the time — but they taught me a lot about character and a lot about believing in myself, and reaching for my dreams. That has stuck with me throughout it all."

One teacher, now retired, heard he was interested in Harvard and pulled him aside. "I don't know how they heard, but they wanted to let me know they believed in me. That really meant a lot. Other teachers were similarly impactful, just trying to push me and make me take it more seriously. Middle school is a great place for you to realize that — in seventh grade, the only class I passed one semester was choir or woodshop, so that explains to you the kind of kid I was."

And in the future, he hopes to pay that support forward.

"Growing up in Odell, I never found anyone to look up to as a role model, especially as a Hispanic student interested in STEM," he said. "Part of my drive and passion comes from this fact. I hope that by taking advantage of all the opportunities that have been presented to me, I can help forge a path for future generations to accomplish their goals and make their dreams come true. In addition, I hope to one day help provide opportunities for Odell students interested in STEM. I know that I would have greatly appreciated and benefited from them."

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Una versión en español de esta historia está en línea en www.columbiagorgenews.com/enespanol.

Carlos Marquez will begin work on his Ph.D. in bioengineering at the Harvard School of Engineering and Applied Sciences in September. An Odell native, his time at Wy'east Middle School was influential.
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