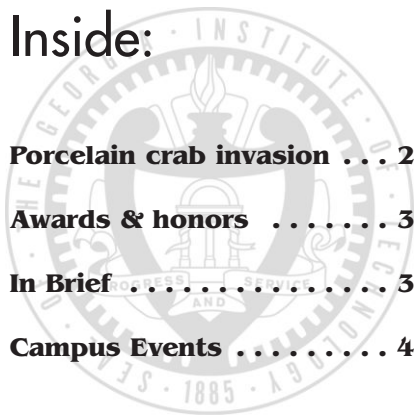


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THE WHISTLE

FACULTY/STAFF NEWSPAPER

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Using captured water to serve campus landscape

Michael Hagearty
 Institute Communications
 and Public Affairs

When the city of Atlanta announced tighter water restrictions for its residents in May, Georgia Tech began looking for alternative ways to take care of its plants. Although watering one day a week is sufficient for some of Georgia Tech's landscape, other areas were jeopardized by the drought.

As with any other city resident, Tech is allowed to draw from the city water supply one day per week. The remainder has to come from other sources.

Buildings such as the Klaus Advanced Computing Building and the Molecular Science Building were designed with in-ground cisterns to capture both air conditioning condensate and stormwater, which in turn provides for the surrounding area. Georgia Tech Facilities decided to tap this condensate water elsewhere, collecting it from two other buildings to irrigate the remainder of campus.

Those collection tanks, located at the Campus Recreation Center and the Environmental Science and Technology Building, harvest about 10,000 gallons of water per day. It is then redistributed in mobile tanks based on priorities established by Georgia Tech Landscape Services.

Howard Wertheimer, director of Capital Planning and Space Management, credited Facilities' administration for managing a difficult situation.

"I think Chuck Rhode, Warren Page and Hyacinth Ide have done a good job coming up with a successful strategy for capturing water that would otherwise go down the storm sewer and using it to take care of some of our needs on campus," he said.

New landscaping is an exception. The city lifts the ban for 30 days in those instances. But as Capital Planning and Space Management Master Planner Anne Boykin-Smith pointed out, the drought is also having an effect on project planning. Sod for the new green space adjacent to the Van Leer Building and the College

Water continued, page 3

Surviving drought conditions



Despite record-setting heat, Facilities workers such as Isadore Snead (above) help keep the campus looking green and lush. How do they do it? A primary method is redistributing the captured condensate from the massive air conditioning units servicing campus buildings. That water is transferred to 1,500-gallon containers and moved around campus for use on lawns, flower beds and other landscaping.

Embryonic stem cells thrive when shaken

Mimicking a mother's movement results in improved development

Megan McRaney
 Institute Communications
 and Public Affairs

Human embryos spend much of their time in the womb bobbing along with a mother's movement, and new research from Georgia Tech and Emory University suggests that embryonic stem cells may develop much better under similarly shaky conditions.

Georgia Tech and Emory researchers discovered that moderate and controlled physical movement of embryonic stem cells in fluid environments, similar to shaking that occurs in the womb, improves their development and suggests that different types of movement could some day be used to control what type of cell they become. The research was published in the September issue of the journal *Stem Cells*.

"Embryonic cells develop under unique conditions in the womb, and no one has ever been able to study the effect that movement has on that development process," said Todd McDevitt, assistant professor in the Department of Biomedical Engineering and head of the project. "While labs typically add all sorts of things to their cultures to influence cell direction, we were able to control the levels of differentiation and size of cell clusters by simply providing some fluid motion."

It all started with a fortunate accident. Rich Carpenedo, a graduate student and first author of the paper, discovered by chance that a dish of embryonic stem cells left on a common lab shaker (typically used to slowly mix samples) had developed in greater numbers and more uniformly than cells grown in a static environment.

Current popular methods of developing embryonic stem cells in the lab involve single droplets of cells separated by a great deal of space in the dish. This time- and space-consuming

Embryos continued, page 2

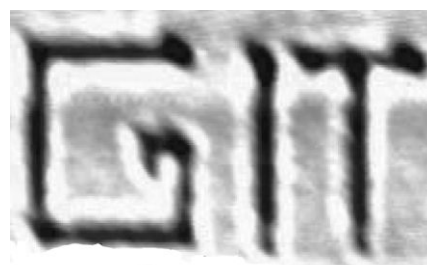
Drawing nanoscale features the fast and easy way

David Terraso
 Institute Communications
 and Public Affairs

Scientists at Georgia Tech have developed a new technique for nanolithography that is extremely fast and can be used in liquids and outside of a vacuum. The technique could help make the manufacturing of nanocircuits commercially viable.

With potential applications for fields ranging from the electronics industry to nanofluidics to medicine, the research employs a technique that is surprisingly simple. Researchers have demonstrated the technique, known as thermochemical nanolithography (TCNL), as a proof of concept.

Using an atomic force microscope (AFM), researchers heat a silicon tip and run it over a thin polymer film. The heat from the tip induces a



The research team used its technique to inscribe Georgia Tech's initials on a polymer film.

chemical reaction at the surface of the film, changing the film's chemical reactivity and transforming it from a hydrophobic substance to a hydrophilic one. The technique is extremely fast and can write at speeds that are orders of magnitude faster than the widely used dip-pen nanolithography.

TCNL continued, page 3

QUOTE

UNQUOTE

"We are interested in play culture and play practices, and how play experiences leak into the real world. This was a rare opportunity ... how many times do you see fairies and stormtroopers and pirates all at the same time, in downtown Atlanta?"

—Celia Pearce, an assistant professor in the School of Literature, Communication and Culture, on the costumed participants of *Dragon*Con*, an annual convention held in Atlanta and heavily influenced by pop culture. (*Atlanta Journal-Constitution*)

Tropical crab invades coastal reefs, but impact is in doubt

John Toon
Research News

A dime-sized tropical crab that has invaded coastal waters in the Southeast United States is having both positive and negative effects on oyster reefs, leaving researchers unable to predict what the creature's long-term impact will be.

Unlike native crabs that eat baby oysters, mussels and fish, the green porcelain crab *Petrolisthes armatus* is a filter feeder, extracting its food from the water much as oysters do. The fast-reproducing invader therefore isn't directly attacking oyster populations — though it may be competing with them for food — and may impact the predators that normally attack the oysters.

Researchers at Georgia Tech have spent more than three years studying the effects of the crab, and are reporting their findings in the journal *Biological Invasions*.

"We're seeing opposing effects from these crabs," said Mark Hay, a professor in the School of Biology. "They are probably having more impact on the ecosystem by being prey than by being predators. Other members of the ecosystem are feeding on them, and that is changing the rate at which fish and other crabs are feeding on the native species."

The impact of the crabs is important because oysters are a "foundation species" essential to the health of coastal ecosystems because their reefs provide homes to dozens of other creatures.



The porcelain crab (shown here on the researcher's thumb) is small, but may potentially have a large impact on Georgia's oyster reefs.

Though the crabs aren't killing existing populations of oysters, their long-term impact could still be significant. For instance, Hay noted, their availability as food could potentially increase the population of native crabs, disrupting the balance between those predators and the oysters.

But assessing the long-term impact of the crabs has been difficult because the creatures reproduce and grow rapidly, flooding the shallow coastal waters with their young. In research conducted off Skidaway Island and Sapelo Island on the Georgia coast, the researchers found "extraordinarily high" populations of the crab — as many as 11,000 individuals per square meter.

"You get a true understanding of

the sheer densities of these crabs only when you actually pick up or dig through clumps of oysters and oyster shell hash," said Amanda Holleb, a graduate student who is now a temporary assistant professor at Georgia Southern University in Statesboro.

"Particularly in the summer months, I was never able to find a patch of oysters in the Savannah area that did not have the green porcelain crab."

The long-term effects of the massive crab population are difficult to predict. Their large numbers could lead to population growth among the native crabs and fish that now prefer eating them instead of their normal diet. But if the predator population should grow large enough to control the non-native crabs, that could lead to a decline in their numbers — and force the predators back to their traditional prey of oysters and mussels.

"We're not sure what's going to happen," Hay said. "We can't really raise the alarm because we don't have the data to say these crabs are doing something bad. It's possible that they will not have a huge effect at all."

"We have observed both positive and negative impacts on oysters and oyster-related biota at small scales, but we cannot definitively answer our concerns about oyster reefs at larger scales," Holleb added. "With continued monitoring of large expanses of reefs, we may begin to understand the long-term, large-scale effects."

Georgia
Tech



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Embryos, cont'd from page 1

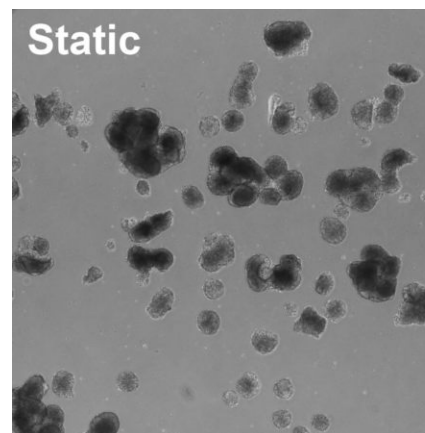
technique allows the cells to develop without excessive clumping — a frequent problem for stem cells developed in the lab — and for a greater number to survive in a small space.

Researchers experimented with the shaking plate and determined that they could consistently produce samples with healthier, more uniform cells just by gentle sloshing the dishes of stem cells on a shaker plate. The method proved to be much simpler and space efficient than the current standard for producing embryonic stem cells, McDevitt said.

"We can throw many cells in a dish and not have to worry about clumping and cell survival," McDevitt said. "We call it the 'set it and forget it' method for growing stem cells."

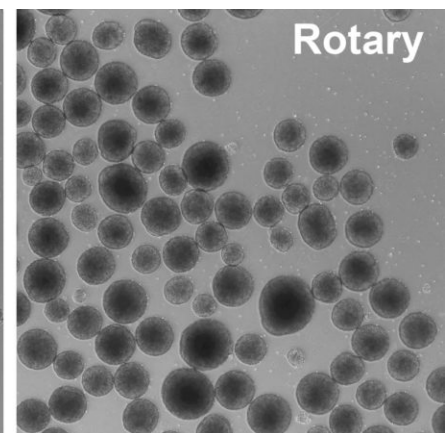
While secret to the shaken stem cells' success is still unclear, it's suspected that the movement of the fluid likely increases nutrient distribution to cells, creating healthier cells, McDevitt said.

The Georgia Tech and Emory



Georgia Tech and Emory researchers have determined that they can consistently produce healthier, more uniform stem cells (right) with gentle sloshing than with current methods, which are more time-consuming and can result in cell clumping (left).

research team then began experiments to determine if the motion could be used to control the size of the cell aggregates and type of cells the embryonic cells would eventually become and found that there was correlation between different types and speeds of movement and the phenotype and size of the stem cells.



Much work remains to be done before the movement control concept could be used to influence what types of cells embryonic stem cells eventually become. The team's next goal is to pinpoint more precisely exactly what speeds and manners of shaking can influence stem cell phenotype.

Water, cont'd from page 1

of Architecture, for example, was delayed in part to minimize the effects of the drought.

"Any new landscaping that we've installed — such as Tech Green North — are within the city's watering restrictions," she said. "We're postponing planting the shrubs and trees in that area until at least October or November."

Other steps taken include placing large bags filled with water at the base of immature trees, which slowly soak the root systems. In keeping with the directives of the Campus Master Plan, Landscaping Services plant native, drought-tolerant vegetation that is more capable of surviving the tough summer months.



Tanks located around Tech buildings help to capture thousands of gallons of water generated by campus air conditioning units.

TCNL, cont'd from page 1

"Thermochemical nanolithography is a rapid and versatile technique that puts us much closer to achieving the speeds required for commercial applications," said Elisa Riedo, an assistant professor in the School of Physics. "Because we're not transferring any materials from the AFM tip to the polymer surface — we are only heating it to change its chemical structure — this method can be intrinsically faster than other techniques."

Other techniques typically require the addition of other chemicals to be transferred to the surface or the presence of strong electric fields. TCNL doesn't have these requirements and can be used in humid environments outside a vacuum. TCNL also has the potential to be scalable, allowing users to independently draw features with thousands of tips at a time rather than just one.

TCNL is also tunable. By varying the amount of heat, the speed and the distance of the tip to the polymer, researchers can introduce topographical changes or modulate the range of chemical changes produced in the material.

"By changing the chemistry of the polymer, we've shown that we can selectively attach new substances, like metal ions or dyes to the patterned regions of the film in order to greatly increase the technique's functionality," said Seth Marder, a professor in the School of Chemistry and Biochemistry and director of the Center for Organic Photonics and Electronics. Marder's group developed the thermally switchable polymers used in this study.

"We expect thermochemical nanolithography to be widely adopted because it's conceptually simple and can be broadly applied," said Marder. "The scope is limited only by one's imagination to develop new chemistries and applications."

IN BRIEF:

Tech football's happy hours

Georgia Tech Football Coach Chan Gailey will be on hand for several live radio broadcasts this fall at Fox Sports Grill in Atlantic Station. Members of the campus community are invited to support the team and socialize with other staff. The Gold Rush Dance team, Buzz and former football players will all be in attendance.

Patrons showing BuzzCard will receive half-price appetizer specials between 5 - 7 p.m. as well as a discount on dinner.

Remaining dates include Sept. 12, Sept. 26, Oct. 17, Nov. 14 and Nov. 21.

For more information, visit ramblinwreck.com/ot/geot-gailey-show.html.

Payroll Department cited for technological excellence

A recent example of how Georgia Tech continues to make progress toward administrative excellence is the recognition of its Payroll Department by the American Payroll Association (APA). At its annual conference, APA presented their Prism Awards in recognition of companies that lead the payroll industry through innovative best practices in four areas: technology, management, process and overall best practices.

This year, the Payroll Department was recognized for the Technology Prism Award. The selection committee cited several reasons: achieving 99 percent employee direct deposit participation, reducing the payroll processing cycle time from two days to less than eight hours and providing a robust Employee Self-Service.

Administrators were quick to share the credit with the Office of Information Technology and the Office of Human Resources Benefits Department.

"This was not accomplished by the Payroll Department alone," Human Resources Service Center Senior Director Maryann Fogarty said. "We needed management support to change our business processes and technical design expertise to develop the required new processes. Building the new processes was one challenge, but keeping them up-to-date requires an ongoing commitment and continuous maintenance. This is truly a cross-departmental success story and it is an honor to be recognized by our peers as a technological leader in payroll."

Georgia Tech at Six Flags

On September 28, the Student Government Association is hosting the fifth annual Georgia Tech Night at Six Flags. The event is open to all Georgia Tech students, faculty, staff, alumni and families and is the Institute's largest student life event.

Six Flags will be running at full capacity from 6 p.m. to midnight. There is free parking for all guests and Auxiliary Services is providing free, round-trip transportation originating from the Georgia Tech Student Center. Tickets are now available for purchase online, at www.sixflags.gatech.edu or at the Student Center Box Office.

Awards & Honors

Professor **Martin Savelsbergh** (Industrial and Systems Engineering) has been awarded the School's Schneider Professorship for a three-year term. As research director of The Supply Chain and Logistics Institute, Savelsbergh is a logistics and optimization specialist with expertise in mathematical modeling, operations research, optimization methods, algorithm design, performance analysis, supply chain management, production planning and transportation.

The **Center for Assistive Technology and Environmental Access (CATEA)** in the College of Architecture recently won a MERLOT (Multimedia Educational Resource for Learning and Online Teaching) Classics award for its Access eLearning tutorial within its GRADE project Web site. The Access eLearning tutorial won the award in the Faculty Development Discipline of the competition.

For "outstanding teaching that significantly improves student achievement," Associate Professor **Kirk**

Bowman (International Affairs) has been selected by the University System of Georgia Board of Regents to receive its 2007 Award for Excellence in Teaching.

Professor **Jeffrey Skolnick** (Biology) has been named among the "People to Watch" list for 2007. This annual list comes from the electronic publication HPCwire and recognizes the most influential, interesting and promising personalities having an impact on the world of high performance computing.

As leading researcher in the applied probability community, Professor **Jim Dai** (Industrial and Systems Engineering) has been awarded the School's Edenfield Professorship for a three-year term. Dai focuses on stochastic processing networks, used for the design, analysis and control of complex systems such as communication networks, manufacturing systems and large service systems.