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THE WHISTLE

FACULTY/STAFF NEWSPAPER **Volume 30, Number 28 • August 29, 2005** THE GEORGIA INSTITUTE OF TECHNOLOGY

Researcher discovers chemical that could revolutionize polymer fuel cells

Megan McRainey
Institute Communications and Public Affairs

Heat has always been a problem for fuel cells. There's usually either too much (ceramic fuel cells) for certain portable uses, or too little (polymer fuel cells) to be efficient.

While polymer electrolyte membrane (PEM) fuel cells are widely considered the most promising fuel cell for portable use, their low operating temperature and consequent low efficiency have blocked their jump from promising technology to practical technology.

But researchers at Georgia Tech have pinpointed a chemical that could allow PEM fuel cells to operate at a much higher temperature without moisture, potentially meaning that polymer fuel cells could be made much more cheaply than ever before and finally run at temperatures high enough to make them practical for use in cars and small electronics.

A team led by Meilin Liu, a professor in the School of Materials Science and Engineering, has discovered that a chemical called triazole is significantly more effective than similar chemicals researchers have explored to increase conductivity and reduce moisture dependence in polymer membranes. The findings were published in the Journal of the American Chemical Society.

"Triazole will greatly reduce many of the problems that have prevented polymer fuel cells from making their way into things like cars, cell phones and lap tops," said Liu. "It's going to have a dramatic effect."

A fuel cell essentially creates electricity by converting hydrogen and oxygen into water. To do this, the fuel cell needs a proton exchange membrane — a specially treated material that looks a lot like plastic wrap — to conduct protons but block electrons. This membrane is the key to building a better fuel cell.

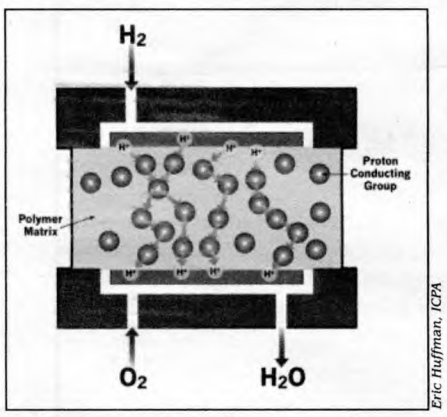
Current PEMs used in fuel cells have several problems that prevent them from wide use. First, their operating temperature is so low that even trace amounts of carbon monoxide in hydrogen fuel will poison the fuel cell's platinum catalyst. To avoid this contamination, the fuel must go through a very expensive purification process that makes fuel cells a pricey alternative to conventional batteries or gasoline-fueled engines. But at higher temperatures, like those allowed by a membrane containing triazole, the fuel cell can tolerate much higher levels of carbon monoxide in the hydrogen fuel.

The use of triazole also solves one of the most persistent problems of fuel cells — heat. Ceramic fuel cells currently on the market run at a very high temperature (about 800 degrees Celsius) and are too hot for most portable applications such as small electronics.

Existing PEM fuel cells can operate at much lower temperatures, but are much less efficient. Polymer fuel cell membranes must be kept relatively cool so that the membrane can retain the moisture it needs to conduct protons. To do this, polymer fuel cells were previously forced to operate at temperatures below 100 degrees Celsius.

Heat must be removed from the fuel cells to keep them cool, and a water balance has to be maintained to ensure the required hydration of the PEMs. This increases the complexity of the system and significantly reduces its overall efficiency. But by using triazole-containing PEMs, Liu's team has been able to increase their PEM fuel cell operating temperatures to above 120 degrees Celsius,

Fuel cell continued, page 3



Eric Huffman, ICPA

A diagram of a fuel cell's polymer electrolyte membrane (PEM) with the proton-conducting group triazole (the circles in the diagram). Protons hop from one group to another to move through the PEM without the need of water.

Conservation project provides economic development, preserves Fiji's coral reefs

Jane Sanders
Research News

In the South Pacific islands of Fiji, coastal villagers are beginning to reap much-needed financial benefits from conserving the beautiful tropical environment they treasure as a family heirloom.

In a unique project that combines environmental conservation, economic development and drug discovery research, scientists and policy experts led by Georgia Tech are collaborating with the villagers of Tagaqe and the University of the South Pacific to explore, protect and generate income for islanders from their coral reef. The project is funded primarily by the Fogarty International Center at the National Institutes of Health (NIH).

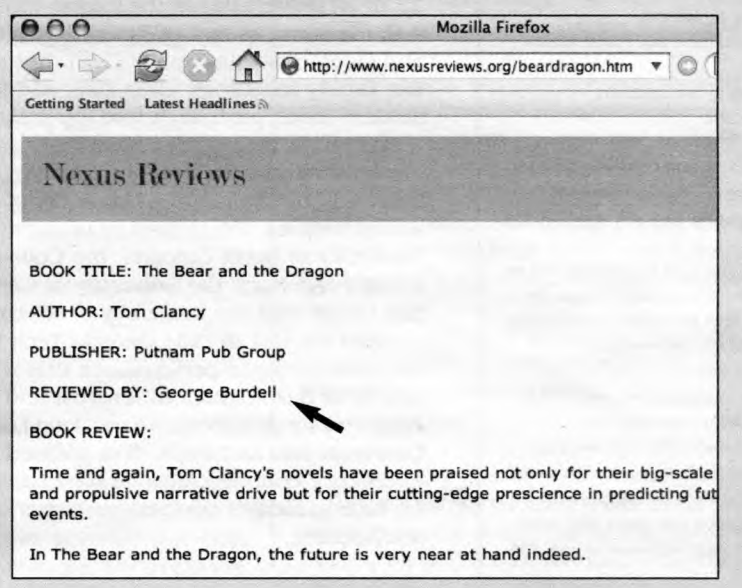
The project, devised and negotiated by the researchers, is intended to reward villagers now for conserving the reef they need to make a living in the future — including potential income from the discovery of drug compounds in reef organisms. Other Fijian villages are interested in starting similar efforts, researchers said.

Instead of breaking off pieces of live coral reef substrate — called "live rock" — for sale to the saltwater aquarium industry, villagers plant a crop of synthetic rock that becomes naturally covered by desirable species. Villagers recently harvested it.

Studies at the University of the South Pacific have shown that the organisms that live on cultivated rock are as effective as those on live rock in purifying aquarium water. The Georgia Aquarium, scheduled to open in Atlanta on Nov. 23, plans to use the cultivated rock in its exhibits.

Fiji continued, page 3

Burdell takes turn as a book reviewer



It seems George P. Burdell — the legendary Tech student who has turned up on class rolls, newspaper editorials and online polls since the 1930s — has a new career: reviewing popular literature.

A recent visit to the Web site **www.nexusreviews.org** credits Burdell with a review of the Tom Clancy novel "The Bear and the Dragon." The one-line bio at the end of the review notes Burdell is a freshman studying chemical engineering. He rated the book an 8.5 out of a possible10.

"QUOTE-UNQUOTE"

"Much of it is getting people to step on a vehicle for the first time. Get people out of their normal habits of how they move around, get them out of their car."
—David Williamson, assistant director of Parking and Transportation, on discussions to link Atlantic Station's Green Line with the Tech Trolley, and to increase awareness of public transportation options available in west Midtown. (Atlanta Business Chronicle)

Gulfstream commits to help GT Savannah's growth

Dan Treadaway
Institute Communications and Public Affairs

In just six short years, the Georgia Tech Regional Engineering Program (GTREP) and Georgia Tech Savannah campus have transformed technological research and education in Southeast Georgia.

In collaboration with its three partner institutions — Armstrong Atlantic State University and Savannah State University in Savannah, and Georgia Southern University in Statesboro — GTREP allows students from Southeast Georgia to earn a Georgia Tech degree without leaving the area. Instruction is delivered through either a partner institution, Georgia Tech faculty in Southeast Georgia, or via distance learning connections with Georgia Tech faculty in Atlanta.

Since their inception in 1999, the Georgia Tech engineering programs have experienced tremendous growth: undergraduate enrollment has increased by 600 percent to a total of 150 junior and senior students, and graduate programs initiated in 2002 have grown by 400 percent to a total of 40 students. More than 130 students have received their Georgia Tech engineering degrees to date.

During its initial six years, GT Savannah has enjoyed strong support for its mission and programs not only from administration and faculty at the main campus in Atlanta, but also among the Savannah region's business community. One of GT Savannah's most enthusiastic supporters has been Gulfstream Aerospace Corporation, led by President Bryan Moss.

In recognition of the crucial role that GT Savannah plays in the economy of coastal Georgia, Gulfstream has made a principal seven-year commitment to the program. One-quarter of the funds will support student scholarships and fellowships at GT Savannah; uses for the remainder of the funds will be designated at a later date.

"We are pleased to be able to make this commitment to Georgia Tech Savannah," says Moss, who graduated with an industrial management degree in 1962. "The program has proved to be a positive force for coastal Georgia in a very short period of time. We hope this commitment will keep that momentum going. The Tech students who have interned at Gulfstream have done an outstanding job for us, and we've also been fortunate to have hired some of them after graduation. This commitment from Gulfstream is designed to enlarge that pipeline of talent not only for the benefit of Gulfstream, but also all of coastal Georgia."

"Through this very generous commitment, Bryan Moss and the leadership team at Gulfstream have expressed a remarkable amount of confidence in GT Savannah," says David Frost, director of GT Savannah and professor of civil engineering. "This is yet another indication of the enduring and productive relationship that we enjoy with Gulfstream. The entire GT Savannah community looks forward to seeing where this relationship will take us in the future."

For more information...
GT Savannah
www.gtrep.gatech.edu

US News and World Report undergraduate rankings, 2003-2005

The chart at right shows how Georgia Tech has fared in US News and World Report's respected annual rankings report over the past three years.

The College of Engineering continued to set the pace, with five disciplines ranked among the top five programs in the country.

As with previous years, Georgia Tech's peer assessment — the school's perceived quality among other universities — placed it in the top 25 of all universities in the nation with a score of 4.0, the same as that of Emory University (20th) and Georgetown University (23rd). But variables like faculty resources, class size, and faculty-to-student ratios push Tech into lower rankings.

Top public universities were ranked as follows: the University of California at Berkeley, the University of Virginia, the University of California at Los Angeles, the University of Michigan, the University of North Carolina, the College of William and Mary, the University of California at San Diego, and the University of Wisconsin.

"Over the last decade Georgia Tech has shown the consistency in performance that reflects the quality of this institution," Provost and Vice President for Academic Affairs Jean-Lou Chameau said last week. "I'm pleased to see that excellence continue, despite the challenges that we face in today's competitive higher education marketplace."

Engineering	2005	2004	2003
Overall	6	6	5
Aerospace	2	2	2
Biomedical	4	6	7
Chemical	12	12	12
Civil	3	4	3
Computer	8	7	6
Electrical	6	6	7
Environmental	7	7	7
Industrial	1	1	1
Materials	7	8	9
Mechanical	5	4	6
Nuclear	11	11	—
Management			
Overall	35	34	36
Operations	11	12	—
Quantitative Analysis	7	7	—
Logistics	18	14	—
Georgia Tech			
Overall	37	41	37
Public Universities	9	10	9

Georgia Tech

THE WHISTLE

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Calendar submissions e-mailed to editor@icpa.gatech.edu, or faxed to 404-894-7214 must be sent at least 10 days prior to desired publication date. Classified submissions are on a first come, first serve basis. For more information, call 404-894-8324.

Institute Communications and Public Affairs
Wardlaw Center
177 North Avenue
Atlanta, Georgia 30332-0181

Georgia Tech is a unit of the University System of Georgia.

Webb joins Provost's office as special assistant

Michael Hagearty
Institute Communications
and Public Affairs

Electrical and Computer Engineering Emeritus Professor Roger Webb will continue to work on behalf of Georgia Tech in his new role as a special assistant to Provost Jean-Lou Chameau. In this capacity, he will represent the Provost's office on several key initiatives, outlined in an announcement regarding the appointment.

Calling him a "talented, experienced and respected faculty member and administrator," Chameau has asked Webb to oversee the progress of three projects: the Nanotechnology Research Center Building (NRCB), an organizational focus on energy, and research, and economic development and technology transfer.

From 1990-2004, Webb served as chair of the School of Electrical and Computer Engineering. He had been a faculty member since receiving his doctoral degree from Tech in1964.

With the NRCB shifting from planning to design and construction, Webb will serve as liaison to ensure the needs of the faculty and units involved are consistent with the vision for the facility.

From an institutional standpoint, Chameau said Tech must do more to bring its academic and research prowess to bear on energy issues.

"To play the leadership role to which we aspire in the nation and the world, energy must become one of Georgia Tech's major thrusts in education, research, service and economic development, comparable to thrusts we have in bioscience, manufacturing and nanotechnology" he said. Webb's role will be to create momentum for this effort, and will organize a major workshop for faculty intended to set the stage for a long-term, institutional commitment to energy.

Lastly, Chameau indicated Webb will devote some of his time to economic development and technology transfer issues, something that "requires continuous attention and commitment," though it is expected to be on an ad-hoc basis.

Fiji, cont'd from page 1

Tech Professor of Biology Terry Snell, who helped lead the conservation effort in Fiji, said, "The villagers have been enthusiastic about the project. They want to conserve the reef so they can pass it on to their children so they can make a living in the village."

Benefits of biodiversity

Conservation of coral reef ecosystems is also important because researchers believe the study of organisms inhabiting them holds significant potential for the discovery of new drugs, including antibiotics and anti-cancer agents.

In particular, reefs in tropical, less developed countries such as Fiji hold the greatest promise because of high species diversity and the tendency of organisms in these habitats to fight back against predators, competitors and pathogens by evolving chemical defenses, explained Mark Hay, a professor in the School of Biology and the project's principal investigator. But species are being lost at dramatic rates as live rock is harvested and reefs are damaged by environmental stress and the effects of overfishing. Researchers are evaluating the effects on the Fiji reef as part of this project.

"As species are lost, we also lose the ability to discover disease cures they may hold," Hay explained. "To prevent that loss, we can't just say, 'preserve the reefs,' to the locals who must depend on these reefs for food and for income to provide more than the bare necessities of life. Thus, we are trying to connect the value of the drugs discovered with efforts and rewards for conservation of biodiversity."

Financial benefits to the villagers from drug discovery may occur many years later — or even not at all if no drugs are marketed — but the project to grow synthetic rock on the reef rewards villagers now for conservation, Hay noted.

The project is a collaboration orchestrated by Snell, Hay, Associate Professor of International Affairs Kirk Bowman and Assistant Professor of Biology, Chemistry and Biochemistry Julia Kubanek. They joined forces with Bill Aalbersberg, a chemist and environmental policy expert from the University of the South Pacific in Fiji, to negotiate the agreement with Tagaqe Chief Ratu Timoci Batireregu in summer 2004.

Using funds from the professorship endowed by Harry and Linda Teasley, Hay purchased 5,000 pumice "blanks" that were suspended on wires above the shallow reef flat and lagoon of Tagaqe's fringing reef to prevent ecosystem damage. The synthetic rocks, naturally colonized by seaweeds and reef invertebrates, were ready for harvest after about eight months.

The researchers have applied for renewal of their NIH grant this fall to extend their research and conservation efforts another four years. Plans call for similar reef conservation projects in five other Fijian villages. The proceeds from these plantings will be used for coral reef conservation in Fiji.

Fuel cell, cont'd from page 1

eliminating the need for a water management system and simplifying the cooling system.

"We're using the triazole to replace water," Liu said. "By doing so, we can bring up the temperature significantly."

Triazole is also a very stable chemical and fosters stable fuel cell operating conditions.

While they have pushed their polymer fuel cells to 120 degrees Celsius with triazole, Liu's team is looking into better polymers to get those temperatures even higher, he said.

Correction: The Aug. 22 issue incorrectly listed Ed Balog as a new faculty member in the School of Psychology. In fact, his appointment is with the School of Applied Physiology.

IN BRIEF:

GTRI director named to state's aviation hall of fame

George Harrison, the director of strategic initiatives for the Georgia Tech Research Institute, was appointed to the Georgia Aviation Hall of Fame board of directors by Gov. Sonny Perdue in June.

Harrison, a retired Air Force major general, also serves as director and executive vice president of the Air Warrior Courage Foundation and director of the Aero Club of Metro Atlanta. He has won military awards and service medals, including the Distinguished Flying Cross, the Vietnam Service Medal with four bronze campaign stars and the Kuwait Liberation Medal from the government of Kuwait.

The Hall of Fame is located at the Museum of Aviation in Warner Robins, Ga.

E-mail limits increased

At the request of its users, the Office of Information Technology has increased the size limit for Spectrum e-mail messages. The size limit for attached files was increased from 10 MB to 25 MB on August 11, making it possible to send and receive larger files by e-mail.

Three Jackets ink NBA contracts

Former Georgia Tech basketball stars Will Bynum and Luke Schenscher both signed free agent contracts with the National Basketball Association earlier this month, Bynum on Aug. 19 with the Boston Celtics, and Schenscher on Aug. 17 with the Denver Nuggets. Tech guard Jarrett Jack, a first-round draft choice who was traded to Portland on draft night, has a three-year contract with the Trail Blazers.

Catering policy changed

Georgia Tech Catering, the on-campus provider, serves as the approved primary catering service for the campus. In cases when alternatives are required to meet budget, service or timing needs, six secondary catering services are available.

In all cases, the procurement of food/catering services must be an approved expense, subject to the State of Georgia and Georgia Tech policies. Any food served or catered on Georgia Tech property, where Institute or Foundation funds are being used to pay for the food or catering service, must be provided through a Georgia Tech approved, licensed catering service.

More information about the new policy, including a list of FAQs, is available at **www.procurement.gatech.edu**.

Two-for-one lunches this week

Located on the third floor of the Student Center, Ferst Place Restaurant is celebrating its fall re-opening with a two-for-one special for the week of Aug. 29 through Sept. 2.

Ferst Place is open during the week from 11:30 a.m. – 2 p.m. For a complete list of the planned menus, visit **www.gatechdining.com/menus.html**.

CAMPUS EVENTS

Art & Culture

Ongoing

The Hewitt Collection of African-American Art will be on display in the galleries of the Ferst Center for the Arts, Tuesday-Saturday from 10 a.m. - 6 p.m. and Sundays from noon - 6 p.m. The galleries are closed on Mondays. Admission is free. For more information, visit **www.ferstcenter.org**.

Sept. 13

The Ferst Center hosts a public policy forum on "The State of the Arts in America, and Its Importance to Atlanta and Georgia," at 7 p.m. There is no cost to attend. For more information, visit **www.ferstcenter.org** or call 894-2787.

Brown Bags/Conferences/Lectures

Sept. 6

The School of Chemistry and Biochemistry hosts a colloquium with Christine Payne, a postdoctoral fellow at Harvard University, at 4 p.m. in Boggs B6A.

Sept. 6

The Healthy Places Research Group holds its monthly meeting at 7:30 a.m. in the Center for Quality Growth and Regional Development at Technology Square. For more information, visit **www.coa.gatech.edu/cqgrd**.

Sept. 8

The Small Business Innovation Research (SBIR) Assistance Program of Georgia and the Technology Association of Georgia host a one-day workshop at the Technology Square Research Building in "SBIR Phase I Proposal Preparation." Early registration fees available until Sept. 2. For more information, visit **www.sbir-georgia.org/training.html**.

Sept. 13

The Nano@Tech Volunteer Researcher Group welcomes GTRI Research Engineer Jud Ready for a lecture on the latest in carbon nanotube research at noon in room 102A, MiRC. E-mail paul.turgeon@mirc.gatech.edu as space is limited. Contact Diana Palma at 894-1541 with questions.

Faculty/Staff Development

Sept. 16

The Office of Organizational Development offers a one-day training course in "Successful Meeting Management," in room 308, Savant Building. For more information, visit **www.orgdev.gatech.edu/training**.

Miscellaneous

Aug. 31

"Meet and Eat" with the Georgia Tech Women's Forum at the Annual Social and Membership Drive from 11:30 a.m. to 1:30 p.m. in the Student Center, room 319. Learn about the organization and browse a collection of plant cuttings (or bring your own to share). A light lunch will be provided. RSVP to maude.robinson@business.gatech.edu.

Aug. 31

Georgia Tech's NSF ADVANCE program is sponsoring a free Nursing Mom's Workshop, featuring a lactation specialist from Northside Hospital, at 1 p.m. in the Student Center Commons' Piedmont Room. There will also be information on GT's lactation rooms and hospital-grade breast pumps. E-mail angela.shartar@oars.gatech.edu.

Sept. 9

The Student Government Association invites everyone connected with Georgia Tech for an exclusive night at Six Flags Over Georgia. Discounted tickets and free shuttle service available. For more information, visit **www.sixflags.gatech.edu** or call coordinator Patrick Cook at 404-392-8828.

Sept. 14

The Center for the Study of Women, Science, and Technology, ADVANCE and the Women's Resource Center co-host a welcoming reception at 3:30 p.m. in the Cresent Room of the Student Center Commons. Open to the campus. Call 385-0230 to attend.

Sept. 15

Georgia Tech is organizing a team to participate in the annual "Kaiser Permanente Corporate 5k Run/Walk." Employees may register at **www.kpcorporaterunwalk.com**. For additional information, call 385-6358 or e-mail susan.paraska@carnegie.gatech.edu.

Sept. 21

The Georgia Tech Faculty Women's Club hosts an 11 a.m. open house. For more information, visit **www.gtfwc.gatech.edu** or call 404-627-7427.

E-mail calendar events to editor@icpa.gatech.edu.

CLASSIFIEDS

Appliances

Kenmore washer/dryer, less than 1 year old, 4 wash cycles, gas dryer with 3 temperature settings, $550 OBO. Haier portable dishwasher, 1.5 years old, $125. E-mail Lucja.Iwanska@gtri.gatech.edu or call 385-2248.

Roper washing machine, excellent condition. $150 OBO. Call 894-5633 or e-mail ww102@oit.gatech.edu.

Automobiles

1974 VW Bug, 1,600cc motor. Daily driver for past year. Father/son did extensive repairs & parts replacement. Needs body work/paint and minor repairs to complete. $2,700 OBO. E-mail joanie.chembars@coa.gatech.edu.

1982 Volkswagen Rabbit, excellent condition, 100K miles, new alternator, convertible top, windshield/gasket, Michelin tires, all records, $1,500 OBO. E-mail dhoff86@att.net or call 770-846-8911.

1987 Mercedes 300E, 163K miles, needs starter otherwise, in good condition, silver w/blue leather interior, a/c works but needs charging. $2,500 OBO. Call 404-409-5873 or e-mail luvthastones74@yahoo.com.

1989 Honda Accord DX coupe. White, automatic, PS, PL. Good campus car w/great gas mileage. $1,500 OBO. Call 678-913-5591.

1994 Nissan Maxima GXE, 136K miles, excellent condition, fully loaded, Bose audio. $4,300 OBO. Call 678-291-0723 or e-mail aadlakha@yahoo.com.

1995 Acura Integra LS. 112K miles. Moon roof, pwr. windows/locks, AM/FM/cassette. New brake system (incl. master cylinder), distributor, timing belt. Needs new a/c compressor. $2,700 OBO. Call Dan, 894-7053.

1999 Mercedes S420. Black w/tan inside, 137K miles, $15,000. Call 894-7325.

Wanted: Ford Bronco, K5 Blazer, or full-size 4x4 truck. Call 770-846-8911 or e-mail dhoff86@att.net.

Furniture

Small desk w/corner shelf unit and chair, excellent condition, $75. Call 404-378-1548 or e-mail dlsmsme@bellsouth.net.

Two oversized (48"x 30") colorful oriental pictures with ivory inlay and black background (king & queen). $250 per piece. E-mail k_muru@comcast.net or call 404-395-4333.

Real Estate/Roommates

1BR/1BA Midtown condo for rent, $790/month. W/D & reserved parking. A great location at Piedmont & 7th, short walk to Tech & Piedmont Park. E-mail papapol@ece.gatech.edu.

2BR/2.5BA townhouse in Smyrna near I-285 and Atlanta Road. Hardwood floors on main. Garden tub under skylight in bathroom. Eleven miles to Tech. Listed at $149,900. E-mail clint.lyle@cetl.gatech.edu.

3BR/2.5BA home with off-street parking and large back yard deck, $242,000 or $1,150/month. Great access to Tech, 285/75 and intown. House is only 4 years old. Call Gary at 770-855-3596.

1BR/1BA Midtown condo by Piedmont Park. Great view. All upgrades. 24-hr. concierge, storage unit & deeded parking space. Washer/dryer and fridge stay. E-mail Jolie.rosenberg@alumni.gatech.edu.

Need roommate by September 2005. Ideal roommate plan in Norcross/Tucker area. Contact Jeanette Collins at 894-9245.

3BR/2BA home in Douglasville. Great room w/fireplace, deck overlooking huge back yard. Dining room plus eat-in kitchen. 2-car garage, storage room, basement. Lease for $1,150/month or buy. Call 404-694-0901.

2BR/2.5BA condo in the Cascade area. On the MARTA busline. 10-15 minutes from downtown. Located in safe, stable neighborhood. $110,000. Owner will pay 6 months of association fees. Call 404-510-2150.

Sports/Fitness/Recreation

Lifestyle Treadmill, excellent condition. $150 OBO. Call 894-5633 or e-mail ww102@oit.gatech.edu.

Miscellaneous

Baby clothes for sale. Boys, mostly 18-24 mo. For pictures and prices, visit www.coa.gatech.edu/jtc. E-mail joanie.chembars@coa.gatech.edu.

Italian tutor wanted for two primary school-aged children. Must be native speaker. Price and hours negotiable. Must be able to travel to in-town location for lessons. Call Jim at 404-524-4481.

Sears Craftsman 10-inch radial arm saw with stand and mobile base. Bought new in 1998, excellent condition. $275. E-mail chris.hamlin@oit.gatech.edu for pictures.

54-year-old electric blues guitarist looking for a singer to form hobby band. Experience isn't necessary as long as you love the Blues and can sing. Call Ed, 894-3160.

Minolta 35mm Freedom Zoom 130. Paid $250, asking $50 OBO. Call 894-1622 or e-mail belinda.harding@dev.gatech.edu.

E-mail ads to *editor@icpa.gatech.edu.*