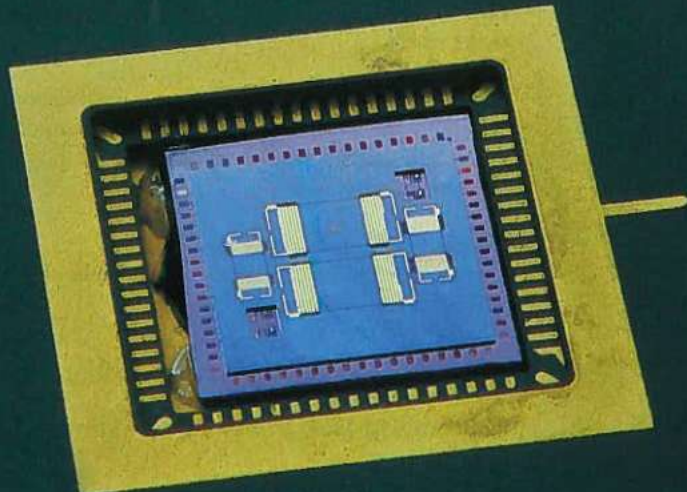


# Revolution revelation

Vice president of  
AEGis' Nanogenesis  
looks for big ideas  
in small places



Micro-scale devices at AEGis Technologies' new division, Nanogenesis.

Glenn Buesku

by Anna Thibodeaux

**W**hen David Thomas was considering his career path, he chose one that would tap “the revolution of our time.”

Thomas' revelation started with a book.

He had just read Juan Enriquez's “As The Future Catches You: How Genomics and Other Forces are Changing Your Life, Work, Health & Wealth,” which is about the impact genetic engineering and computers would have on the future of the world. It was a visionary work at the time, but for Thomas it has become fate. Events unfolded in the last 10 years that have brought him to the brink of his dream.

“Nanotechnology is an area of science that can revolutionize just about every aspect of our lives,” says Thomas, vice president of Nanogenesis, a division of AEGis Technologies. “It's really a revolutionary aspect of science.”

Unveiled in October, Nanogenesis is the advanced technology development arm of AEGis Technologies Group, formed to create a unique identity for Huntsville-based AEGis' work in the field. The team was originally called the Microsystems Group, which primarily supported the development of micro-electromechanical systems (MEMS) in the late 1990s and in early 2000. The group's responsibilities and facilities grew in the last five years.

Nanotech may be groundbreaking work, but it's the study of very small things – so small you need a microscope to see them. It's the study of manipulating matter on an atomic and molecular scale. The structures are generally 1 to 100 nanometre (equal to one billionth of a metre) in at least one dimension. Applications include medicine, electronics, biomaterials or energy production.

John Williams, associate director of the Nano and Micro Devices Center at the University of Alabama in Huntsville, says MEMS and nanotech have changed nearly every aspect of daily life in the last 15 years.

“The air bag in your car is controlled by a MEMS accelerometer integrated with digital electronics,” Williams says. “The Wii remote your children play with utilizes microfabricated gyros to accurately determine position. The HDTV and 3-D movie pictures you watch are generated using lithographic patterning and/or microfabricated mirrors.”





Glenn Baeske

**Biomedical Engineer Carlos Kengla, left, and Nanogenesis Vice President David Thomas hold micro-circuits in front of a company clean room.**

Stain-resistant clothing has nanocomposite fibers weaved into it to prevent water and other chemicals from binding to the surface. Your cell phone was developed using state-of-the-art semiconductor circuits and microfabricated radio-frequency signal filter networks.

Williams says Nanogenesis is among more than a dozen local companies, government agencies and academic institutions developing the next generation of ultra-small sensors and actuators that will further revolutionize the world.

"The most prevalent of the past two years, and (winner of) the 2010 Nobel Prize in physics, was the development of graphene," he says. "Graphene is a single atomic sheet of carbon in graphite form that conducts electricity around its edges, but not through the sheet itself. The nature of the material lends well to magnetic sensing and quantum computing, which many believe will significantly alter our perception of artificial intelligence."

For Nanogenesis, Thomas says one of their research areas is improving the efficiency of solar cells by using "nanophotonics" to guide light into the cell.

"Electronics are being shrunk to cubes to make them faster and have a smaller footprint," he says. "Nanomaterials allow sensors to survive in very harsh environments."

Biodelectors have much higher sensitivity if they are fabricated at the nano scale, Thomas says. Nanogenesis is working with a university to develop small biosensors capable of detecting numerous medical conditions such as heart attacks and providing screening tools for the public.

"Nano-scale detectors have special properties and can be used for security screening micro and non-destructive inspection," he says. "There are numerous others."

Nanotech is a techno hot spot for the military because of its ability to engineer at the molecular scale, producing devices

with extraordinary capabilities, Thomas says. Calling it the bottom-up approach, he says Nanogenesis starts engineering at the molecular scale and builds up. "The performance of devices engineered this way is superior to systems developed using top-down methods, where you start with larger raw materials and engineer down in size."

Thomas envisions the company as idea machine.

"We have a heavy emphasis on a culture that fosters innovation," he says. "We're trying to create a culture where the best in the world can come together to try to solve problems." Thomas calls their research and development platform a "genesis engine." The word genesis refers to creation of ideas, a birthing process.

"When you put the two words together, you see we are about creating new ideas in an area of science that holds the promise of having a significant impact on our lives," Thomas says.

Even the company logo includes a portion of a Carbon 60 molecule known as a buckyball. The logo embodies the company mission. It is a tribute to one of the first nano materials with unique properties able to make devices that are stronger, smaller and faster.

The division's mission is to develop life-changing technologies that have a positive impact on society. Nanogenesis is working every competitive edge. And that's exactly what Thomas says comes with the company's strong collaborative environment. The scientists are encouraged to sit around and share ideas, hopefully fueling the kind of crossover knowledge that can take nanotech from science fiction to practical application.

Communication is a high priority. All company offices have video conferencing capabilities and videoconferences are held regularly. They also use blogs to share ideas and web-based



file sharing sites. Video chatting has helped “maintain a sense of closeness even though we are separated geographically,” he says.

AEgis Technologies has multiple rooms dedicated solely to collaboration located throughout the corporate headquarters and Albuquerque, N.M., labs.

“We use these rooms frequently for brainstorming, planning and review,” he says. “Our collaboration rooms are outfitted with video equipment and large televisions so we can see each other as we talk. We use virtual whiteboards so that anyone can contribute to the session, regardless of location.”

The team’s diversity is another facet of promoting an exchange of ideas. Nanogenesis also encompasses special laboratories, including Class 1000 and Class 10000 clean rooms in Huntsville. In Albuquerque, the company has laser and chemical labs.

“We cannot have a positive impact on society if the ideas remain in the laboratory,” Thomas says. “So we put

a lot of effort into transitioning game-changing technology to the field. The second part of the mission speaks to the environment and culture of the group. We are very serious about creating an environment where highly creative people have the opportunity to pursue their dreams. Our organization and management structure is designed to promote the success of each person within the group.”

Nanogenesis has strategically positioned itself to facilitate close interaction with the U.S. Department of Defense and U.S. Department of Energy national labs.

The division’s personnel at its laser laboratory in Albuquerque work closely with the U.S. Air Force laser effects group, and with Redstone Arsenal in Huntsville and Sandia National Labs in Albuquerque. Nanogenesis is also a longstanding, recurring industrial user of the Oak Ridge National Laboratory’s Center for Nanophase Materials Sciences’ nano-fabrication user facility

in Oak Ridge, Tenn.

“In this way, we have access to world-class facilities that only exist in a handful of places around the country,” Thomas says. “We also collaborate with leading scientists. In fact, almost all of our projects include subject-matter experts who are world leaders in a particular field. This geographic diversity makes it much easier to collaborate with leading scientists and work in some very unique facilities.”

Thomas also credits AEgis co-founders Steve Hill, president and CEO, and Bill Waite, chairman and chief technical officer, for helping bring Nanogenesis and its team to reality.

“I can not take credit for the success of the group,” Thomas says. “The whole point of the culture and organizational structure is to give bright people an environment and the support they need to succeed. It is the hard work and creativeness of everyone in the group who makes it successful. No one person can claim that.” ■