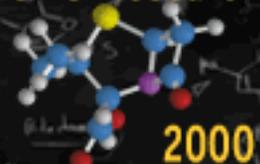


# From the Hilltop to the Marketplace

SMU Research



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[news & info](#)

**W**hile working as an antenna engineer for Hughes Aircraft Company, Choon Sae Lee wanted to develop a better antenna for the booming field of telecommunications.



Choon Sae Lee, associate professor of electrical engineering, has succeeded in designing a new form of antenna that could revolutionize the wireless communications industry.

It was not until he joined the SMU faculty in 1989, however, that Lee had the opportunity to pursue research in this area.

Aided by several grants from the Texas Higher Education Coordinating Board's Advanced Technology Program, created by the Texas Legislature to fund research on technologies with

potential for commercial application, Lee has succeeded in designing a new form of antenna that could revolutionize the wireless communications industry.

Lee, associate professor of electrical engineering, has developed a flat antenna about 10 inches square that could replace the large, dish-shaped antennas now used to receive satellite television signals. "We're trying to replace the existing market with something that is better and cheaper," he says.

The antenna, known as a microstrip antenna, could cost much less than conventional reflector antennas because it can be mass-produced instead of assembled, Lee says. Its small size is more aesthetically pleasing, and the antenna can

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[Setting the Standard](#)

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do Math](#)

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Law](#)

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Middle Ages](#)

[Financial  
Engineering](#)

[Features](#)

[From the Hilltop to the Market place](#)

[Profiting from Patents](#)

[Scholar of the Southwest](#)

[In Pursuit of the Sacred and the Obscured](#)

[Sponsored Research](#)

[Faculty Publications](#)

[Faculty Recognition](#)

[Mary Vernon: Portrait of an Artist](#)

withstand harsh environments better than conventional antennas.

SMU received a patent on Lee's basic antenna design in 1998, and the University has signed a licensing agreement with Crest International in Fort Worth to manufacture direct broadcast satellite television antennas as soon as Lee delivers the final prototype.

"We estimate that this product will make SMU several million dollars a year over the next few years," says Tom Athans, president and CEO of Crest International.

Satellite dishes now account for the largest segment of the consumer electronics business in the United States – a market that is growing by 3 million customers a year, Athans says. "We expect to capture 50 percent of that market," he says.

Crest International has lined up distributors for the antenna in the United States, Mexico, South America, and Asia, as well as foreign manufacturing facilities.

Lee is working on another version of his antenna that could be placed on the 2 million towers nationwide that relay cellular phone calls. He believes his antenna could help relay calls better and at a lower cost than the current antennas.

Lee's antenna also could be used by developing countries that are building wireless telephone networks. SMU has filed international patents on his antenna to cover this and other uses overseas.

"The overseas market could be larger than that in the United States," he says.

**L**ee is only one of several SMU researchers who have made discoveries that are moving from their laboratories to the marketplace. Although academia does not require faculty members to engage in "technology transfer," it offers many benefits to researchers and the university.

"We can use funds generated by these efforts to support further research," says Narayan Bhat, dean of research and graduate studies.

Another SMU researcher who has developed several products with potential commercial value is John Buynak,

professor of chemistry in Dedman College. Buynak has created a new class of compounds called beta-lactamase inhibitors that can effectively treat penicillin-resistant infections. His compound DVR-2, for example, has shown success in fighting *Pseudomonas aeruginosa*, a bacterial infection common in hospitals.

SMU and Research Corporation Technologies, which helps universities identify and manage technologies of commercial value, are working to introduce Buynak's compounds to the market.

"We're quite interested in John's compounds," says Scott Pyron, RCT's director of institutional relations. "We think they may have real value in the fight against antibiotic-resistant organisms."

At its December 1999 meeting, the SMU Board of Trustees approved the establishment of a company with RCT to develop and test Buynak's compounds. This is the first such company SMU has formed. "This work should succeed, unless we get very different answers when the compounds are tested in animals and humans," Pyron says.

Buynak received a \$102,594 grant from the 1999 Texas Advanced Technology Program to continue his work on beta-lactamase inhibitors.



Donald Butler and Zeynep Çelik-Butler have developed breakthrough technology that allows the creation of lighter, cheaper, and more sensitive devices to detect infrared radiation.

**Z**eynep Çelik-Butler, professor of electrical engineering, and Donald Butler, associate professor of electrical engineering, have developed another technology that RCT believes will be of great interest to the marketplace.

The Butlers' breakthrough technology enables the creation of lighter, cheaper, and more sensitive devices to detect infrared radiation. The technology has numerous consumer applications, including night vision for automobiles, the development of burglar alarms, and

equipment that could detect fires or monitor air pollution.

For example, products based on this technology could be used by firefighters to find the "hot spots" in a burning house or to determine whether there is a raging fire behind a closed door. It also could be used to locate people more quickly.

"Smoke obscures your regular vision, but infrared light can penetrate the smoke," Donald Butler explains.

Or, instruments could be developed to detect forest fires long before any other means. "For a very small cost, a station could be set up to monitor a large area of forest," Butler says.

SMU has received four patents on the Butlers' technology and also has filed international patents on it. They already have received inquiries about their technology from several European countries, Japan, Israel, and Turkey.

RCT is looking for a company to license the Butlers' technology. In the meantime, the Butlers have received a grant from NASA to develop an infrared detector that will be placed on low-orbiting satellites measuring the Earth's radiation for a global warming study.

**P**eter Raad, professor of mechanical engineering, has several innovations of interest to industry. In 1999 SMU received a patent on a modeling algorithm Raad developed that can help reduce from weeks to minutes the time required for the thermal analysis of integrated circuits. As more powerful computer chips are made, they generate additional heat that can degrade performance and limit their useful life.

"This is a truly amazing technique because it replaces work that previously was done only by supercomputers," says Larry Smith, director of research and technology management at SMU.

Raad's modeling algorithm allows thermal design for integrated circuits to take place at the same time as electrical design. His work could help companies that design and manufacture high-performance integrated circuits develop more reliable products and bring their products to market faster.

SMU is seeking funding to make the interface with the simulation algorithm user-friendly so that it will have more

commercial value. To date, Raad has received support for his work from the National Science Foundation, Texas Instruments, Raytheon Systems Company, TriQuint Semiconductor, Marlow Industries, and Isonics.

Raad also directs a lab called the SMU Submicron Electrothermal Sciences Laboratory, in which he can measure the thermal properties of thin-film materials used in integrated circuits.

"The properties of many materials are different when they are in a thin-film form," Raad explains.

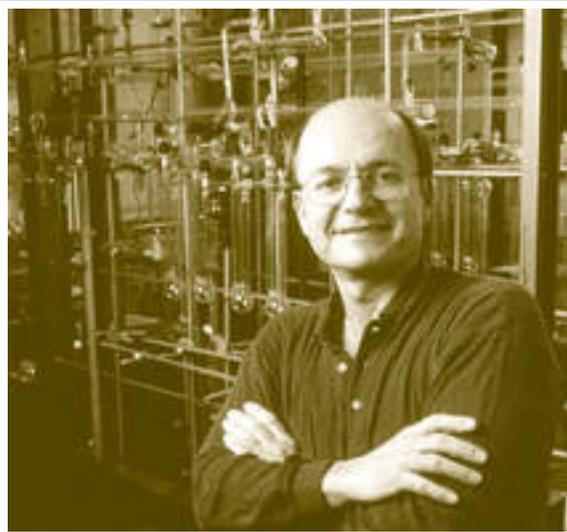
Several Dallas-based companies use Raad's lab to test new materials or new ways of using old materials. The lab also can determine the reliability of materials and systems.

**D**avid Matula, professor of computer science and engineering, also has created a product that may be of value to the booming telecommunications industry. Matula has developed a method of handling and assigning calls within a cellular phone system that has the potential to increase the system's load-carrying capacity by 10 to 15 percent. His system would eliminate blocks and dropped calls in congested cells, such as those that occur in rush-hour traffic.

"This technology is a significant advancement in the way cellular calls are handled in highly utilized systems," Smith says. The University received a patent on Matula's invention in 1997 and is trying to find a company interested in using it. Matula is fine-tuning his work to enhance its appeal in the marketplace.

**F**or SMU faculty members who conduct research with commercial potential, the work offers both advantages and disadvantages.

One advantage is the potential financial gain for themselves and SMU. According to the University's intellectual property policy, up to 40 percent of any net income generated through royalties is paid to the inventor and an additional 10 percent to the inventor's lab. This income can further researchers' work by enabling them to improve their facilities or expand their staffs.



Chemistry professor John Buynak has created a new class of compounds that can effectively treat penicillin-resistant infections.

Choon Sae Lee hopes that if his antenna becomes a commercial success, SMU will use some of its revenue to build an antenna testing facility on campus. He now tests his antennas at a company in Richardson.

"There is a great need in the Dallas-Fort Worth area for more facilities of this kind," Lee says. "If SMU had one, it could

provide a service to the local industry and generate even more revenue."

In addition, Lee says the testing facility would be a valuable resource for students. "We could train students on this critical technology in wireless communication," he says. "If we had more research facilities, we also could have more graduate students." Projects such as his also expose graduate students to interaction with industry.

Lee estimates that it would cost \$5 million to build the antenna testing facility he needs. "That's not money you can get as a professor at SMU – or any other university," he says.

Peter Raad, who also serves as assistant dean of the School of Engineering and Applied Science, says his electrothermal testing lab generates goodwill between SMU and industry, which in turn leads to internships and job opportunities for graduates, and helps attract more students, faculty members, and endowment funds.

"It is important to connect with your city and your industry," Raad says, noting that Dallas was recently named the top city in the country in which to do business. "If we can't do something of value for our city, we don't deserve to be here."

Donald Butler says royalty income from his infrared detectors could help further his research in other areas.

"The problem with doing research is that it costs money to get started and to achieve the preliminary results you need to put into grant proposals," Butler explains. "This could help us

prepare better research proposals."

The push to commercialize inventions has several downsides, however. One is the initial cost.

"Many people think intellectual property is a way of generating money, and it can be," Smith says. "But it also costs a whole lot on the front end."

Smith estimates it costs from \$10,000 to \$20,000 to receive a U.S. patent. "International patents are much more," he adds.

In addition, the time needed to perfect a product for market is time taken away from other research. "Researchers have to make a choice about how they spend their time," Smith says. "If they are doing developmental work, they are not doing discovery research."

The process of bringing products to the market also can be long and frustrating.

"One of the big myths about intellectual property is the old saying that 'if you invent a better mousetrap, the world will beat a path to your door,'" Smith says. "Nothing could be further from the truth. The world doesn't care if you invent something. You have to market that invention, sell it, and convince people it is an advancement in technology that is worth adopting. People are reluctant to change what they already have an investment in."

Overall, however, Smith says he believes the effort to bring new technology to market is worth it. "If faculty members at SMU and elsewhere weren't doing this type of work, we wouldn't have all the products we have," he says.

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