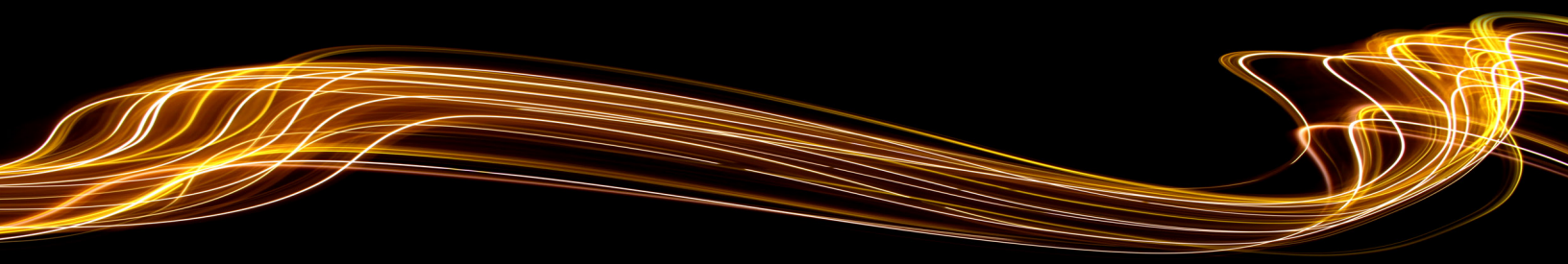
MAKING WAVES

Sensor Electronic Technology, Inc. revolutionizes UV systems across a variety of fields



From trapping mosquitos and identifying weaponized bio-agents to sterilizing medical equipment and securing communications, one of the most exciting innovations in scientific research is invisible to the human eye.

"Deep UV," or ultraviolet light with extremely short wavelengths, holds incredible potential across a wide range of applications. Deep UV rays are energetic enough to alter subcellular structures like DNA, it can purify air and water, and it can even supply humans with the same Vitamin D that comes from exposure to the sun but without the accompanying skin damage.

"You can't see that light, but you can do a lot of things with it," said Dr. Remis Gaska, cofounder of Sensor Electronic Technology, Inc. (SETi), which, with the help of contracts from the Small Business Innovation Research (SBIR) program, developed and manufactured technology that generated much smaller UV light waves—with big results.

Founded in 1999 by Gaska and Dr. Michael Shur, SETi set out to develop what would become a new generation of high-powered devices using UV technology. Gaska coined the term "deep UV" to describe the shift beyond blue ultraviolet wavelengths, which are no shorter than 365 nanometers and typically generated using indium gallium nitride (InGaN) materials. Humans cannot see wavelengths shorter than 400 nanometers. Creating even shorter wavelengths required shifting the composition of material systems to aluminum gallium nitride (AlGaN), which can yield ultraviolet light in the 220 to 360 nanometer wavelengths. This required shifting the composition of material systems to aluminum gallium nitride (AlGaN), which can yield ultraviolet light in the 220 to 360 nanometer wavelengths. When the wavelengths are that short, "the applications are limitless," Gaska said.

SETi's founders also envisioned moving away from using lamps and lasers to generate ultraviolet light and instead developing technology based on solid-state light emitting diodes, or LEDs. Much like the standard LED

lighting that has since become commonplace in homes and commercial settings, ultraviolet LEDs are more compact, consume less power, and last longer than older technologies. All this allows the technology to be used in inexpensive sensors and deployed for a wide range of applications.

Despite the potential of deep UV, SETi's founders recognized from the onset that they would need to find a long-term source of funding in order to develop and ultimately produce the UV LED technology. Gaska felt that venture capital, the typical source of funding for startups, was unlikely to sustain the lengthy process needed to make deep UV systems a reality.

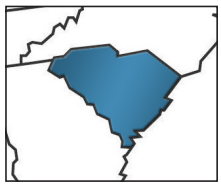
"The technology wasn't ready for venture capital," Gaska said. "We needed to start with everything—material research, device research, and how it all was tied together."

Dr. Remis Gaska

Dr. Michael Shur

Multi-phase SBIR contracts from DARPA, Missile Defense Agency (MDA), Army, Navy, NASA and the National Science Foundation supported much of SETi's work through the early 2000s. In the process, Gaska and Shur received more than 150 U.S. and international patents stemming from research supported by the contracts.

SETi ultimately became the world's largest producer of deep ultraviolet LEDs, with more than 3,000 commercial and government customers worldwide, including the U.S. Army, Department of Homeland Security, NASA, DARPA, and others. The company grew to nearly 100 employees, and its technology was adopted by a number of prime contractors for government projects. Deep UV technology has been used aboard the International Space Station to eradicate microorganisms in biological experiments, in systems that detect biohazards, attract and trap mosquitos, and extend the shelf life of produce, and in the development of secure communication systems that take advantage of UV's tendency to be absorbed by the atmosphere to limit the potential for eavesdropping from above.



In 2005, SETi entered a strategic partnership with Seoul Viosys, a semiconductor company, which significantly increased the production capacity of the technology. In 2012, SETi's founders received the prestigious Tibbetts Award, which recognizes innovations that result in significant commercial impact, meet federal needs, and support the commercialization of government research. The company and its founders also have won a number of other awards, including the 2009 PRISM Award for best photonics product of the year, the 2009 Best of Columbia Award, and two nominations as finalists for the Institution of Engineering and Technology (IET) Innovation Award.

In 2017, Gaska founded a new company, UVTON Inc., which focuses on applications of deep UV LEDs with an initial focus on healthcare devices. Its first product was a pocket-sized case designed to disinfect hearing aids—a technology of particular importance to veterans, significant numbers of whom develop hearing issues in combat settings, according to Gaska.

Gaska credits SBIR funding with giving SETi the time required to develop the underlying UV technology and the processes to manufacture it. "We knew we could not oversell this—it was a long road for development, and it gave us flexibility," he said. "It let us start with seemingly one thing, but everything developed under that later translated into optoelectronics."

Sensor Electronic Technology, Inc.

Columbia, SC

Modernization Priority: General Warfighting Requirements (GWR)

STTR contract: N00014-01-C-0195 • Agency: Navy • Topic: N00-T003, Solar-Blind AlInGaN Optoelectronic Transistor Arrays

SBIR contract: W31P4Q-04-C-R040 • Agency: DARPA • Topic: SB022-043, AlInGaN-Based Deep Ultraviolet Laser Diode Over Bulk AlN Substrates SBIR contract: W911NF-09-C-0160 • Agency: Army • Topic: A08-077, High Power AlInGaN-Based Deep Ultraviolet Light Emitting Diodes