Tripping the Light FANTASTIC

OPTIGRATE MAKES HOLOGRAPHIC TECHNOLOGY BREAKTHROUGH.

By Nancy Christianson Curry

Like a marathon runner entering his 25th mile, Leon Glebov can almost see the finish line. The Russian-born physicist and University of Central Florida (UCF) professor has been nurturing a scientific discovery for nearly 20 years, and it's about to pay off with far-reaching commercial applications.

PHOTOS BY CHARLES HODGES

Glebov is the co-founder and chief technology officer of OptiGrate, a University of Central Florida (UCF) Technology Incubator company that designs and manufactures a variety of optical gratings and devices for specialized commercial and defense applications.

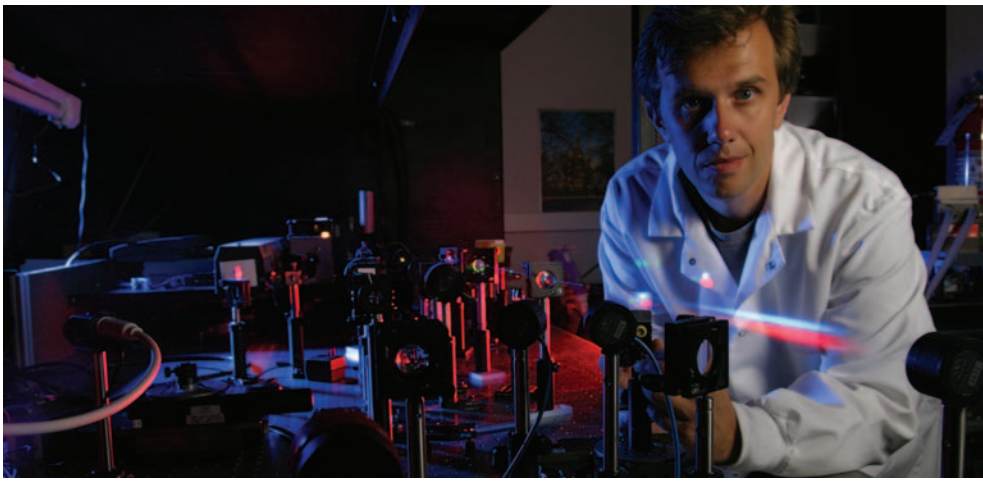
Glebov's breakthrough has been to develop a method of embedding microscopic holograms into optic glass that can direct light to perform a vast number of functions. He holds two patents for the technique, which has revolutionary promise for the military, semi-conductor, spectrometry and automotive and shipping industries, as well as for consumer applications ranging from medical imaging to mind-blowing high-resolution big-screen TVs.

"I believe we'll see widespread commercial applications within eighteen months," says Glebov.

That path to commercialization has been helped by the Florida High Tech Corridor Council's (FHTCC) innovative Matching Grants Research Program, which provided OptiGrate $225,000 in matching funds for research.

"The FHTCC program is extremely helpful for both small companies and the university because it provides additional funding for research," says Glebov. "The money is flexible, so when we see something unexpected in the lab, we can capitalize on it. Both sides — the company and the university — have a very good benefit."

Glebov's highly specialized glass provides a vehicle for directing light that is far more durable and precise than the photosensitive materials commonly used in today's optics marketplace. Currently, photosensitive glass is created with an organic surface coating. Creating the glass by embedding a hologram creates a thicker platform, one that can withstand high temperatures, immersion in water and numerous other environmental challenges. OptiGrate's finished product will facilitate the use of semiconductor lasers as a high-quality light source because it can stand up to the extreme heat they generate, something that previous photosensitive platforms cannot do.



Lasers offer quantum gains in efficiency and quality for all sorts of light-related technology applications. For example, a traditional projection TV screen that emits 3 watts of light requires roughly 300 watts of energy. Using a laser with holographic control to project images drops the power requirements to just 10 watts.

This achievement is a major milestone in a long career: Glebov has been working with glass since 1970. Originally from the Soviet Union, he served as director of the prestigious Vavilov State Optical Institute of St. Petersburg until 1995, when UCF recruited him to conduct research at the College of Optics & Photonics and Center for Research and Education in Optics and Lasers (CREOL).

He founded OptiGrate in 1999 with his wife, Larissa, an organic chemist, and Vadim Smirnov, a former student who serves as the company's director of holography. OptiGrate supplies clients in the semiconductor and optics industries, but also performs pure research. The company has been awarded two Phase I Small Business Innovation Research grants from NASA, and is successfully completing two Phase II Small Business Technology Transfer Research grants. The grants are worth $1.5 million issued by the U.S. Department of Defense's Missile Defense Agency and the Defense Advanced Research Project Agency.

Like many scientific achievements, Glebov's initial discovery came while looking for something else. In 1989, one of his Vavilov students was having difficulty drilling holes in optical glass. Glebov realized the "faulty" process was actually etching a hologram.

"We recorded the world's first phase-volume hologram in glass the very next day," recalls Glebov. "At the time, there was no useful application for it. After this, I moved to America, and three years later we made the first glass that did not produce scattering. It took us ten years to make a high-quality hologram."

The roadblock he faced was that photosensitive glass needs to be extraordinarily pure and homogeneous. Achieving that combination was nothing short of miraculous.

One year and a half later Glebov and his team acheived the "impossible," producing the first high-purity and homogeneous glass.

UCF played an integral role in OptiGrate's success. In addition to the business mentoring and guidance provided by the Technology Incubator, UCF and its CREOL lab have been a key source of employees and scientific resources. Five UCF students are participating in the research grant project and UCF grads hold three of the company's four full-time technical positions.

"There's only one university in the United States that can produce optical glass," says Glebov, "and that's UCF."