


A Chip off the Old Circuit

Faculty entrepreneur figured it out, then built it — just like dad

By April Frawley

They spent their free time in the basement: A father teaching his son how to solder complicated circuitry on a piece of circuit he'd found and had connected to an antenna outside. The little boy watching as his father worked, learning and diligently listening to the smartest man he knew.

The project continued. Richard Claus, then 6, didn't know what his father was scheming in the basement of their house near Baltimore until one night when his parents woke him up in wee hours of the morning.

A photograph of Richard Claus, a man with a mustache, standing in an anechoic chamber. He is wearing a light blue and white striped button-down shirt and khaki pants. The room's walls, floor, and ceiling are covered in dark blue, pyramid-shaped electromagnetic wave absorbers. To his left, a piece of equipment is mounted on a tripod. The lighting is soft, highlighting the man against the textured background.

Richard Claus, a professor emeritus at Virginia Tech and the founder of NanoSonic Inc., poses in a room designed for the measurement of electromagnetic properties of materials. The odd-shaped rectangular cones on the sides of the room absorb spurious electromagnetic signals, so the background noise level is low and the measurements are improved.

Photo by Amanda Loman



His father placed a pair of headphones over Richard's ears.

"I could hear this thing go 'Beep, beep, beep,'" he remembered. "We had built a receiver to listen to Sputnik. My dad was a nerd like me. He drew a picture of Sputnik and the Earth. He had figured out how to do it and we built it."

As the first satellite launched into space, Sputnik is credited with spurring the advancement of space exploration. For Richard Claus, the memory of listening to that beach-ball-sized satellite as it orbited through space represents the first time he knew he wanted to be an engineer, just like his dad.

Claus, a professor emeritus at Virginia Tech and the founder of NanoSonic Inc., has spent his career following the example his father set for him in the basement of their house decades ago.

It's a simple idea, really. First, figure out how to do something. Then, build it. Of course, Claus is an engineer. So the results of his decades of work have been anything but simple.

An electrical engineer by trade, Claus spent 32 years at Virginia Tech, holding the Lewis A. Hester Chair of Engineering and leading the university's Fiber and Electro-Optics Research Center.

Since 2009, however, Claus has focused his energy solely on NanoSonic, a company known for producing innovative materials for such clients as NASA, Boeing, and major chemical companies. But NanoSonic's humble roots trace back to a student's kitchen. Unlike many tech startups, the initial goals for the company had little to do with making money and more about supporting a promising graduate student.

"We had been talking with a company about a project that would have supported a student, but it didn't work out, so the university suggested we start a company," Claus said. "You can't use university facilities for outside work, so he, effectively, did the project in a kitchen."

That project turned into another and then another, until finally they landed one that involved exploring nontraditional coatings for optical fibers, strands of glass no wider than human hair that can carry information and electric current.

A self-assembling marvel

One of the coatings involved a self-assembly process, meaning the molecules would arrange themselves into the correct shape at the smallest level — nanometers. Think of it this way: Instead of Michelangelo carving the statue of David out of marble, imagine the molecules of marble forming the correct shape by themselves.

"You design the molecules in advance so when you make the coatings, the molecules self-assemble. Engineers are lazy people," he joked. "Self-assembly sounds great. With some thought in advance, the molecules line up and assume positions in the material that give it some interesting properties."

It was this work that really paved the way for the NanoSonic of today.

One of the company's signature products is a material called metal rubber. Like the name implies, it's as stretchy as a rubber band, expanding to about 1,000 percent of its original size.

Unlike rubber, though, it conducts electricity as well as copper. The polymer chemist at NanoSonic who sits in the office next to him developed this idea, Claus said.

"There aren't many materials like this," Claus adds. "They don't exist."

In addition to selling its signature products, NanoSonic also partners with government agencies to develop solutions to various engineering problems. They are currently working with the Environmental Protection Agency to create spray-in foam insulation using self-assembly technology.

For Claus, his role in the company has taken the same shape as his academic career at Virginia Tech. These days, as the self-described "oldest" person in the shop, he feels like his job is to serve as a mentor, a mantle he wore comfortably during his three decades at Virginia Tech.

"A lot of very successful scientists and executives have big egos and are not very good at sharing success; Rick has never been like that. He has always been more than happy to spread the wealth when breakthroughs are made or patents are applied for," said William Spillman, a former director of the Virginia Tech Applied Biosciences Center who has known Claus for 30 years. "That, of course, results in a win-win situation for everybody. Students were more gratified and did better work and he got more out of them because of that."

An entrepreneur at heart

Interestingly, Claus's tenure at Virginia Tech lasted about 27 years longer than he thought it would. After earning his doctorate in electrical engineering from Johns Hopkins in 1977, he had a few different job offers — including one at a TV station where he'd worked as an engineer.

One of the reasons Virginia Tech appealed to him at the time was that it was just a two-hour trek to Shenandoah National Park. He thought he would be at the university for five years.

But once he arrived at Virginia Tech, he found himself immersed in research and teaching in his specialty — fiber optics. He was instrumental in establishing Virginia Tech's Fiber and Electro-Optics Research Center (FEORC), the aim of which was to encourage faculty members to partner with industry.

"Rick and the FEORC were so influential that there was a movement afoot to rename the (Roanoke/New River Valley) area as 'Silica Valley,'" said Chris Thompson, a Virginia Tech alumnus who worked as a researcher in the center. "The FEORC was really an entrepreneurial endeavor. Starting, building, staffing, growing a center is really not very different from doing the same in the private

sector. So Rick has the entrepreneur's heart and the skills that go along with it. One of the key qualities is he is a tireless worker. He would be the first in the office and the last to leave — often by six or eight hours."

The center resulted in more than 18 spinoff companies, one of which Claus founded with the help of Thompson. That company, now called Luna Innovations, is one of the publicly traded companies to spin off from research at Virginia Tech, Thompson said.

At the end of his academic career, Claus had amassed 1,000 journal papers and 30 patents, had received \$50 million in research funding, and earned a slew of awards. However, what means the most to him, now and then, are the students he mentored.

"A lot of companies these days treat the people that work for them as interchangeable pieces," Spillman said. "Rick feels a responsibility for the people who work for him and all the students he has had. That engenders a certain loyalty. He cares about his people."

Now that he is moving closer to retirement, Claus is thinking about the things he might like to do next. He loves being in the mountains. And he likes writing; interestingly, he admits he always did better in English than in his math classes.

Because of this, Claus likes to joke that he ended up in engineering by accident, mistakenly checking "engineering" as his major at Johns Hopkins University instead of "English." It's not true. He always knew he wanted to become an engineer like his dad, who he still describes as the smartest person he has ever known.

"I still have the headphones they put on me (to listen to Sputnik). I wish I still had his circuit," he says. "My dad never went to college and didn't even finish high school until he got a GED after World War II. I never was as smart as he was, and I went to school for a long time."

About the series

This is a continuing series of profiles featuring members of the inaugural class of the Virginia Tech Faculty Entrepreneur Hall of Fame, selected for personifying Virginia Tech's teaching, research, and service missions. As entrepreneurs, they have created problem-solving products and services, enhanced local and regional economies, and created high-quality jobs.