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## *A Warmer Wetter World*

Though significant uncertainty remains regarding the amount of global warming that will occur over the next century or two, scientists agree that the trend will continue for the next hundred years even if fossil fuel consumption is dramatically reduced. Scientists predict significant increases in global temperature and sea level this century. And related changes in weather patterns are expected to affect agricultural production. Global warming is likely to have the greatest human impact in poor countries unable to adequately respond to the changes.

Professor Robert Dickinson of the Georgia Institute of Technology's School of Earth and Atmospheric Sciences presented the evidence behind this assessment at the annual meeting of the American Association for the Advancement of Science (AAAS) in February 2002. Dickinson's presentation, titled "Predicting Climate Change," was part of the

PHOTO BY MICHAEL VAN WOERT, NOAA



symposium "Climate Change: Integrating Science, Economics and Policy."

"Current climate models can indicate the general nature of climate change for the next 100 to 200 years," Dickinson says. "But the effects of carbon dioxide (CO<sub>2</sub>) that have been released into the atmosphere from the burning of fossil fuels last for at least 100 years. That means that any reductions in CO<sub>2</sub> that are expected to be possible over this period will not result in a cleaner atmosphere and less global warming than we see today for at least a century."

Climate models indicate temperature increases of 3 to more than 10 degrees Fahrenheit this century and a sea level rise of 6 inches to nearly 3 feet. The burning of fossil fuels emits greenhouse gases, such as CO<sub>2</sub>, into the atmosphere. These gases contribute to global warming, and the temperature increase expands the oceans and causes ice sheets to melt, in turn increasing sea level.

Despite differences in climate model projections and the limitations of the models themselves, scientists agree that significant consequences from global warming will occur in this century, Dickinson says.

— Jane M. Sanders

■ For the full-text news release version of this story, see [gtresearchnews.gatech.edu/newsrelease/WWWorld.html](http://gtresearchnews.gatech.edu/newsrelease/WWWorld.html). For more information, contact Robert Dickinson, School of Earth and Atmospheric Sciences, Georgia Tech, Atlanta, GA 30332-0340. (Telephone: 404-385-1509) (E-mail: robert.dickinson@eas.gatech.edu)

## Nanocarrots & Nanocherries

Using molten gallium as a catalyst, researchers at the Georgia Institute of Technology have simultaneously grown hundreds of thousands of silica nanowires from each micron-scale catalyst droplet. Bundles of the highly aligned and closely packed nanowires form unusual structures resembling cones, cherries, carrots and comets.

Use of gallium catalysts could facilitate high-volume production of silica (SiO<sub>2</sub>) nanowires, improving the vapor-liquid-solid (VLS) process now used to make the structures. The gallium catalysts also

produce nanowires that spontaneously divide into branching structures that could have potential applications as optical splitters in nanometer-scale photonic systems.

The National Science Foundation-sponsored work was reported in the February 2002 issue of the *Journal of the American Chemical Society*. "These nanowires demonstrate many amazing growth phenomena unlike any previously observed through a conventional VLS growth process," explains Zhong Lin Wang, director of the Georgia Tech Center for Nanoscience and Nanotechnology, and a professor of materials science and engineering. "These silica nanowires could have applications ranging from

Gallium-based synthesis process could facilitate high-volume production of aligned silicon-based nanowires with optical properties.

optics to surface coatings. It's my hope that they can be useful as small-scale optical fibers useful for splitting a signal."

The ability to grow large bundles of aligned nanowires from a single catalyst could help lower production costs, potentially opening up new applications for the structures.

— John Toon

■ For the full-text news release version of this story, see: [gtresearchnews.gatech.edu/newsrelease/SIWIRES.htm](http://gtresearchnews.gatech.edu/newsrelease/SIWIRES.htm). For more information, contact Z.L. Wang, School of Materials Science and Engineering, Georgia Tech, Atlanta, GA 30332-0245. (Telephone: 404-894-8008) (E-mail: zhong.wang@mse.gatech.edu)

## Medical Micromachines

Micromachines, devices based on micro electro-mechanical systems (MEMS) technology and built using microelectronics industry fabrication techniques, have begun finding their way into real-world Georgia applications.

Researchers at the Atlanta-based company CardioMEMS are testing a microchip that could be implanted in the body to wirelessly transmit information about blood flow and pressure to equipment located outside the body.

CardioMEMS, a member company in Georgia Tech's Advanced Technology Development Center (ATDC), is using MEMS technology

to develop a new class of implantable sensor to detect blood pressure, flow rate and other key information from deep within the body. And the company's medical micromachines could one day move beyond diagnostics to help treat disease.

**Left: A rising global temperature is melting polar ice, causing an increase in sea level. In this photo from the National Oceanic and Atmospheric Administration (NOAA), melting ice drifts in the Ross Sea off the coast of Antarctica.**

**Below: A scanning electron microscope (SEM) image shows a group of silica (SiO<sub>2</sub>) nanowire bundles grown from gallium droplets.**

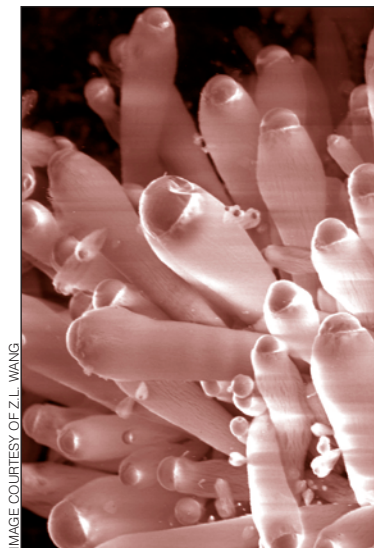
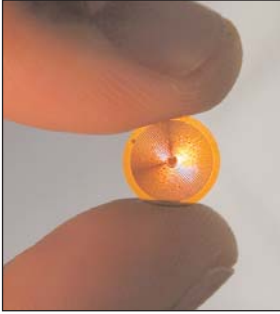


IMAGE COURTESY OF Z.L. WANG

PHOTO COURTESY OF CARDIOMEMS



**The CardioMEMS sensor is based on technology originally developed at the Georgia Institute of Technology for monitoring jet engines.**

"The focus of the company is applying MEMS fabrication techniques to develop medical devices we hope to use initially for the diagnosis and management of disease, and ultimately for the treatment of various cardiovascular problems and other types of medical conditions," says David Stern, the company's vice-president of research and development. "There is substantial interest in medical applications of MEMS because they hold the promise of revolutionizing the way people receive treatment."

CardioMEMS was founded by Jay Yadav, a Cleveland, Ohio, cardiologist, and Mark Allen, a Georgia Tech professor of electrical engineering and a MEMS researcher. The year-old company has licensed MEMS technology from both the Georgia Institute of Technology and the Massachusetts Institute of Technology.

Though the technology has broad potential application in medicine, CardioMEMS is focusing first on a sensor that will be used to monitor the pressure within an aortic aneurysm and in the treatment of congestive heart failure.

— John Toon

■ For the full-text news release version of this story, see [www.atdc.org/news/january282002.html](http://www.atdc.org/news/january282002.html). For more information, contact David Stern at CardioMEMS, 430 10th St., Suite N-005, Atlanta, GA 30318. (Telephone: 404-885-9980) (E-mail: [dstern@cardiomems.com](mailto:dstern@cardiomems.com))

## Spawning New Companies

Digital Furnace, a maker of technology to enhance broadband networks, was just two years old when Broadcom snapped it up in February 2000 for stock worth \$136 million. Key to the company's success was the core role of the Georgia Institute of Technology.

Georgia Tech helps power the state's economy through start-ups based on research innovation.

Without its connections through two faculty members who were part of the founding team, the startup might have withered like so many others in its first year, says one of Digital Furnace's investors.

"The Georgia Tech and Georgia Centers for Advanced Telecommunications Technology (GCATT) connections were critical to our making the investment," says Stephen Fleming, former general partner at Atlanta-based venture capital firm Alliance Technology Ventures.

First, Fleming and co-investors knew two of Digital Furnace's three founders through Georgia Tech and GCATT. Second, the company spent its first year at the Advanced Technology Development Center's facility in GCATT and employed several Georgia Tech graduate students, Fleming explains.

Digital Furnace has plenty of company in its Georgia Tech connections. For the past few years, about half of Advanced Technology Development Center (ATDC) companies have been built around research conducted at Georgia Tech or around ideas hatched by the Institute's faculty members, says Wayne Hodges, associate vice president for Economic Development and Technology Ventures.

That's what both investors and Georgia Tech want. Fashioning successful businesses from academic research is central to Georgia Tech's mission as a state-supported research university, says Provost Jean-Lou Chameau. That mission includes furthering the economic development of the state.

Commercializing laboratory-born research, especially by forming companies that can create jobs, is one way to do that.

As part of the effort, Hodges and other Georgia Tech officials studied commercialization programs at other schools including the Massachusetts Institute of Technology, Stanford University, Carnegie-Mellon University and the University of Michigan.

One result is VentureLab, a pilot program formed last fall to help expand the amount of commercialization activity coming out of Georgia Tech's research programs. As a one-stop center for technology commercialization, VentureLab provides faculty a clear pathway from laboratory innovation to commercial market. It offers assistance throughout the process, including help in evaluating the commercial value of an innovation and guidance from entrepreneurs with experience in forming new companies.

— Charles Davidson, freelance writer

■ For the full-text version of this article, see [www.atdc.org/atdcletter/feb02/gtfims.html](http://www.atdc.org/atdcletter/feb02/gtfims.html). For more information, contact Wayne Hodges, Advanced Technology Development Center, 430 10th St., Suite N-112, Atlanta, GA 30332-0390 (Telephone: 404-894-5217) (E-mail: [wayne.hodges@atdc.org](mailto:wayne.hodges@atdc.org))

**Right: Atlanta start-up company Quellan is using Georgia Tech technology to improve the performance of optical networks. The company has grown rapidly and raised funds to continue the development. CEO Lloyd Solomon is shown at an optical test lab in the GCATT Building.**

PHOTO BY GARY MEEK

