



INVENTIONAL WISDOM

A life, patented

Richard Willson Chemical Engineer



One day in the early '90s, Richard Willson found himself in the Las Vegas apartment of a Russian arms dealer. He was there to purchase a cutting-edge infrared camera that had been developed by the Department of Defense as part of President Reagan's Strategic Defense

Initiative, better known as Star Wars. It cost \$45,000 new, but Willson had learned from the manufacturer that the Russian was selling a used one for \$35,000. He paid the money, and the Russian handed him a large metal suitcase with the camera packed snugly inside. Then he tried to sell Willson a laser that could blind someone at a distance of three miles.

"At the time, the whole technology stank of undercover intrigue and Cold War tensions," Willson remembered. "The guy was shady—it was clear that he had stuff that he probably shouldn't have had."

Willson, a professor of chemical and biomolecular engineering at the University of Houston, needed the infrared camera to try out an idea he had about how to test catalysts—the substances used to set off controlled chemical reactions, like the one in your car's catalytic converter, or the ones used to make polymers for everything from plastic water bottles to smartphone batteries.

The traditional way of testing and perfecting a catalyst was one at a time in a chemical reactor, adjusting its chemical composition until the desired reaction was triggered. But Willson came up with a different idea after a chance encounter at a scientific conference. "This guy I met told me he was working on catalysts, and complained about how time-consuming it was to test them," he said. "And then, without even thinking about it, I said, 'Oh, that's easy—just look at it with infrared cameras.' It was one of those moments that just freezes in time and your mind is working 5,000 times faster than usual."

Willson's idea was to manufacture several thousand catalysts, each with a slightly different chemical make-up, and test them all at once. That's where the Russian arms dealer came in. In his UH lab, Willson laid out all the catalysts in a grid, doused them with a reactant, and then took a photo with his fancy new camera. The successful reactions created heat, which showed up on the camera. "The active ones would just light up like stars," Willson said. "It was really obvious that *these* 900 don't work, but *that* one does. This way, you could do thousands and thousands at a time."

Willson wrote a paper about his new process, secured a patent on it, and co-founded a company with a few business partners. Today, his technique has been adopted by Exxon, Dow, DuPont, and countless other companies around the world. It's a major reason why the 55-year-old scientist will


be named a permanent fellow of the National Academy of Inventors this month.

As it happens, the catalyst test is just one of the 16 patents Willson has secured since joining UH in 1989. Thirteen more are pending. "A patent is not just a single act—it can be a lifestyle," Willson said. "I've had prosecutions [of patent applications] go on for 14 years. Then there are foreign counterparts, and translations of foreign counterparts. *One* patent can be a lifestyle."

Even a casual glance at his family tree suggests that Willson was fated to be a chemical engineer. His father is a chemical engineer and patent lawyer (father and son worked together on the catalyst patent), his grandfather was a chemist, and another relative owned a brewery in the early 20th century. According to family lore, one of his earlier ancestors was a Scottish alchemist. Growing up, Willson's natural predilection manifested early. "I was always inventing—making odd things, soaking up ideas. A lot of the things I invented were silly, and some of them were evil," he said with a laugh.

These days, when colleagues ask Willson about his streak of successful inventions, he cites the importance of working across disciplines. "It's really good to know something about two fields, and think about where they bump into each other—I think that interface is nearly always productive," he said. "For instance, my principal appointment is in chemistry, but I also spend lots of time in biology and biochemistry, and I also do work at Methodist [Hospital]."

Willson shows no signs of slowing down. He and his graduate students are currently working on an iPhone-based diagnostic test for diseases like dengue fever and chlamydia. To demonstrate his idea, he held up a pregnancy test strip that was on his desk. "This thing is really kind of a miracle," he said. "What if it was as easy to test for dengue or chlamydia as it is for a pregnancy?" All you would need, he explained, is a sample prep kit, an app, and a plastic device that slips onto the iPhone's camera. One of his students has already used a 3D printer to create a prototype. "There are three million cases of chlamydia in the US, 90 percent of them undiagnosed because it's asymptomatic until there's an outbreak. But it's eminently treatable if you diagnose it."

Recently, while working on the project, Willson went online to shop for iPhone accessories. To his amusement, one of the items he came across was a plug-in that turned the phone into an infrared camera. When he looked at the camera specs, he realized that the \$250 device was just as powerful as the \$35,000 camera he had bought from the Russian arms dealer two decades ago. He had kept that camera in his office as a souvenir, but now it seemed like just another piece of junk, so he threw it away. He laughed ruefully. "The suitcase was more valuable." 

BY
MICHAEL
HARDY

PHOTO
BY
JACK
THOMPSON