"Engineering schools need to stop producing nerds," says Roger Gonzalez, founding chair of the engineering leadership program at the University of Texas at El Paso (UTEP). With a view toward changing “the face of engineering in America,” he is out to prove that a project-based, active-learning approach can work not just at small, selective private schools but also at large public universities that cater to a local population (see Physics Today, June 2017, page 28).

Gonzalez grew up in El Paso, where his parents worked minimum-wage jobs to support their six kids. Neither parent finished high school. But his five older sisters all went to college. He understood that education was his ticket to a better life.

After graduating from UTEP, Gonzalez worked for a few years in industry, with stints around the country and in Mexico. He then went back to school at UT Austin to get a PhD in mechanical engineering with a biomedical emphasis. Later he joined the faculty of LeTourneau University in northeastern Texas, where he taught for 16 years. While there, he started a nonprofit company, LIMBS International, with some of his students. The company makes and distributes...
prosthetic lower-limb systems and distributes them throughout the developing world.

A childhood experience provided the impetus for LIMBS, Gonzalez says in a video on the company website. Once, when his family went shopping in Juarez, he said something snide about a crippled child he saw. His father said sternly, “There but for the grace of God go you and I.” That never left him, he says. “I have an obligation as an individual who grew up less fortunate in our own country to help those who grew up less fortunate around the world. It’s a sense of being part of our global society, and being able to say, ‘I care.’”

Physics Today spoke with Gonzalez about the arc of his career and his future plans.

PT: Why did you go into engineering?

GONZALEZ: When I was graduating from high school, my dad laid out three options on the table: One, you can sign up for the military. Two, you can stay here at home. We will feed you, and give you a place to sleep if you go to college and do well. Or, three, you can get a job and pay rent. I quickly realized that my parents were supportive of my going to college, and they would let me live here for free.

I chose engineering by a process of elimination. I didn’t want to be a teacher. I didn’t like the sciences. I certainly didn’t want to do anything in the liberal arts. I didn’t think about business. I felt comfortable with mechanical issues, and physics never intimidated me, even though I didn’t do well. So I chose mechanical engineering.

PT: You were considered an “at-risk” student. How did things go?

GONZALEZ: I was not a particularly stellar student in high school. In fact, there were some disciplinary issues. I was more wrapped up in having a good time than I was with dedicating myself to my studies. But I have always been a highly driven, highly motivated individual—in high school I was highly driven and motivated to have fun. So I never wondered if I would graduate from college. I knew I could do it. I just wondered how well I could do.
There were not a lot of options on the table about what universities I could go to. Fortunately, UTEP has a philosophy of providing access to students. I was admitted as a provisional student for at-risk students that want to major in engineering.

PT: What came next, after college?

GONZALEZ: I went to work for General Electric, in their manufacturing management program. It’s their leadership development program. After about four years I decided I really wanted to go back to a university environment. I liked the culture of university campuses—young minds, different aspects of freedom of thought.

PT: So you went back to school.

GONZALEZ: I realized the only way I was going to get back to academia was to be a faculty member. I didn't go for a PhD because I was dying to get a PhD—I went to get a PhD as a means to an end.

PT: For a long time you were on the faculty at LeTourneau University, where you founded the biomedical engineering department. What lured you back to UTEP?

GONZALEZ: I was in El Paso giving a talk, and the dean of engineering asked if I’d be interested in coming back. My answer was no. I didn’t want to be just a faculty member in another department.

I said to the dean, “If you want to just build a program for UTEP, that's great, but I'm not your guy. If you want to build a program that wants to change the face of engineering in America, with UTEP being the place that can help do that, that would excite me. So, which one of those do you want to do?” After about three months he got me to come to lead the engineering leadership program.

I felt like it was not just a job I was coming back for. It was a purpose, a stronger mission. I moved back five years ago. I don't think I could be happier.

PT: What do you like about the job?

GONZALEZ: Being in charge of building something from scratch, from inception to application.

PT: Who is in the program, and how does it work?

GONZALEZ: We don't have the longest track record like other programs do. It takes a special student to say I will take a risk and do that new engineering leadership program. We are not exclusive.

We put our project-based, active-learning program in the university's existing
ecosystem. Our students take one course with us each semester but otherwise are part of the broader university. In the first year, they take introduction to engineering and leadership; in the second year, modeling and simulations; in the third year, entrepreneurship and innovation. In their fourth year, they work with a company to innovate a new product or process. All of our courses are project-based in a studio environment. Projects range from building a company to simulating what you observe in nature. We allow students to be wild and crazy to understand the process, gather information, and design technology. Students have to become comfortable with ambiguity.

**PT:** You mentioned that engineering overall at UTEP has 15–20% women, whereas in your program the percentage is 40–45%. Why is that?

**GONZALEZ:** I think that historically women like options, and engineering has always been a highly constrained academic program. I think the women that come to us realize, “Wow, here's an engineering program I can tailor-make for myself. I can focus in on my particular orientations and talents.”

**PT:** Do you teach?

**GONZALEZ:** I teach all the freshmen and all the seniors. I want to see them when they come in, and I want to see them when they leave.

**PT:** Why are you a fan of project-based learning?

**GONZALEZ:** Traditionally, engineering schools graduate students who have great technical skills, but they don't understand how to interface with customers, work on a team, or have other pursuits outside of the technical world. Or they don't interact well with people outside the discipline—their people skills are not real strong. Those are all things that engineers typically have to work at.

What we try to do is give our students clues into those issues. We expose them to business acumen. We expose them to leadership development. We expose them to entrepreneurial ideas and innovation. And it's not because they become expert entrepreneurs, or leadership gurus, or business people. We give them a clue about what life is going to bring.

**PT:** Do you feel you are a role model for your students?

**GONZALEZ:** That is the essence of being at UTEP. Many of my students are like I was 35 years ago. They come from homes where the parents don't have a college education, and their families are poor. I keep telling them, “You need to work at your education and be highly motivated and focused because this will change your life.”
PT: How did you start LIMBS International?

GONZALEZ: It started as a student project at LeTourneau. I was past the assistant professor years, and I felt I had control of my teaching. I was ready to take on a new project. So I handpicked the four students I wanted to work with. That's how it started. I thought it would last two or three years. I never thought it would become a nongovernmental organization and would consume so much of my life. We have worked with Africa, Asia, and Latin America. Our knee is our signature product.

PT: How many people are walking around with your knees?

GONZALEZ: I don't really know. In the early years, we empowered some clinics to make our technology, so it's hard to keep up with numbers. I would guess 3500, 5000, something like that.

PT: What are your plans for the future?

GONZALEZ: I have a bunch of goals. My wife says I have enough goals to keep 10 wives busy. I wake up every day, including weekends and holidays, with a goal. I made a decision that I want to retire at 60, because I believe you need to go out at the top of your game, but with a passion and energy to contribute elsewhere.

My wife and I are certified marriage counselors. We want to give back to help others achieve their own joy and fulfillment that having a strong marriage gives. We would like to contribute to that on a global scale.

PT: Anything else you would like to add?

GONZALEZ: The thing that has always surprised me about life—whether it's the nonprofit, my job as department chair and professor, or anything I have done—is that the problem with people and internal politics is sometimes the most difficult thing. It's not the technology. Many good things go undone because of politics and people's self-interest. As an engineer, if I want to get things done, I may not like it, but I better learn to deal with it.