At the nurses’ station, the repeated rings from a patient’s call button pierce the typical nighttime hum, then bounce off a high stucco ceiling and echo down the corridors of the nursing home.

Residents awaken and call out in the darkness for familiar faces. Nurses exchange information across the hallways. Someone reaches into the janitor’s closet for a mop, and a creaky hinge grates on nerves like fingernails scraping a chalkboard. Sleep eludes the residents, and frustrated nurses dread tomorrow.

Noise disturbs sleep. Your mother knew it when she tiptoed down the hall from the baby’s room, and research proves it’s equally true for seniors in nursing homes. Now, acoustical engineers and geriatrics researchers want to know if they can improve nursing home residents’ sleep — and ultimately their health and quality of life — by implementing a few noise-reducing, environmental interventions. The interventions have appeal because they create no additional burden on the staff, which is already stretched thin because

by JANE M. SANDERS

Sound-absorbing panels hung on nursing home hallway walls have reduced noise by a factor of 16 in experiments conducted by Georgia Tech Research Institute researchers. That reduction is equivalent to the difference in noise between music booming from 16 speakers versus just one speaker.
of a nursing shortage, researchers say.

Even modest noise increases above the background level — not just the spike from a metal object banging a tile floor — disturb the sleep of nursing home residents, according to researchers from the Georgia Institute of Technology, Emory University and the Atlanta Veterans Administration Medical Center. Their data shows that noise increases measured at six or more decibels were a factor in 18 percent of almost 4,000 awakenings among 52 nursing home residents studied for almost 500-person nights. The findings are from an ongoing, five-year study funded by the National Institute of Aging.

“The nursing home population has a great deal of sleep disturbance,” says Bettye Rose Connell, a health research scientist at the Department of Veterans Affairs Medical Center in Atlanta and an assistant professor of medicine at Emory. “Not all awakenings are related to noise. Health problems affect residents’ sleep. But sleep disruption related to noise is enough of a problem that we want to find ways to relieve it.”

Researchers have determined that nursing home noises usually fall into one of three broad categories: people talking, including staff; mechanical noises, including alarms, elevators, computers and cleaning equipment; and people doing things, such as pushing carts down the hall and closing file drawers.

With these findings in mind, acoustical engineers at the Georgia Tech Research Institute (GTRI) created several low-cost, noise-reducing environmental interventions, which they have tested with noise measurement equipment in five metro Atlanta nursing homes. The results are promising, they say. One of the interventions — sound-absorbing panels hung on hallway walls — has reduced noise by a factor of 16. That is equivalent to the difference in noise between music booming from 16 speakers versus just one speaker, researchers explain.

“These interventions reduce echoes and reverberations in hallways and rooms,” says Krishan Ahuja, a Regents researcher at GTRI and a professor of aerospace engineering at Georgia Tech. “We have the noise-absorbing panels, ways to reduce banging doors, special hooks for curtains, and we even wrap the ice machines in material to reduce noise.”

Researchers have also tested an environmental intervention to reduce television noise. They have moved the speakers from the TV set to the head-boards of nursing home beds, allowing residents to hear the TV just as well without having to turn up the volume too high. They are also experimenting with tiny speakers embedded in bed pillows.

Feedback from the Field

Though researchers have not systematically collected user feedback as part of the study, residents and staff have volunteered their opinions on the interventions.

Quantifying the Results

Having examined the extent to which noise increases are associated with awakenings among nursing home residents, researchers are eager to quantify the effects of their noise-reducing interventions on diminishing nighttime sleep disturbances, Ahuja says.

“In the next phase, we will apply these interventions in facilities for a longer period of time and actually compare the noise at bedtime with data from volunteer residents who are wearing equipment to detect whether they are sleeping and how many times they wake up during the night,” explains Robert Funk, a GTRI research engineer, who is leading the field research for Ahuja.

Researchers are studying sleep using wrist actigraphy, in which residents wear a device that looks like a large sports watch. The device records the normal arm movements a person makes when he or she wakes. Researchers chose wrist actigraphy over polysomnography — which involves the attachment of wires to a person’s head to record brain waves — because the latter is not feasible to use with many nursing home residents, Connell explains. Wrist actigraphy is a “less fine-grained” technique, but it has been validated against polysomnography and proven reliable, she adds.

To gather noise data, researchers use standard sound-level meters, which plot curves showing the noise spectrum — noise amplitude versus frequency. The equipment also measures overall loudness expressed in decibels weighted to reflect the human ear’s response, Funk explains.

After researchers quantify the effects of environmental interventions on nursing home residents’ sleep, they plan to study the combination of these interventions with behavioral interventions being investigated in a parallel study led by physician Joseph Ouslander, a professor of medicine and nursing and director of the Emory Center for Health in Aging. Ouslander’s study is testing six interventions, including increased daytime activity, light exposure, consistent bedtime routine and a noise abatement policy for staff. To date, he has found that these interventions reduce the amount of daytime sleep among nursing home residents. Analysis of sleep data is ongoing.

“The implications of our data so far are that it will probably take a combination of behavioral and environmental interventions to improve sleep in nursing home residents,” Ouslander says. “This is what we plan to test in the fifth year of the grant. Our long-term goal is to provide nursing homes with feasible interventions that will improve the...
A new study confirms what some job seekers may suspect. "The more effort people put into a job search, the more likely they are to find employment, even in difficult economic times," says Ruth Kanfer, a Georgia Institute of Technology psychology professor. "That may seem intuitive, but it's something people forget — especially if the economy is bad," she says. "When jobs are scarce, people often assume that there's no point in looking."

Kanfer specializes in self-regulation in the workplace, the process by which people set goals, evaluate resources and manage their behavior. Researchers have used self-regulation for several decades as a framework to study issues such as weight and smoking cessation. But Kanfer has been among the first to apply it to job searches following involuntary layoffs.

She is completing a two-year study in cooperation with the Georgia Department of Labor that sheds more light on job-search behavior. Although she is still crunching the data, she says, "Aided by Georgia Tech graduate student Tracy Kantrowitz and other researchers, Kanfer worked with the Labor Department's Rapid Response Team. When layoffs occur at a company, this team meets with employees to discuss the problem and help them find new jobs. We've even put these panels in some of the auditoriums at Georgia Tech."

Though the applications of the research are potentially broad, the focus of the study remains on nursing homes, where the noise problems are most critical to people's health and quality of life. "Sleep disturbance is a very common problem among nursing home residents," Connell says. "They sleep during the day because they don't sleep at night. Some don't sleep at night because they sleep during the day. It can be a vicious circle. Also, diseases contribute to sleep disturbances. We can't do anything about that, but we can potentially impact sleep problems caused by noise."

Though we probably can't help residents sleep through the night, we hope we can reduce the number of times they wake up."

For more information, you may contact Krishan Ahuja, Aerospace, Transportation and Advanced Systems Laboratory, Georgia Tech Research Institute, Atlanta, GA 30332-0844. (Telephone: 770-528-7054) (E-mail: krishan.ahuja@gti.gatech.edu); or Bette Rose Connell, Atlanta V.A. Medical Center, 1670 Clairmont Road, Decatur, GA 30033. (Telephone: 404-321-6111, ext. 6798) (E-mail: brcconnel@aol.com)
should try to maintain the status quo after losing a job,” says Kanfer. “But we’re finding that people..."There’s been an implicit notion that people...Department study: Many people who have lost jobs reported that a change in their routine positively affected their ability to find work.

One surprising result of the Labor Department study: Many people who have lost jobs reported that a change in their routine positively affected their ability to find work.

“...with law firms, she began to apply for sales jobs and worked her way into a great position selling legal software. Professor Ruth Kanfer is completing a two-year study on job-search behavior in cooperation with the Georgia Department of Labor. "...to the workforce—mostly college graduates—who are in a more structured search environment, Kanfer says.

Change of Routine

One surprising result of the Labor Department study: Many people who have lost jobs reported that a change in their routine positively affected their ability to find work.

“...and companies that decide not to move them further along in the process.”

Not everyone has the emotional resiliency to bounce back from those daily rejections. Yet companies often focus on delivering administrative services, such as daycare or places where job seekers can make phone calls, rather than one-on-one counseling support, Challenger explains.

The idea is to enhance job-search behavior. If outplacement counselors can identify individuals who aren’t strong in the personality traits conducive to a job search, they can be more proactive with training and counseling.

“...which are less conducive to the path that they’re used to in contrast. Some people are naturally outgoing or predisposed to set goals and follow through. In a job search, it’s often the little extras that can make a difference impressing employers.”

Outplacement: One Size Doesn’t Fit All

Kanfer’s research will help human resources professionals respond to the different needs among job seekers.

“A formulaic approach to outplacement doesn’t work,” observes John Challenger, CEO of Challenger, Gray and Christmas, a Chicago-based consulting firm that specializes in outplacement.

“The job search is a process where there is constant rejection. People are rejected by their former companies— and companies that decide not to move them further along in the process.”

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“Personality traits may be stable and enduring, but you can still learn coping skills,” says Kanfer, adding that it’s possible to raise both self-efficacy and self-esteem. To raise self-esteem, counselors could help individuals identify valuable skills they may possess, but not be aware of.

“Especially in today’s service-oriented workplace, skills that get you a new job don’t have to be the same ones that defined you in your previous job,” says Kanfer, referring to a friend who was laid off. The woman, an attorney, was very extroverted. Instead of interviewing with law firms, she began to apply for sales jobs and worked her way into a great position selling legal software.

Change of Routine

One surprising result of the Labor Department study: Many people who have lost jobs reported that a change in their routine positively affected their ability to find work.

“There’s been an implicit notion that people should try to maintain the status quo after losing a job,” says Kanfer. “But we’re finding that people who change their daily routine— for example, engaging in more exercise or going to more church activities— were more successful in finding re-employment.”

“...that comes from losing a job. When Ken Markham of Milwaukee lost his job as a project engineer at a pattern manufacturing company earlier this year, his stress-busting strategy was to stay busy. Over the next 10 weeks, Markham searched for a job, but he also chauffeured his three children about, tackled more housework, landscaped his yard and refinished kitchen cabinets. “The busier I was, the less stress I felt,” he says. What’s more, Markham believes the positive feelings that resulted from achieving tangible results transferred to his job interviews. “If you feel good about yourself, potential employers will pick up on it,” he says. Plus, his projects kept him organized. I had plenty to do, but I still had to balance that with my job search.”

Although Markham wasn’t part of the Labor Department study, his situation illustrates the dual behavioral challenges that job seekers face: 1. Reducing the negative emotions that accompany job loss. 2. Self-regulation: Directing and motivating themselves to find and win a new job.

“What’s difficult about job loss is that there’s no structure pushing you to do something. For most people, it’s all self-initiated,” Kanfer says. “We want to learn about how people change their routines and determine which ones may be more helpful.”

Diverse Sampling

Most job-search studies examine human capital factors, such as education and age, when predicting job-search success. But Kanfer’s focus on behavior provides a valuable pool of rich information on the processes and activities involved in a job search.

The study of 100 laid-off workers— primarily high school graduates an average of 40 years old— is smaller than Kanfer had hoped for. But it provides a useful complement to studies of job-search behaviors that have focused on new entrants to the workforce— mostly college graduates— who are in a more structured search environment, Kanfer says.

“For job seekers, a job search is self-managed...
and self-motivated — no one is offering them opportunity,” she adds.

Kanfer’s study differs from previous research in two other ways, as well:

• Greater ethnic mix. About half of the participants were African-Americans.

• Organizational diversity. Participants came from a variety of different companies.

Often job-search studies look at downsizing within a single organization, which can skew results. In contrast, the Labor Department study provides a look at job-search behaviors across different occupations and industries.

Almost half of the participants in Kanfer’s study had been laid off at least once in the previous five years. “That really speaks to how the work world has changed – that job loss is no longer an infrequent event,” Kanfer says.

On the brighter side, the study shows that job loss doesn’t necessarily mean settling for less. Among the Labor Department study participants, several reported they were happier in new situations than the ones they had left.

The study also points to areas that warrant more research, such as the impact of age on job-search behavior. Older people may limit their options because they believe they don’t have the right skills, Kanfer says. “And that’s a vicious cycle because the more you look, the more likely you are to find employment,” she adds.

Granted, in a poor economy, the chances of finding a job are lower, but it’s still an active approach that can win results. Kanfer stresses: “You can’t make employment happen. But you help control what happens by managing your assets, marshaling your skills and getting yourself out there.”

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Researchers led by Leanne West in the Georgia Tech Research Institute (GTRI) are adapting the television closed-captioning concept for the deaf to allow them to participate in other activities in businesses, schools, theaters and elsewhere.

Researchers are adapting TV programs provide closed captioning for deaf people, why not adapt the concept to allow people who are hard of hearing to participate in other activities in businesses, schools, theaters and elsewhere? That’s the idea behind wearable micro-display glasses, one of 14 research projects now under way at the new Rehabilitation Engineering Research Center on Mobile Wireless Technologies for Persons with Disabilities.

The center’s work involves researchers from the Georgia Institute of Technology, the Georgia Centers for Advanced Telecommunications Technology (GCASTT), and the Shepherd Center, an Atlanta-based catastrophic care hospital. It is primarily funded by a $5 million, five-year federal grant awarded to GCASTT last winter by the National Institute for Disability and Rehabilitation Research (NIDRR). The grant created one of 17 national Rehabilitation Engineering Research Centers (RERC) – this one housed on the Georgia Tech campus.

“With this grant we are able to move from research to real-world applications of technology to address the needs of people with disabilities,” says Helena Mitchell, director of GCATT’s Office of Technology Policy and Programs, and principal investigator and director for the RERC. “The collaborative, interdisciplinary nature of our team generates dynamic and innovative solutions.”

The RERC has two parallel goals: (1) to develop new and innovative ways of applying strophic care hospital. It is primarily funded by a $8 million, five-year federal grant awarded to GCASTT last winter by the National Institute for Disability and Rehabilitation Research (NIDRR). The grant created one of 17 national Rehabilitation Engineering Research Centers (RERC) – this one housed on the Georgia Tech campus.

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The RERC has two parallel goals: (1) to develop new and innovative ways of applying
mobile wireless technologies to help people with disabilities; and (2) to promote the accessibility of new wireless devices. Although the RERC’s immediate constituency is the estimated 54 million Americans with some form of disability, its research — and development of user-friendly technology is intended for the good of the entire population.

“Everyone benefits if we can help cell phone manufacturers build a product that’s easier to use because it has a clearer display; a speaker system, hands-free operation or voice-recognition capability,” says John Peifer, co-director of the RERC, and research director of the Biomedical Interactive Technology Center (BITC), one of five Georgia Tech research groups involved in RERC projects.

RERC researchers are building prototypes of devices that demonstrate new capabilities. Five of the 14 projects funded are already in development. They include the caption-capable glasses, which work like this:

“By providing them with information on how to manage their disability, keep their health and help manage their own health care, people with catastrophic disabilities can more effectively integrate back into the community and look forward to a better quality of life,” he adds.

In another project, Georgia Tech researchers in the Interactive Media Technology Center are identifying interface issues that represent barriers for persons with disabilities, then developing multimodal interfaces to test with a wireless personal digital assistant (PDA). One approach under investigation relies on a voice-recognition system. Another experimental interface interprets hand gestures.

Accessibility issues include emerging trends in mobile wireless technologies to help people with disabilities; and (2) to promote the accessibility of new wireless devices. Although the RERC’s immediate constituency is the estimated 54 million Americans with some form of disability, its research — and development of user-friendly technology is intended for the good of the entire population.

“One of the strengths of our grant proposal, and what excited the people at NIDRR, was that we included the policy aspect,” Mitchell says. “A lot of times awards are given and the results end up on somebody’s shelf. They don’t always get to the people who would benefit from this new knowledge, but more importantly, the results don’t get to the change agents — legislators, regulators and policymakers at the state and federal government levels.”

To encourage industrial interaction, researchers plan to present their findings and prototypes to industry representatives in annual roundtable meetings and a state-of-the-technology conference.

And RERC is leading the creation of universal design; courses for Georgia Tech and other students to expose them to disabilities research. Mitchell expects the curriculum to be popular across a range of academic majors.

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Gary Gieiling is an Atlanta-based freelance writer.

Assistant Professor Bruce Walker, center of the School of Psychology and College of Computing, and research scientist Jeff Wilson, right, of the Biomedical Interactive Technology Center at Georgia Tech are exploring non-speech sonification techniques to assist people with visual impairments with wayfinding and obstacle avoidance. Their goal is to develop a wearable, environment-aware device. First, they are developing a virtual reality test bed (shown in the background) for simulating sonification techniques and environments. Graduate student Giao Fu, left, demonstrates a prototype of the wearable audio navigation system.
Recent tests demonstrate in-flight ability to autonomously reconfigure low-level control system.

by JOHN TOON

Recent world events have highlighted the utility of unmanned aerial vehicles (UAVs) for both military and civilian applications. In manned aircraft, the pilot is in control, functioning as the integrator of the on-board subsystems and mitigating problems when they occur. With the advent of UAVs, the human integrator capability is lost, which increases the probability of aircraft loss and/or mission failure.

Researchers from more than a dozen organizations participating in the SEC program will use the OCP’s distributed processing, multi-platform coordination and real-time control technologies to create a platform capable of responding to unforeseen system faults, the SEC program will also give the machines more agility, helping them to avoid hostile actions without exceeding critical flight parameters.

The SEC program plans a number of progressive technology demonstrations over the next two years. While the springtime benchmark demonstration was a major accomplishment, Schrage says, additional demonstrations will go a long way to transferring the SEC technologies, including the OCP, to the UAV community.

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Don Giddens is dean of Georgia Tech’s College of Engineering. The college consistently ranks among the elite top five engineering schools in national rankings.

Q & A with Don Giddens
Dean of the Georgia Tech College of Engineering

On Giddens, one of the nation’s pioneers in biomedical engineering, became dean of the College of Engineering at the Georgia Institute of Technology on July 1, 2002. The college consistently ranks among the elite top five engineering schools in national rankings.

Giddens, who has been associated with Georgia Tech for more than 30 years, worked with Atlanta-based Emory University to develop a joint biomedical engineering department, and he enhanced Tech’s research, commercialization, and faculty and student recruitment efforts. Under Giddens’ direction, the biomedical engineering program continued its rise in national stature. Last year, it was ranked sixth in the nation by U.S. News and World Report.

1. What are the most critical challenges ahead for engineering?
   For one thing, there is this “pipeline” issue. In a number of engineering fields, you have a relatively older age distribution. For example, in the defense industry, a lot of people will be retiring in the next few years, and there aren’t enough students going into science and engineering to replace them.

   So how do we get young people excited about engineering? Engineering education is a challenge. It is becoming more interdisciplinary, and knowledge is growing so fast. How do we handle that in our curricula? Education is not synonymous with training, though. Things change too rapidly to “train” students effectively. We have to deal with fundamentals that will be useful to students for a long time, while at the same time their education must be interesting to keep them motivated and to attract students into the field. So we need to provide a good basis for lifelong learning. This is becoming more and more of a challenge as things get more complex.

   The public perception of engineering is another challenge. A lot of young people think of engineers as nerdy and not very social. This is not really true, but the image is somewhat problematic. How can we convey the excitement and creativity, and the professional and financial potential, of engineering to them? How can we ensure that our students have a liberal education that enables them to be effective in their careers?

2. In a world that has changed significantly in the past year, how do you expect the engineering disciplines to contribute to hopes for a brighter future?
   From the economic side, engineering can contribute by continuing to improve productivity, a factor that contributes to a robust economy. Whether it’s in manufacturing, development of new technologies, computing improvements, nanotechnology, etc., engineering can create more productivity per worker.

   Engineers play a vital role in national defense. A topic on everyone’s mind today is bioterrorism. Attempts to thwart it depend on engineering technologies, at least in part. For example, issues of detection depend on engineered devices such as sensors.
Another example…. if you look at contributions from industrial and systems engineering, we might be able to do a better job of handling the logistics of confining a contaminant more efficiently.

Sustainable energy is another area in which engineering has a large role to play. There are political and economic aspects, of course, but technology has to be one of the important elements in determining how we live on this planet without making it a lot worse. We need to develop alternative energy sources and recycling capabilities much more than we have done to date, and we must understand the economic impact of “life cycle costs” of products. …what may be cheap to produce may cost a fortune to remediate.

While much of this issue is driven by economics and politics, a lot is science- and technology-based.

In health, there are a host of things that involve engineering. There are devices, prosthetics, continuing research and development into how we see, how we touch, hear, breathe; how we protect ourselves from injury, how we distribute health care, how we can perform surgery better or even remotely.

Then at the molecular level, the genomics explosion involves numerous engineering issues, such as techniques for molecular imaging, reliable testing with small samples, how to analyze a huge amount of data from molecular biology. The data are overwhelming for us to analyze in traditional “bench science” ways.

Tissue engineering holds promise, both in hybrids and engineered tissues, such as artificial skin or a tissue-engineered liver. The tissue engineering center here at Georgia Tech is very involved in those matters.

I also have to mention the importance of engineering in our civil infrastructure.

We take a great deal for granted, but what would our lives be like without modern water treatment, transportation and communication systems, and construction techniques? Someone once said that some of the greatest technological impacts are from things we don’t think about when we use them.

So there are many opportunities in engineering to help toward a brighter future. We just need to communicate this excitement better.

3. As a pioneer in the field of bioengineering, describe what it takes to make an important contribution to science and technology.

For one thing, it takes a bit of luck to pick an important problem or area to work on. I urge my students to focus on identifying important problems and not just work on things that are incremental. It’s easy for researchers to slip into this trap. Add a little bit of knowledge, get some publications and give some presentations. After 10 years, maybe you look back and what you’ve done has not had a big impact at all. It’s just a little more of the same. I see a lot of this in presentations at meetings and, very often, in publications.

So, you have to be willing to bite off an important piece of a significant problem and then see it through. It’s persistence. If you can do this successfully, you will have an impact.

You also have to be willing to take risks. I was in aerospace engineering, and it was a big change to move into bioengineering. At the time, I did not think of the risk. I just did it.

4. If experience is one of the best teachers, what has it taught you that you pass on to others in your charge?

Experience has taught me to be open to continual learning. I don’t assume that because I have a lot of experience, because I have a Ph.D., or because I’m a professor, that I know everything. You’d be surprised how many people just close their minds. They think they have nothing to learn from someone else…. and so they stop learning.

We should value people and the different insights they bring. They might think of something you never thought about. This includes valuing student insight into educational issues. We can learn a lot from students — how they learn and what’s important to them.

So for me, being open to learning new things is very important. I advise my students to do this. It has ethical dimensions, as well, such as having respect for others and their views.

Another thing that experience has taught me is that you really have to like what you’re doing. If you do, you will work hard at it and spend time and be successful.

5. Given your experience with interdisciplinary research and inter-university collaboration, what are the long-term benefits of those interactions? How do you keep those professional relationships strong?

One way to gain new knowledge is through the various disciplines. Assimilating this knowledge is a characteristic of engineering. Engineers integrate things into creating or understanding a system, whether it is manufacturing an airplane, an automobile or a medical device. By nature, when you practice engineering, it must be multi-disciplinary to get to the solution. You interact with people in mechanics, chemistry, whatever. It’s necessary to do that to solve the systems problem.

A great benefit of interdisciplinary research is learning from other people. There’s a lot of cross-fertilization that occurs. You gain knowledge and perspective from interdisciplinary experiences. You get a lot of energy from interacting with other people. In kinetic theory, there’s a little experiment. You have a box with a partition dividing it. On one side, there’s a vacuum with no energy, and on the other a gas under pressure and a lot of energy. If you punch a hole in the partition, the energy goes over and invigorates the other side. Some of this happens in interdisciplinary research. The disciplines can excite and invigorate each other.

Another example… if you look at contributions from industrial and systems engineering, we might be able to do a better job of handling the logistics of confining a contaminant more efficiently.
And another benefit is the leverage you can get from doing interdisciplinary research. For example, in the School of Biomedical Engineering, we have taken advantage of the strengths of Georgia Tech's engineering school and Emory University's medical school. We can often tackle bigger and more important problems by using an interdisciplinary approach.

Nurturing interdisciplinary relationships takes a good bit of effort; however, respect for the views of others, valuing their knowledge and being willing to be a team player are all important. If you look for the “win-win” opportunities, this is the best strategy.

6. What are your expectations for change in the College of Engineering for the next five years or so?

There are two types of change - change in what we can actually see around campus and change in what we don't actually see, or change in more abstract ways. In what we can see, what is visible to the campus visitor, I want to continue to push the need for space and infrastructure. We've done well with this, but we can't let up. Technology moves so quickly. We need more space, labs and equipment for faculty and for students.

Another thing we can see as we walk about the campus is the diversity of students and faculty here. Georgia Tech has done well by comparison, but I'd like to see the makeup of the student body change even more in the next five years to increase diversity. The field of engineering has done so poorly in recruiting women and minorities. By comparison, medicine has increased the number of women MDs entering the field to about 50 percent. In engineering, the level is in the 20 percent range, and it's not changed much in the past several years. Why is that? A lot of universities are interested in addressing that issue, and Georgia Tech should help lead the way.

An area that is not so “visible” is Tech's entrepreneurial spirit. We need to take even more advantage of it in the College of Engineering than we have to date - and we are already pretty good at this.

An area of change is in engineering education. We have made many improvements, but I'd like to see us, as a faculty, thinking more about learning issues as opposed to teaching issues. The environment to make such interactions natural and more frequent for faculty and students. As the largest college at Georgia Tech, the College of Engineering has a responsibility for making this kind of qualitative change. I think we would be better served as a college if we look outwardly more than we presently do.

Another area of change is in engineering education. We have made many improvements, but I'd like to see us, as a faculty, thinking more about learning issues as opposed to teaching issues. Students today are accustomed to interactions. Lectures can be appealing, but they are not the only way students learn. We can borrow from our learning science friends who study how people learn from each other, and how they learn in self-motivated ways.

7. What measures of success will you use to evaluate the College of Engineering’s accomplishments?

Engineers like to quantify things, so we often present data to measure whether we’re meeting a goal. You can count diversity - the number of women students, the number of African-American students - for example. You can quantify things like the number of research dollars per faculty member. A softer, but perhaps better measure is publications or, more importantly, citations. Citations are a method to measure whether your publication has had an impact. Then there are honors and awards, such as society fellows, national academy membership and so on. Each of these measures, as well as others not mentioned, can tell us if we are continuing to make progress.

We also need to look at the student/faculty ratio. It has quantitative and qualitative implications. If you have too many students per faculty member, you are not likely to do as good a job because you can be overwhelmed by the workload. If we can manage it, I want to get a ratio closer to those of some of our competitors. We have close to a 20:1 ratio in the College of Engineering. We would be more productive if we had a ratio approaching 15:1.

But one measure is when we're really successful is when we stop feeling compelled to compare ourselves to others. It's like the old TV commercials for Avis. They said, “We're number two and we're trying harder.” Immediately, you thought of Hertz! It was an amusing thing.

8. What are you most proud of from your tenure at Georgia Tech?

And what do you most want to accomplish as dean of the College of Engineering?

One thing I am proud of is my role in helping to start the joint Coulter Department of Biomedical Engineering between Georgia Tech and Emory. This was a bold move by the two institutions, and I was lucky to be a part of it. Another thing high on my list would be the postdocs and graduate students who came through my lab. I have a sense of pride in their success and in the success of their students.

As dean of the College of Engineering, I have some things in mind that, if we can do them, would give me a sense of satisfaction. Georgia Tech could and should be a stronger player in the “bio-X” arena. And I’m not just talking about biomedical engineering. We also have a role in the bio-environmental area and sustainable energy, to give just a couple of examples. Integration of engineering and the life sciences is so important to our future. We’ve only touched the tip of the iceberg in this area. As dean, I hope I can push this issue forward. I would look back and feel good about helping do this.

At the educational level, I want us to give more attention to learning versus teaching. I want us to get at how students learn and how to convey needed fundamentals so this issue of taking four prerequisites before being able to take a certain course becomes less significant, and it opens flexibility in education. I question the bean-counting approach to the curriculum. It all gets back to the issue of training versus educating. So we need more emphasis on learning issues and on multidisciplinary education.

Also, I want to continue to encourage the entrepreneurial character of Georgia Tech. It is incredibly valuable. … I hope to open up more degrees of freedom for this activity to take place than currently exists.

And another benefit is the leverage you can get from doing interdisciplinary research. For example, in the School of Biomedical Engineering, we have taken advantage of the strengths of Georgia Tech's engineering school and Emory University's medical school. We can often tackle bigger and more important problems by using an interdisciplinary approach.

Nurturing interdisciplinary relationships takes a good bit of effort; however, respect for the views of others, valuing their knowledge and being willing to be a team player are all important. If you look for the “win-win” opportunities, this is the best strategy.

An area that is not so ‘visible’ is Tech’s entrepreneurial spirit. We need to take even more advantage of it in the College of Engineering than we have to date – and we are already pretty good at this.”

Q & A with Don Giddens

“An area that is not so ‘visible’ is Tech’s entrepreneurial spirit. We need to take even more advantage of it in the College of Engineering than we have to date – and we are already pretty good at this.”

For the text of the complete interview, see gtresearchnews.gatech.edu/reshor/rh-f02/faculty-profile.html For additional information, you may contact Don Giddens, College of Engineering, Georgia Tech, Atlanta, GA 30332-0280. (Telephone: 404-894-125) (E-mail: don.giddens@coe.gatech.edu)

The interview with Don Giddens was conducted by Jane M. Sanders, editor of Research Horizons magazine.
Risky Diseases, Risky Vaccines, Risky Policies

Public concern is rising about the risks of vaccination.

by ANN BOSTROM

In the late 1990s, health authorities worldwide considered destroying their remaining stocks of live smallpox virus — until they began to worry about bioterrorism.

Immunization in the 20th century had eliminated smallpox, but not its menace. In its heyday, smallpox killed a third to more than one-half of its victims and nearly all infants in some outbreaks. Global travel and ever denser, susceptible populations made it plausible that smallpox, if released, could again become the “speckled monster.”

In June 2002, the Advisory Committee on Immunization Practices (ACIP) recommended revisions to U.S. smallpox vaccination policy. Pushed by the Bush Administration, the ACIP made its recommendation months earlier than scheduled. The ACIP proposed a ring-vaccination policy, along with early vaccination of health workers and emergency response personnel. Successfully used to eradicate smallpox, ring vaccination controls outbreaks by vaccinating everyone who is likely to have been exposed to smallpox, creating a “ring of vaccinated people” around those infected.

Since the proposal in June, debate about smallpox vaccination has continued in the United States and elsewhere. In fact, the ACIP’s invitation for public comment on its proposal (www.cdc.gov/agents/smallpox) sparked new debate. The culture of advocacy in public health has not always readily meshed with deliberative processes, nor with the uncertainties explicit in scientific standards of evidence.

Consequently, there is scientific disagreement on the efficacy of ring vaccination policies for smallpox, too. Presumably, the ACIP believes the proposed policy would protect public health effectively, at an acceptable risk and cost. In any such policy decision, public health, individual liberties and fairness must be weighed with the relevant science and technology, their uncertainties, and the practicalities of vaccine availability and administration.

Take the nation’s childhood vaccination requirements as an example. Since 1980, at least 15 new or improved vaccines have become available, including the varicella (chickenpox) vaccine. The ACIP-recommended childhood immunization schedule now includes more than three dozen doses of 11 different vaccines before the age of 12 — not counting the hepatitis A and influenza vaccinations recommended for some children.

Over time, consumer groups have demanded — and gotten — greater scrutiny of immunization practices and policies, and of the costs of limiting individual choices ... Program at the Program for Appropriate Technology in Health (www.childrensvaccine.org). This proliferation of vaccines and information may be contributing to vaccine safety concerns. Public health experts, such as Drs. Gene Gangerosa at Emory University and Bob Chor at the CDC, attribute increased concerns to a shift in personal risk-benefit calculations caused by the near-complete disappearance of some diseases. Thanks to immunization, we are unfamiliar with smallpox, polio, whooping cough, diphtheria and several other infectious diseases.

Although many childhood vaccines are now required for school entry by state laws, states allow medical, and sometimes religious or philosophical, exemptions. A small percentage of parents choose not to vaccinate their children. In June 2002, the ACIP recommended revising U.S. smallpox vaccination policy. Pushed by the Bush Administration, the ACIP made its recommendation months earlier than scheduled. The ACIP proposed a ring-vaccination policy, along with early vaccination of health workers and emergency response personnel. Successfully used to eradicate smallpox, ring vaccination controls outbreaks by vaccinating everyone who is likely to have been exposed to smallpox, creating a “ring of vaccinated people” around those infected.

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Over time, consumer groups have demanded — and gotten — greater scrutiny of immunization practices and policies, and of the costs of limiting individual choices with mandatory immunization. Now, parental concerns about vaccine safety — while still low — appear to be creeping higher. In response, non-governmental vaccine advocacy organizations have also raised their voices. Among those groups are the Allied Vaccine Group (www.vaccine.org), the National Immunization Network (www.immunizationinfo.org) and the Children’s Vaccine Program at the Program for Appropriate Technology in Health (www.childrensvaccine.org). This proliferation of vaccines and information may be contributing to vaccine safety concerns. Public health experts, such as Drs. Gene Gangerosa at Emory University and Bob Chor at the CDC, attribute increased concerns to a shift in personal risk-benefit calculations caused by the near-complete disappearance of some diseases. Thanks to immunization, we are unfamiliar with smallpox, polio, whooping cough, diphtheria and several other infectious diseases.

Although many childhood vaccines are now required for school entry by state laws, states allow medical, and sometimes religious or philosophical, exemptions. A small percentage of parents choose not to vaccinate their children because they fear that vaccines cause autism, or other immune dysfunctions. In contrast, tests of smallpox vaccines in October 2001 were swamped with volunteers hoping to get the vaccine for themselves and their children.

To better address safety concerns, federal agencies have increased research on and attention to vaccine safety issues. Research on vaccine risks, risk perceptions and risk communication has been growing at Georgia Tech and elsewhere. Meanwhile, physicians’ opinions and recommendations often determine individuals’ vaccination decisions, and those opinions presumably would also affect choices about a national voluntary smallpox vaccination program following
Researchers develop system to recover and reuse electronic wastes.

An estimated 12 million tons of electronic waste may soon be jamming American landfills. Rising concern has prompted a Georgia Tech study to create a “reverse production” system that designs infrastructure to recover and reuse every material contained within e-wastes. Professors Jane Ammons and Matthew Reffitt, center, are conducting the study in cooperation with Chuck Bookins of the Georgia Department of Natural Resources.

ом historians have theorized that the demise of the Roman Empire could be partly attributed to the gradual poisoning of its citizens. They believe lead leached from so many sources — from tableware to water pipes — that Romans eventually succumbed to chronic heavy metal toxicity. Now, many governments around the world are worried that their citizens might become modern-day Romans because of the heaps of trashed electronics clogging landfills. Such “e-waste” — discarded computers, televisions, cell phones,
audio equipment and batteries — leach lead and other substances that eventually can seep into groundwater supplies. Just one color computer monitor or television can contain up to eight pounds of lead. An estimated 12 million tons of e-waste may soon be surging American landfills, according to the U.S. Environmental Protection Agency.

Concern has reached such a level that some European countries are forcing manufacturers to take back discarded electronics, and in the United States, California and Massachusetts have banned their disposal in municipal solid waste landfills. But what then?

A study under way at the Georgia Institute of Technology — in cooperation with the Pollution Prevention Assistance Division of the Georgia Department of Natural Resources (DNR) and the National Science Foundation — may offer a model for other states and nations.

It is a “reverse production” system that designs infrastructure to recover and reuse every material contained within e-wastes — metals such as lead, copper, aluminum and gold, and various plastics, glass and wire. Such “closed loop” manufacturing and recycling offers a win-win situation for everyone — less of the Earth will be mined for raw materials, and groundwater will be protected, researchers explain.

But this simple concept requires a lot of brand new thinking, says Jane Ammons, a professor in the School of Industrial and Systems Engineering and a governor-appointed member of the Georgia Computer Equipment Disposal and Recycling Council. She and colleague Matthew Realff, an associate professor in the School of Chemical Engineering, are devising methods to plan reverse production systems that will collect e-trash, tear apart devices (“de-manufacture it!”) and use the components and materials again — all while making the process economically viable.

Though this system is being designed for Georgia, its application elsewhere has sparked interest nationally and internationally, the researchers say. Officials in Taiwan and Belgium have consulted with the researchers, as have several multinational electronics and logistics firms. Also, the researchers’ work on carpet recycling was used in testimony to Congress and helped in developing an industry coalition that has the goal of diverting 25 percent of carpet from landfills by 2012.

The project is building on other research that Ammons and Realff are conducting. Their fundamental work in reverse production systems has been repeatedly funded by the National Science Foundation. Ammons’ related research is funded by the National Science Foundation (NSF) as one of four ADVANCE chaired professors at Georgia Tech. ADVANCE is a program to improve the career success of women faculty in science and engineering, and the chaired professors are serving as mentors for younger women faculty in their schools. Also, Ammons and Realff are applying their findings from other studies to the e-waste project. For example, they have modeled the regional and national infrastructure necessary for cost-effective and environmentally beneficial collection and recycling of carpet to extract nylon fiber, caprolactam monomer and other products.

“It’s a matter of seeing waste as a resource,” Ammons says.

Key to their approach is the ongoing development of a mathematical model to predict the economic success of recovery efforts. Modeling is necessary given the uncertainty inherent in a host of variables — quantities, locations, types and conditions of old parts, and numerous aspects of transportation (distance, costs of fuel, labor, insurance, etc.); Ammons and Realff have involved experts, many of them from Georgia recycling and salvaging businesses, to probe the complicated interplay between manufacturing, de-manufacturing and logistics.

“Strong leverage comes from our new mathematical models,” Ammons says. “They allow us to ask really good questions while designing the infrastructure for these systems.”

Realff’s expertise is the design and operation of processes that recover the maximum amount possible of useable product from e-waste. He has devised ways to separate metals, as well as different qualities of plastic from crushed, ground-up components. Realff and his students measure density and surface properties in novel ways. For example, they measure how far pieces fly off a conveyor belt and how well air bubbles stick to them. This information enables more accurate representations of recycling tasks to be incorporated into the strategic models and the synthesis of lower-cost alternatives, Realff explains.

“For chemical engineers, this is a challenging problem that has not been widely studied,” he says. “It’s exciting. We are creating a new architecture for separation systems.” From this work, new industries and an infrastructure can be created to recover value not only from e-waste, but also from automobiles and other durable goods, Realff adds.

The reverse production systems research project has also delivered a wonderful learning opportunity for Ammons’ and Realff’s students, who come from many countries to study at Georgia Tech. Many of these students are planning to take the methodology back home to help plan recycling and recovery systems in their countries.

Now into the second and final year of the Georgia project, Ammons, Realff and their students are tweaking and testing their mathematical model (which for some problems has required computers to determine more than 300,000 variables) by testing hundreds of “what if” scenarios. The researchers are continuing their collaboration under a new grant from the National Science Foundation, it will help broaden their model to other reverse production system problems.

Meanwhile, the DNR is eagerly awaiting the final results of the study.

“This work is tremendously important. E-waste poses potential serious environmental problems if it continues to go into landfills,” says Chuck Boelkins, a DNR resource recovery specialist. The Georgia recovery system “may become a national model. It could be key to the future of responsible environmental management.”

For more information, contact Jane Ammons, School of Industrial and Systems Engineering, Georgia Tech, Atlanta, GA 30332-0100. (Telephone: 404-894-2364) (E-mail: jane.ammons@eye.gatech.edu); or Matthew Realff, School of Chemical Engineering, Georgia Tech, Atlanta, GA 30332-0100. (Telephone: 404-894-1834) (E-mail: matthew.realff@che.gatech.edu)

Renee T wombly is an Alabama-based freelance writer.

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