Supercomputing cluster to power new research center

David Terraso
Institute Communications and Public Affairs

Funded by $8.5 million in grants from the state of Georgia, the Georgia Research Alliance and the National Institutes of Health, Georgia Tech has announced that one of the world’s most powerful supercomputing clusters will anchor its new Center for the Study of Systems Biology.

The Center will use IBM technology to advance research into new drugs for the treatment of some of today’s most life-threatening diseases, including cancer. The Center’s research will be headed by Jeffrey Skolnick, the Georgia Research Alliance Eminent Scholar in Computational Systems Biology.

“By using IBM technology for our research, we can significantly shorten the time to market for new drugs,” Skolnick said. “Systems biology integrates mathematics, physics, chemistry and biology with advanced, high-performance computing and engineering. Bioinformatics and systems biology allow us to utilize the vast information growing out of the sequencing of the human genome, enabling drug developers to reduce the number of compounds they must screen by a factor of 10.”

The 1000-node Cluster 1350 system, built on IBM systems and powered by dual-core AMD processors, is capable of performing more than 8.5 trillion calculations per second, which would place it among the top 50 most powerful supercomputers in the world.

The system performance will offer students and faculty the ability to quickly and accurately analyze complex DNA and proteins to determine the biological and chemical processes of human cancer genes and proteins, to aid in the development of more targeted drugs to treat such diseases.

“Only the most technologically savvy universities are able to compete in the field of drug discovery and bioinformatics,” said Mike Cassidy, president and CEO of the Georgia Research Alliance. “Georgia Tech’s new Center for the Study of Systems Biology will bring together world-class research in computing and engineering, biology and bioinformatics. By using IBM technology, we can provide our researchers with unprecedented computing power.”

Cluster facts

- Core processors: 4,000
- Ethernet wiring: 5 miles
- Calculations/second: 8.5 trillion
- Weight: 35 tons
- Power consumption: 300 kilowatts

Professor named president of Europe’s largest scientific body

Catherine Brechignac, adjunct professor of physics and a distinguished visiting scholar chair at Georgia Tech, has been appointed president of France’s Centre National de la Recherche Scientifique (CNRS), the largest scientific organization in Europe.

Brechignac oversees the day-to-day operations as director general for CNRS from 1997-2000, returning to research upon the end of her tenure. Picked for the post by the French government, Brechignac will now be responsible for formulating and guiding the organization’s research strategy.

“We will continue promoting the traditional disciplines. But now, we have to face the global problems of the world, like energy and water, and that requires an interdisciplinary approach,” said Brechignac. “If you want to make new things, you have to bring people from different fields and motivate them to work together.”

With a budget close to $3 billion ($2.29 billion Euros) and a workforce of more than 26,000 people, the CNRS is an influential scientific organization that helps coordinate research in government, university and corporate laboratories.

Brechignac’s affiliation with Georgia Tech began in the early 1990’s, when she began collaborating with Regents’ Professor Uzi Landman, director of the Center for Computational Materials Science. Her extensive work with Landman’s group on fission processes of charged metal clusters, that bear similarities to nuclear fission, led to Brechignac’s appointment to adjunct professor of physics and the distinguished visiting scholar chair in 2001.

“Catherine has long been a leader of the international scientific community and she is most deserving. I am confident that she will lead the CNRS,” Beamish said.

Faculty member wins jury prize for AI-based game design

Elizabeth Campell
Institute Communications and Public Affairs

A Georgia Tech professor has won the annual Guerilla Gamemaker Competition at the recent Sundance Film Festival, honoring independent gamemakers and filmmakers.

Michael Mateas, an assistant professor in the School of Literature, Communication and Culture and the College of Computing, and co-developer Andrew Stern, received the Grand Jury Sparky Award for “Façade,” a one-act interactive drama.

The competition — held simultaneously but in contrast to the Sundance Film Festival in Park City, Utah — recognizes the work being done by independent game designers, programmers and artists.

Mateas, an expert in artificial intelligence (AI)-based art or expressive AI, and Stern worked on their creation for five years.

“With Façade we really wanted to open up a whole new genre of interactive entertainment experience,” he said. “Traditionally, games have focused on physical movement —

Façade continued, page 3
A faster, more sensitive AFM to probe the nano world

Megan McRainey
Institute Communications and Public Affairs

While a microphone is useful for many things, you probably wouldn’t guess that it could help make movies of molecules or measure physical and chemical properties of a material at the nanoscale with just one poke.

Georgia Tech researchers have created a highly sensitive atomic force microscopy (AFM) technology capable of high-speed imaging at the nanoscale 100 times faster than current AFM. This technology could prove invaluable for many types of nanoresearch, in particular for measuring microelectronic devices and observing fast biological interactions on the molecular scale, even translating into movies of molecular interactions in real time. The research appears in the February issue of Review of Scientific Instruments.

Not only is FIRAT — Force Sensing Integrated Readout and Active Tip — much faster than AFM (the current workhorse of nanotech), it can capture other measurements never before possible with AFM, including material property imaging and parallel molecular assays for drug screening and discovery. FIRAT could also speed up semiconductor metrology and even enable fabrication of smaller devices. It can be added with little effort to existing AFM systems for certain applications.

“I think this technology will eventually replace the current AFM,” said Levent Degertekin, head of the project and an associate professor in the School of Mechanical Engineering. “We’ve multiplied each of the old capabilities by at least 10, and it has lots of new applications.”

FIRAT solves two of AFM’s chief disadvantages as a tool for examining nanostructures — it doesn’t record movies and it can’t provide information on the physical characteristics of a surface, said Calvin Quate, one of the inventors of AFM and a professor at Stanford University.

“It is possible that this device provides us with the ‘ubiquitous’ tool for examining nanostructures,” Quate added.

And the key to this dramatic increase in speed and capabilities? A completely new, microphone-inspired probe.

Current AFM scans surfaces with a thin cantilever with a sharp tip at the end. An optical beam is bounced off the cantilever tip to measure the deflection of the cantilever as the sharp tip moves over the surface and interacts with the material being analyzed.

FIRAT works a bit like a cross between a pogo stick and a microphone. In one version of the probe, the membrane with a sharp tip moves toward the sample and just before it touches, it is pulled by attractive forces. Much like a microphone diaphragm picks up sound vibrations, the FIRAT membrane starts taking sensory readings well before it touches the sample.

And when the tip hits the surface, the elasticity and stiffness of the surface determines how hard the material pushes back against the tip. So rather than just capturing a topography scan of the sample, FIRAT can pick up a wide variety of other material properties.

“From just one scan, we can get topography, adhesion, stiffness, elasticity, viscosity — pretty much everything,” Degertekin said.

For a regular AFM to detect the features of the object, the actuator must be large enough to move the cantilever up and down. The inertia of this large actuator limits the scanning speed of the current AFM. But FIRAT solves this problem by combining the actuator and the probe in a structure smaller than the size of the head of a pin. With this improvement, FIRAT can move over sample topography in a fraction of the time it takes AFM to scan the same area.

Georgia Tech researchers have been able to use FIRAT with a commercial AFM system to produce clear scans of nanoscale features at speeds as high as 60 hertz (or 60 lines per second). The same system was used to image the topography as well as elastic and adhesive properties of carbon nanotubes simultaneously — another first.

FIRAT’s new speed and added features may open up many new applications for AFM.

For instance, FIRAT is capable of scanning integrated circuits for mechanical and material defects. In biomolecular measurement applications, FIRAT can scan the surface quickly enough for a researcher to observe molecular interactions in real time.

“The potential is huge. AFM started as a topography tool and has exploded to many more uses since. I’m sure people will find all sorts of uses for FIRAT that I haven’t imagined,” Degertekin said.

FIRAT will be available for certain applications immediately, while others may take a few years, Degertekin said.
Facade, cont’d from page 1

running, jumping, shooting — in fantasy or science fiction environments. In contrast, Façade focuses on social interaction with human characters. Games are the cinema of the 21st century, and are capable of commenting on the full range of human experience. But fundamental artificial intelligence and design research are necessary to enable games to move beyond action/adventure scenarios. Façade takes a big step in this direction."

Available as a free download, Façade is shaped as a visit to a quarreling couple, where the player finds herself involved in the breakdown of their marriage. Whether and how their marriage ends — and how they feel about you — depends on how you interact with them. Advance artificial intelligence techniques are used to control the autonomous characters, to manage the dynamic plot arc and to understand the player’s natural language conversation with the characters.

Mateas is now working with Assistant Professor Blair MacIntyre to have Façade ported into an augmented reality experience in which viewers can physically walk through Trip and Grace’s apartment and carry on a conversation with the couple. The animated characters are superimposed on the real world, using an augmented reality headset. “We’re trying to get as close as we can to the Star Trek Holodeck,” says Mateas.

Mateas directs the Experimental Game Lab (EGL) at Georgia Tech, where he and other faculty push the limits of game design and technology. He continues to develop advanced AI for interactive entertainment, including AI techniques for interactive story, advanced autonomous characters and for games which dynamically change and morph depending on how the player plays them.

Besides entertainment applications, such technologies have huge implications for future education and training simulations. “Imagine historical simulations where you can talk to famous people from the past, organizational simulations for management training that include office politics and face-to-face people skills, healthcare simulations that allow doctors to practice bedside manner, Façade was only the first step.”

IN BRIEF:

Tech rises among world’s best MBA programs

Tech’s College of Management continues to rise in The Financial Times’s rankings of the world’s top 100 full-time MBA programs, moving up four spots this year to 20th place. Two years ago, the program ranked 94th.

In addition to the overall ranking, the 2006 survey listed Georgia Tech as the 35th best value for the money (a 13-point jump since last year) and 58th in job-placement success.

Nearly 150 schools competed for the top 100. Of those ranked, 57 are based in the United States, 27 in Europe, seven in Canada, two in South America, two in Australia, two in China, one in Mexico, one in South Africa and one in Singapore.

USG chancellor makes inaugural presentation to Regents

In his first formal remarks to the Board of Regents, newly appointed University System of Georgia Chancellor Erroll Davis paid tribute to the intellectual talent on the system’s campuses and the role faculty, staff and students play in Georgia’s growth.

“People and businesses are drawn to centers of education and intellect, and you are the nucleus of intellectual activity,” Davis said in a portion of his remarks directed to the University System’s employees and students. “That is why what you do has so many implications for the future prosperity of this state.”

Davis noted that his immediate plans are to visit the USG’s 35 campuses, balanced against working with the General Assembly on Gov. Sonny Perdue’s Fiscal Year 2007 budget recommendations for the University System.

“I will use such visits as data-gathering opportunities to help formulate my vision and plans for the System,” he said.

Unite for Sight

The Georgia Tech chapter of Unite for Sight is a non-profit organization devoted to increasing awareness of eye disorders by performing free eye exams and donating eyeglasses to third-world countries. Its members are asking faculty and staff to consider donating unwanted eyeglasses and sunglasses at one of several collection points across campus.

For a list of collection sites or to learn more about the organization, visit www.cyberbuzz.gatech.edu/uniteforsight.

Event planning

Looking for a location for your next event? The Georgia Tech Alumni Association House has spaces available for conferences, meetings, receptions and other events. For more information visit gtalumni.org/house or contact Senior Event Coordinator Heather Nyle at 894-7085.
CAMPUS EVENTS

Art & Culture
Feb. 15-18
DramaTech Theater performs the Pulitzer Prize-winning "Proof," by David Auburn at 8 p.m. For tickets and information, visit www.dramatech.org or call 894-5481.

Feb. 24
The Frist Center for the Arts welcomes Chick Corea and Toucane for an 8 p.m. performance. For tickets and information, call 894-9600 or visit www.fristcenter.org.

Brown Bags/Conferences/Lectures
Feb. 14
Professor Walt de Heer will be the featured speaker at the next meeting of the Nano@Tech Volunteer Group, on "Nanopatterned Epitaxial Graphene: A Route to Carbon-based Nanoelectronics," at noon in room 102A, MRC. To register, e-mail paul.turgeon@mirc.gatech.edu or visit grover.mirc.gatech.edu.

Feb. 14
The School of Aerospace Engineering’s Distinguished Lecture Series welcomes John Logsdon, director of the Space Policy Institute at George Washington University’s Elliott School of International Affairs, on “Prospects for Space Exploration: The View from Inside the Beltway,” at 11 a.m. in the Claytor Theater. For additional information, e-mail cindy.pendley@ae.gatech.edu.

Feb. 15
Living Game Worlds, a symposium featuring leading digital designers and design theorists, will be held in the Technology Square Research Building. For more information, visit www.gameworlds.gatech.edu.

Feb. 15
The IMPACT Speaker Series continues with John Owen, president and CEO of Assurant Specialty Property, at 4:50 p.m. in the LeCraw Auditorium.

Feb. 16
The School of Mechanical Engineering welcomes Regis Babinet, counselor for nuclear energy in the French embassy, on "Nuclear Energy Policy in France: European Context and Environmental Issues," at 11 a.m. in the MARC auditorium. For more information, call 894-5601 or e-mail nolan.herte@me.gatech.edu.

Feb. 21
The Materials Council welcomes National University of Singapore Associate Professor Yi Li on "Glass Formation and Glass-forming Ability in Metallic Systems," at 3 p.m. in room 183, Love Building.

Feb. 22
The College of Architecture welcomes California College of the Arts Associate Professor Lisa Findley on "Power Play: The Spatial and Cultural Agency of Architecture," at 5 p.m. in the College of Architecture Auditorium.

Feb. 22
The IMPACT Speaker Series continues with Madeleine Hamill, managing director of Venadar LLC, at 4:50 p.m. in the LeCraw Auditorium.

Feb. 28
The Library's Tuesday Talks lecture series continues with Professor August Giebelhausen, on “Visionary or Autocrat? Pat Crecine and Georgia Tech Reorganization, 1988-1990” at 2 p.m. in the Wilby Room. For more information, call 894-4530 or e-mail prgroup@library.gatech.edu.

Faculty/Staff Development
Feb. 15
The Office of Organizational Development sponsors a class in, "Successful Meeting Management," at 8:50 a.m. in room 308, Savant Building. To register, visit www.trainsweb.gatech.edu.

Feb. 16
The Center for the Enhancement of Teaching and Learning holds a faculty development seminar on "Fostering Critical Thinking," from 11 a.m. - 1 p.m. in the Library. Lunch is provided. To register, visit www.cetl.gatech.edu/services/faculty/devsem.htm.

Miscellaneous
Feb. 15
The second of two pre-retirement meetings will be held for employees who are within ten years of retirement. This section, covering Teacher’s Retirement benefits and optional and supplemental retirement benefits, will be held in room 117, Student Services Building from 1:30 - 4:30 p.m. To register, visit www.trainsweb.gatech.edu.

Feb. 23
The Georgia Tech Women’s Forum holds a general meeting, "Empowered by Flora and Fauna," featuring the work of photographer Phyllis Walker at noon in room 519, Student Center. To attend, e-mail maude.robinson@business.gatech.edu.

E-mail calendar events to editor@cppo.gatech.edu as soon as dates are confirmed.

CLASSIFIEDS

AUTOMOBILES

FURNITURE
Moving sale: Storehouse Java queen bed, night stands; Ethan Allen entertainment unit and coffee table; Crate & Barrel dining table and chairs; crib and bedding set; rocking chair; futon. All less than 5 years old. E-mail anping@bellsouth.net for pictures.

Coffee table with two matching end tables. Oak finish. Very good condition. $75 for set. E-mail rita.brown@edi.gatech.edu for pictures or call 770-928-7344.

MATCHING TWIN MICROFIBER SOFA AND LOVESEAT. RED MICROFIBER CHAISE LOUNGE. ALL IN EXCELLENT CONDITION. E-mail eh579@yahoo.com for pictures and more information.

REAL ESTATE/ROOMMATES
1BR/1BA, street-level garden condo at 3609 Essex Avenue, Vinings. Swim, tennis, stream and private woods view. No stairs, motivated seller. $135,900. E-mail precision36098@comcast.net or call 770-541-6769.

2BR/2BA authentic loft in Castleberry Hills, two miles from campus. Amenities include high-speed internet, swimming pool, dog run, and roof top deck. Visit www.lofts-of-atlanta.com (GE Lofts #112), or call 404-688-6098.

2BR/2BA, two-story home in Underwood Hills near Atlanta Station. Move-in condition with new carpet, roof and HVAC. Landscaped back yard fully fenced for privacy and security. Renting for $2,200/month. E-mail ngpanic5@aol.com.

3BR/3BA, furnished house for rent in Dunwoody Redfield area. Excellent schools, includes swim and tennis facilities and 1.5 miles to MARTA. Available Aug. 2006 for $1,800/month + utilities. Contact yves.berthelot@me.gatech.edu.

2BR/2BA home in Home Park with 2-car garage. Walk to GT and the Midtown business district. Available March 1. Month-to-month or longer term available. $1,475/month. For more information, visit www.tech-tutors.com/calhoun.htm.

2BR/2.5BA townhome 1.5 miles from campus in gated community. Great roommate plan with 2 master suites, hardwood floors, 10 ft. ceilings, gourmet kitchen, new HVAC, private patio, 2-car garage. $260,000. Call 404-849-2778.

Spacious garden level 1BD/1BA apartment in Midtown for $800/month, available immediately. Private garden gate entrance, fish pond, optional garage parking, lots of closet space, north and east facing windows. E-mail ellendo@gatech.edu.

2BR/2.5BA apartment for rent, 5 miles from Tech. Living room fireplace, eat-in kitchen w/all appliances, laundry room, $840 + utilities. Call 404-605-7012 or e-mail elleengram@juno.com.

MISCELLANEOUS
New home needed for a 5-year-old male Border Collie, named Chad. He is microchipped, house- and crate-trained with basic obedience covered. Chad comes from national herding champion family line. Price negotiable. E-mail Lou32@yahoo.com.

Free: three male guinea pigs born Feb. 2005 with special cage that houses all three. Family has grown, and we do not have room for these adorable animals. E-mail kathy@ccc.gatech.edu or call 770-942-8315.

Panasonic PV-GS34PFG digital palmcorder, 30x optical/1000 zoom, 1-touch navigation/joystick, LED light, carry case, AC adapter, 2 batteries, 3 PVC pouches, software. $375 OBO. Call 894-9005 or e-mail elleengram@juno.com.

E-mail ads to editor@cppo.gatech.edu. Due to the volume of submissions, ads run for three consecutive issues and appear as space is available.