

2010-2011

Inside SARGENT

Boston University College of Health & Rehabilitation Sciences: Sargent College

THE RACE FOR A NIMBLE OLD AGE

HIP PAIN? WITH CARA LEWIS'S ROBOTIC EXOSKELETON YOU MIGHT BE ABLE TO WALK IT OFF.

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BOSTON
UNIVERSITY

HEARING IN A NOISY WORLD
ATTACKING A CRISIS IN KENYA
HEALTHY EATING 2.0



Dear Friends,

Pioneers. Innovators. Visionaries. These three words are so often overused in our society that sometimes it's easy to lose sight of their true meaning. However, they truly capture the spirit of our students and faculty.

In this issue of *Inside Sargent*, you'll read about faculty and students at Boston University College of Health & Rehabilitation Sciences: Sargent College who are pioneers in their field. Their research is new; it is groundbreaking; it is exciting; and it will open doors for new areas of thought, research, and development. These members of the Sargent College community are true innovators and visionaries.

We've added a number of new faces to our faculty in the past couple of years and they're already making their presence felt. One of those additions is Assistant Professor Jason Bohland, who came to Sargent College's Department of Health Sciences from the Cold Spring Harbor Laboratory in Cold Spring Harbor, New York, where he worked as a postdoctoral fellow and scientific informatics manager. Bohland's engineering experience, coupled with his doctoral work in cognitive and neural systems, allows him to bring a fresh perspective to his research, which focuses on the relationship between genes and behavior to better understand where speech and language break down in people with developmental disorders.

As you'll read in our cover story, "The Race for a Nimble Old Age," Sargent's newest assistant professor in the Department of Physical Therapy & Athletic Training, Cara Lewis, is pushing boundaries, too. She's built a robotic device that can teach the healthy and injured how to walk correctly; in some cases, it may actually prevent an injury from ever taking place. Lewis recently received a 2010 Peter Paul Career Development Fellowship, a prestigious three-year fellowship established in 2006 to recognize outstanding young faculty and help support and further their research. Numerous nominees are proposed by deans from across BU each year; only a select few are chosen.

Assistant Professor of Occupational Therapy Jessica Kramer, another new faculty member, advocates for youth with disabilities and includes them as coinvestigators on her own research—certainly an innovative process. Kramer is hoping their work together will give young people with disabilities the skills necessary to change their environments and enjoy the same life experiences as other teens.

Of course, our more established faculty continue to make exciting advances. World-renowned researcher Helen Barbas is studying the brain's communication system. Her ongoing research, which works to connect neural brain anatomy and cognition, enables her to propose new treatments for everything from autism to schizophrenia.

Visionary Sargent College students are also making a difference. From codeveloping an iPhone application for healthier eating, to starting a nonprofit organization to address immediate health concerns in Kenya, Sargent students consistently develop new ideas that will help shape our world for years to come.

We're extremely proud of the work our faculty and students are doing, both inside and outside of the walls of BU and Sargent College. Our students are fortunate enough to work in a variety of clinical positions throughout the country, sometimes as early as the first semester of their program. In this issue of *Inside Sargent*, you'll learn about two of these clinical experiences—one at Massachusetts General Hospital and the other at BU's Henry M. Goldman School of Dental Medicine—as well as some of the other projects engaging our students in the community.

Sargent College is working to make a difference in our world and I'm thrilled to be able to share this exciting, pioneering work with you. I hope you enjoy this issue of *Inside Sargent* and, as always, I welcome your thoughts and feedback at gwaters@bu.edu.

With warm regards,

Gloria Waters

Gloria Waters
Dean and Professor

"OUR STUDENTS ARE FORTUNATE ENOUGH TO WORK IN A VARIETY OF CLINICAL POSITIONS THROUGHOUT THE COUNTRY, SOMETIMES AS EARLY AS THE FIRST SEMESTER OF THEIR PROGRAM."

InsideSARGENT

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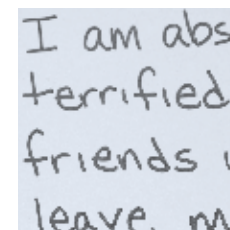
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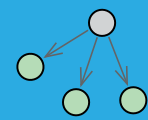
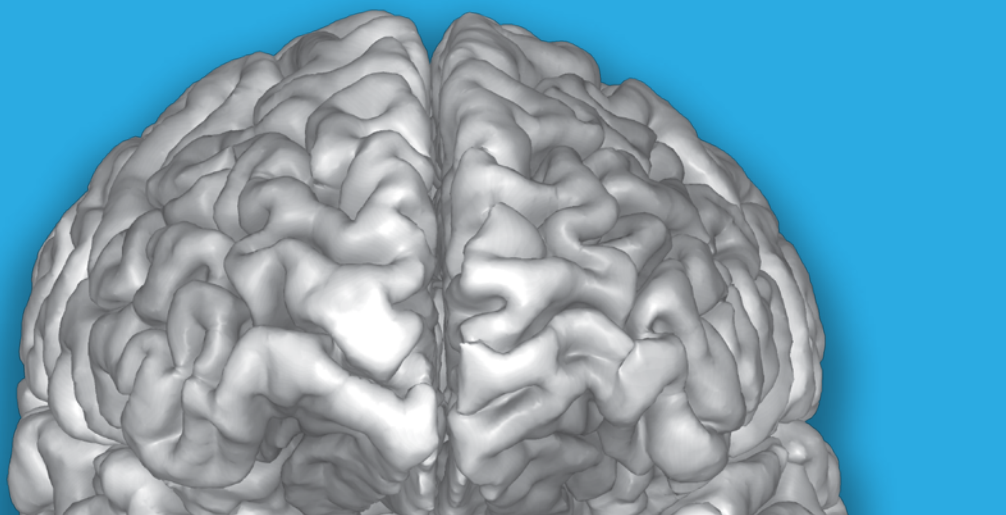
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A NEUROSCIENTIST IS MAPPING THE RELATIONSHIP BETWEEN GENES AND BEHAVIOR TO UNDERSTAND HOW THE BRAIN WORKS—OR DOESN'T—IN PEOPLE WITH DEVELOPMENTAL DISORDERS.

By Tricia Brick



Before he was a neuroscientist, Jason Bohland built artificial brains. While studying for his master's degree in electrical engineering, he designed computer models that simulated the encoding and storage of memories. "I was working with simple units meant to mimic neurons," he says, "and looking at how the connections among them can affect the capacity of memories, and how the dynamics of that artificial system unfold over time."

Bohland (GRS'07), an assistant professor in BU Sargent College's Department of Health Sciences, has since turned his attention to real brains and now is researching the role of genetics in certain deficits associated with developmental disorders. Why does delayed spoken language affect only half of people diagnosed with autism spectrum disorder? What are the underlying relationships among genetics, brain architecture, and behavior? Answering such questions could eventually lead to the generation of improved diagnostic and therapeutic tools.

Yet Bohland has not entirely left his early engineering work behind. He is still looking at the structure and dynamics of whole systems, using computer analysis to explore how the elements of the brain work together. He says, "My engineering experience allows me to look at the system we're studying and ask, 'How is it put together? If I were to build a system to do the things a brain has to do, how would I go about doing it?'"

< Jason Bohland's study of brain images could improve our understanding of conditions affecting speech and language. The scan shown is of Bohland's own brain.

Bohland is part of a multidisciplinary vanguard in neuroscience that combines the holistic perspective of systems biology with new computational capabilities—in this case, the analysis of huge data sets, involving terabytes of information—to revisit long-standing questions about the brain. "Historically, because of technological limitations, researchers have generally spent their careers working on one part of the brain, using a set of techniques of their choice, which may or may not be the same set of techniques another lab uses in another part of the brain," Bohland says. "While it has led to a lot of great insights, we're left without many big-picture ideas about neuroscience."

But technological advances in the last decade have exponentially increased the capacity to store, analyze, and share data, opening a new front in the quest to understand the workings of the brain. At Seattle's Allen Institute for Brain Science, for example, scientists have built a standardized atlas of gene expression for the entire mouse brain and are finishing work on a similar atlas of the human brain. Both atlases are available online to any researchers interested in working with the data.

Bohland worked with the mouse data as a postdoctoral fellow and scientific informatics manager at Cold Spring Harbor Laboratory, Cold Spring Harbor, New York, an elite institute for the study of molecular biology and genetics. Now, at Sargent College, he plans to use the forthcoming human brain data for a project that he hopes will shed light on the genetic

"MY ENGINEERING EXPERIENCE ALLOWS ME TO LOOK AT THE SYSTEM WE'RE STUDYING AND ASK, 'HOW IS IT PUT TOGETHER? IF I WERE TO BUILD A SYSTEM TO DO THE THINGS A BRAIN HAS TO DO, HOW WOULD I GO ABOUT DOING IT?'"
JASON BOHLAND



components of certain heritable disorders affecting speech and language, and to begin to account for the wide range of behavioral variability in individuals with these disorders.

The study will engage healthy adults and children in tasks selected to highlight certain behaviors that are impaired in people with autism, specific language impairment, and other conditions that affect speech and language. With fMRI (functional Magnetic Resonance Imaging), he will localize the brain areas that are activated, and the functional interactions between these areas, as the subjects carry out their tasks. Then, using advanced computational techniques, he will compare his findings to the Allen Institute data to identify genes or sets of genes that tend to be highly expressed in those brain systems. "This provides a way to bridge the genotype-phenotype gap: We can get from the genes to the systems they're expressed in, and we can get from behavioral outcome to the parts of the brain associated with that behavior," Bohland says.

As with much systems-biology research, this work is data-driven rather than hypothesis-driven. But Bohland describes his work as a "hypothesis generator": He hopes his study of healthy subjects will help him formulate theories about the mechanisms of such disorders as autism, dyslexia, and stuttering. "Jay's research has the potential to provide new insights into the neurocomputational underpinnings of a large number of genetic disorders," says Professor Frank Guenther of the Departments of Speech, Language & Hearing Sciences and Cognitive & Neural Systems. "This knowledge will be valuable in guiding pharmacological as well as behavioral treatments for these disorders."

Bohland intends for the tools and methods he develops to be available for use by other researchers so that they may use them to develop and test their own hypotheses. A planned online portal will provide access to his imaging results and other resources. "More and more people are adopting the spirit of 'We're all in this together,'" he says. "In terms of science, that spirit of sharing data and tools is a huge component of what I believe in."

THE RACE FOR A NIMBLE OLD AGE

HIP PAIN? WITH CARA LEWIS'S ROBOTIC EXOSKELETON YOU MIGHT BE ABLE TO WALK IT OFF.

By Patrick L. Kennedy

You were taught to read and write. You were taught to do arithmetic. But chances are, you taught yourself to walk. And quite possibly you got it all wrong. Sure, you get from point A to point B. But you might also be damaging your hip. As a result, you could be on track to needing a hip replacement someday, according to Cara Lewis, an expert on gait and the musculoskeletal causes of hip pain. Fortunately, she's built a robotic device that can be used to teach both the healthy and the injured how to correct a hip-battering walk.

"My goal is to intervene early on, so that osteoarthritis doesn't progress—or doesn't even develop," says the assistant professor of physical therapy.

"There are a lot of questions in physical therapy that we don't know the answers to, like why one treatment works and another doesn't. I kept running into that as a clinician." So she got a PhD in Movement Science.

Lewis's biggest questions as a therapist were, "Why do people have hip pain, and how can I fix it?" The answers could help a sizeable population: Nearly 200,000 hips are replaced in the United States every year.

After completing her degree with a concentration in biomechanics, Lewis undertook postdoctoral work with kinesiology expert Dan Ferris at the University of Michigan, Ann

< **Every year, nearly 200,000 hips are replaced in the U.S. Changing the way we walk in our 20s could spare us that late-life pain, says Cara Lewis.**

Arbor. In a study of types of gait, Lewis and Ferris determined that walkers who push off harder from the foot take the stress off their hip joints.

"You can experiment with this on the street," Lewis says. "If you push more with your feet, your legs kind of launch *themselves* forward."

Conversely, walkers who unwittingly rely on hip torque to swing their legs forward are using energy much less economically, Lewis says. They're also, by repeatedly straining the hip muscles, putting themselves at risk of injuring the tissue in their joints.

Hip pain can't be written off as a burden of old age, a sign of wear and tear. That wouldn't explain the increasing number of young people, especially runners and other athletes, who are now being diagnosed with acetabular labral tears. A source of hip pain that has been recognized only recently, labral tears heighten the risk of developing arthritis in the hip earlier than expected, says Lewis.

The labrum is a ring of fibrocartilage attached to the rim of the acetabulum, the hip socket in which the femur sits. "The



"MY GOAL IS TO INTERVENE EARLY ON, SO THAT OSTEOARTHRITIS DOESN'T PROGRESS—OR DOESN'T EVEN DEVELOP."
CARA LEWIS

labrum is some of the tissue that helps add stability, similar to that in the shoulder," says Lewis.

The repetitive stress from an improper gait, Lewis believes, will cause hip pain, "which then progresses to a labral tear; you then start losing stability in the joint, which then leads to the arthritis—which [may result in the need for] a hip replacement. The replacement might be happening when you're 60, but it's because of something you did when you were 30.

"That's the population [20- and 30-somethings] to target. If you change the way they're walking now, you can change their pain after they already have a tear—or maybe change it *before* they get the tear." The way lies in "identifying the people who are at risk for the tear, and changing their mechanics."

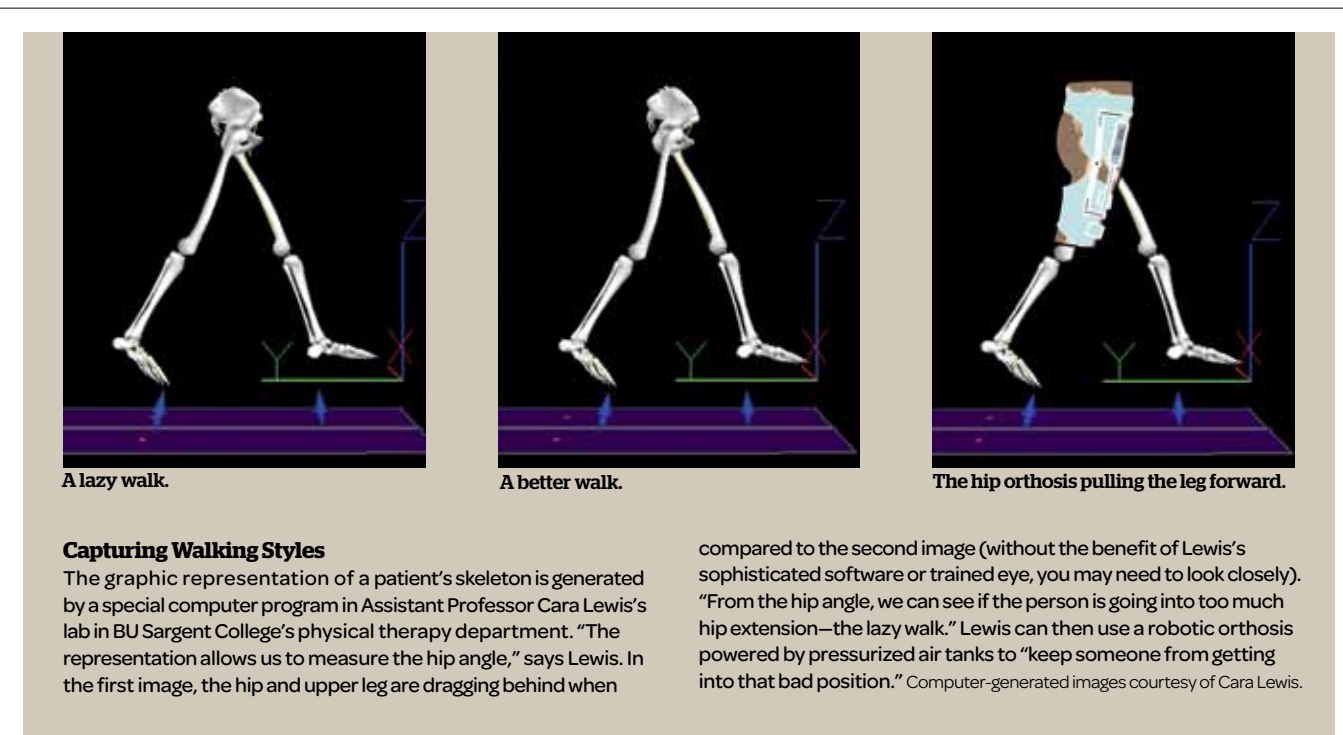
But how do you change the mechanics of a person's gait?

For Lewis, the answer came in Michigan, while she worked with Ferris on robotic exoskeletons for the ankle joints. "Because of advancements in orthotic materials, in actuator technology," Lewis explains, "we were able to finally move the technology to doing work at the hip joint."

Lewis built a robotic orthosis, a pneumatically powered exoskeleton—more on the air tanks that power it later—consisting of a brace each for the waist and two legs. An orthosis is any device that supports or corrects limb or torso movement; splints and arch supports are orthoses.

Whereas Ferris focuses on studying how people walk, Lewis wants to change the way people walk. "She's in virgin territory," says Ferris. "She's using an orthosis for motor retraining rather than for assistive technology... That's what's novel."

In a newly built lab at BU Sargent College, where Lewis has been teaching since fall 2009, healthy subjects wear the orthosis >>



Capturing Walking Styles

The graphic representation of a patient's skeleton is generated by a special computer program in Assistant Professor Cara Lewis's lab in BU Sargent College's physical therapy department. "The representation allows us to measure the hip angle," says Lewis. In the first image, the hip and upper leg are dragging behind when

compared to the second image (without the benefit of Lewis's sophisticated software or trained eye, you may need to look closely). "From the hip angle, we can see if the person is going into too much hip extension—the lazy walk." Lewis can then use a robotic orthosis powered by pressurized air tanks to "keep someone from getting into that bad position." Computer-generated images courtesy of Cara Lewis.

In the Lab

Eight cameras follow reflective markers on a subject and feed the data into a computer program. "The camera system and split belt treadmill make this lab unique," says Lewis.



>> while walking on a custom treadmill with two plates measuring force separately for the left and right foot. Electrodes on their legs record their muscle activity. And they are covered in reflective markers monitored by several motion-capture cameras.

"The computer system picks up the marker positions, and then can re-create a model of the skeleton," Lewis explains. "From that we can tell differences in angles, and figure out when we want to apply the robotic force, and how much."

That means when subjects exhibit what Lewis calls "the lazy walk," in which they're straining their hips by using them to swing one leg forward while the other leg lags far behind, Lewis presses a button. Air from a large pressurized air tank bursts into the orthotic actuators and corrects their gait.

"It'll start bringing your leg forward sooner," Lewis says, "so it keeps you out of that bad position" more effectively than verbal direction does.

Then, "Because I have such precise control over the timing and amount of assistance, I can wean people off of the bad position," Lewis says. "And then they can walk normally on the street."

Currently the lab is for research, not intervention. But Lewis envisions a time when this system is replicated in clinics all over. If you were recovering from a hip injury, you could make regular visits to a clinic to work out on the treadmill until you'd trained yourself to walk better. Furthermore, Lewis hopes, healthy people could use the orthosis to *prevent* a hip injury from ever happening.

No one can say whether this will work, because nobody's ever tried it, says Ferris. But if anyone can pull it off, it's Cara Lewis. "Most physical therapists—in fact, virtually all—do not have the level of technical understanding in terms of quantitative biomechanical analysis that she does," Ferris says. "She has a unique background that's going to really set her up for success regardless of what project she undertakes."



From digital motion capture to real-time robotics control, learn more about Cara Lewis's lab at www.bu.edu/sargent/human-adaptation-lab.

Student Experience



Mary Khetani's research findings as a student could help occupational therapists improve the care they offer to families of children with disabilities.

How to Tame Tantrums

A DOCTORAL STUDENT'S RESEARCH BREAKTHROUGH COULD HELP THERAPISTS BETTER MEASURE THEIR IMPACT.

By Annie Laurie Sánchez

The playdate might not happen after all. The car fills with shrieks as the unwilling toddler acrobatically arches away from the car seat. For a parent whose child has been diagnosed with a disability—any parent for that matter—it can be hard to work out what to do next.

Enter the occupational therapist. They can work with a parent to help manage the situation by suggesting a cornucopia of strategies—things to say and do that help a child resolve or avoid a tantrum, among other things. But it's hard for therapists to know for sure what's working when, and why. Without any solid benchmarks for expected behavior in specific situations, professionals can't measure the impact of their strategies against anything. Before she joined BU Sargent College for doctoral studies in the Rehabilitation Sciences program, Mary Khetani ('10) was working as an occupational therapist and struggling to gauge her impact on clients;

her attempt to solve the problem could change practice—and improve parental strategies—nationwide.

Khetani, now a newly minted doctor of science, began her work at Sargent with a close-up look at children who are supported by Part C early intervention: state-delivered services for families with kids aged 0 to 3 who've been diagnosed with, or are at risk for, disabilities or developmental delays. Her dissertation research involved reviewing information that researchers had gathered in a 10-year, 2,000-family national survey; she also conducted her own in-depth interviews with a small number of Boston-area families.

The process Khetani chose for those interviews surprised her with a breakthrough. When she started meeting families, they weren't sure how to interpret the standard, broad questions researchers typically ask. "You're not talking in the framework they're used to," says Professor Wendy Coster, chair of the Department of Occupational Therapy and Khetani's advisor. "Researchers think about models and theories, but that's not how parents think about their kids."

So Khetani, who became interested in occupational therapy as an undergraduate working at a summer camp for kids with disabilities, developed new language that parents could relate

to. She stopped asking theory-based questions about family satisfaction—"Describe for me how your child functions on a typical day"—and started asking upbeat, activity-specific questions, such as, "Tell me how you can tell when things are going great while on a playdate with your child—what are you doing and what is your child doing?" She got results.

Khetani's revised approach helped her spot specific patterns of children's—and parents'—behavior during certain activities or under particular conditions. Her findings could provide a benchmark for therapists to determine which strategies are (or aren't) likely to work and when, such as when a parent's touch and tone, interactive toys, or sing-along music will result in a car trip ringing with giggles—or wails. Successful strategies mean more children developing toward their potential, more families leading fuller lives, and more successful playdates all around.

Her doctorate awarded, Khetani plans to continue her research. Armed with family friendly questions and newly discovered patterns of behavior, she hopes to develop easy-to-use benchmarks so that therapists across the country can measure the impact of their strategies—and help more parents tame tantrums.

YOUTH WITH DISABILITIES WANT THE SAME THINGS AS EVERY OTHER TEEN—GREAT GRADES, AN EXCITING JOB, A FUN SOCIAL LIFE—BUT PHYSICAL AND SOCIAL BARRIERS OFTEN BLOCK THE WAY. A NEW PROJECT AIMS TO GIVE THEM THE SKILLS TO DEMAND A BETTER FUTURE.

By Andrew Thurston



Assistant Professor Jessica Kramer is asking teens with disabilities for their help: “They’re the experts,” she says.



Amateur photographer Sammi is planning for life at college. She hopes other youth with disabilities can “Realize that you’re not alone, that it’s OK to be different.”



Zach is big into sports—he’s a whiz with sporting stats and enjoys being “part of the community.”



Musician Katie has often been told there are some things she can’t do. Her response? “I can do anything that any other kid can.”



“Someone at school told me I couldn’t act because of my disability,” says Madeline, “and I felt really sad.” She proved them wrong, attending acting camp and picking up an award.

Advocating for the **Everyday**

Katie unpacks the Beast and lets the tiger-striped guitar rip with a few power chords. Like any other teen, she can’t resist making a little noise and there’s no way her wheelchair is going to stop her.

The high school junior wants to be a musician—at her mom’s insistence she’ll consider a psychology degree, too—and has crafted an inimitable playing style to circumvent the arms and buttons of her wheelchair. Katie holds her chords and notes from above, rather than below: “Your disability is a stupid reason why you shouldn’t be able to do something,” she says.

Katie is one of six youths with disabilities who are building a training program to help their peers recognize and confront the barriers between them and participation in everyday life. The panel is working with Assistant Professor Jessica Kramer.

Navigating the universally tricky transition to adulthood is especially fraught with obstacles for youth with disabilities. Confronted with physical and social barriers, from impassable stairs to bullying, students with disabilities have a school dropout rate twice that of other children and half will leave high school without a diploma. Even if they then find a job—only some 40 percent of those of working age do—they’ll earn thousands less than their peers. Kramer, of BU Sargent College’s Department of Occupational Therapy, says discrimination is a factor, and that many people with disabilities don’t know how to ask for the changes (which they often have a legal right to) that will enable them to join in with school, work, or community activities.

“Teenagers go from being taken care of or protected by professionals and other adults to needing to advocate on their own,” says Kramer, who’s also working on an assessment tool to help track changes and growth in children with autism. “All of a sudden, you, as the person with the disability, have to be able to say, ‘I need access; this is not working for me; this is what I need.’”

Most don’t know where to start. “The medical model of the view of disability is still in existence,” says Youth Transition Specialist Stacy Hart of the Boston Center for Independent Living and a consultant to Kramer’s youth panel, “that model of helping people with disabilities, curing people with disabilities.”

The youths working with Kramer are focusing on changing the environment, not themselves. They meet regularly, mostly in pairs, to discuss, write about, or photograph their experiences and frustrations—the “common things that suck,” says panel member Yishai, like when “PE teachers tell you that scorekeeping or refereeing is participation” or when pessimistic doctors constantly tell him “to be cautious, that I can’t do things.” The group also shares success stories: For Yishai, it’s creating new game rules so he can play alongside his classmates; for Katie, it’s asking her music teacher about a new playing style so she can dream of rock ‘n’ roll fame. These stories, in turn, inspire the games, videos, and other learning activities that will form a curriculum designed to teach other youth with disabilities strategies they can use to help themselves. The strategies could cover anything from how to ask for a modified college room to tips on how to tell a teacher about a bully.

The panel, which includes teens with both physical and cognitive disabilities, is scheduled to finish work on the training program in 2010, with a pilot implementation slated to follow.

The youths are considered coinvestigators on the project—unofficially for now—but Kramer admits it took them a few sessions to feel comfortable with the title: “They’re used to taking directions from adults,” she says, “and they hadn’t quite realized how much influence they could have over this project.”

According to the former deputy director of the federal Office on Disability, Eileen Elias, it’s a “paradigm shift” from thinking of youth as research *subjects*: “It’s what people with disabilities are asking for: ‘Do it with us, not without us,’” says BU Sargent College Adjunct Professor of Disability Advocacy Elias. “They know what they need and they know what they don’t need, and they don’t need a professional telling them.”

Kramer is aware that teaching people how to dictate their own care and ask for environmental changes may upset some fellow occupational therapists. “We maintain the idea that we have the expertise,” she admits, but thinks the profession should benefit: “Schools have a shortage of rehabilitation professionals. They also have high caseloads and a very limited amount of time with the youth, so we’re purposely making this a group intervention.”

Occupational therapists, she adds, should think about how they can transmit their knowledge to people with disabilities, “rather than just doing it for them.”

Before starting this project, Kramer and her research assistants, Michelle Mermelstein (’10) and Sarah Olsen (’10), reviewed reams of existing data and found that including youth led to consistently better outcomes: “When kids are

“YOUR BODY MIGHT BE A LITTLE BIT DIFFERENT FROM MOST PEOPLE’S, YOUR MIND MIGHT WORK IN A DIFFERENT WAY FROM MOST PEOPLE’S, BUT YOU HAVE THE RIGHT TO ACCESS AND HAVE THE SAME OPPORTUNITIES AS EVERYONE ELSE.”

JESSICA KRAMER

involved in making decisions about the accommodations they get, the accommodations work better,” she says.

And the kids aren’t asking for much. Kramer’s young coinvestigators all want the same things as any teen: a fun social life, the pick of any college, a career as a rock star.

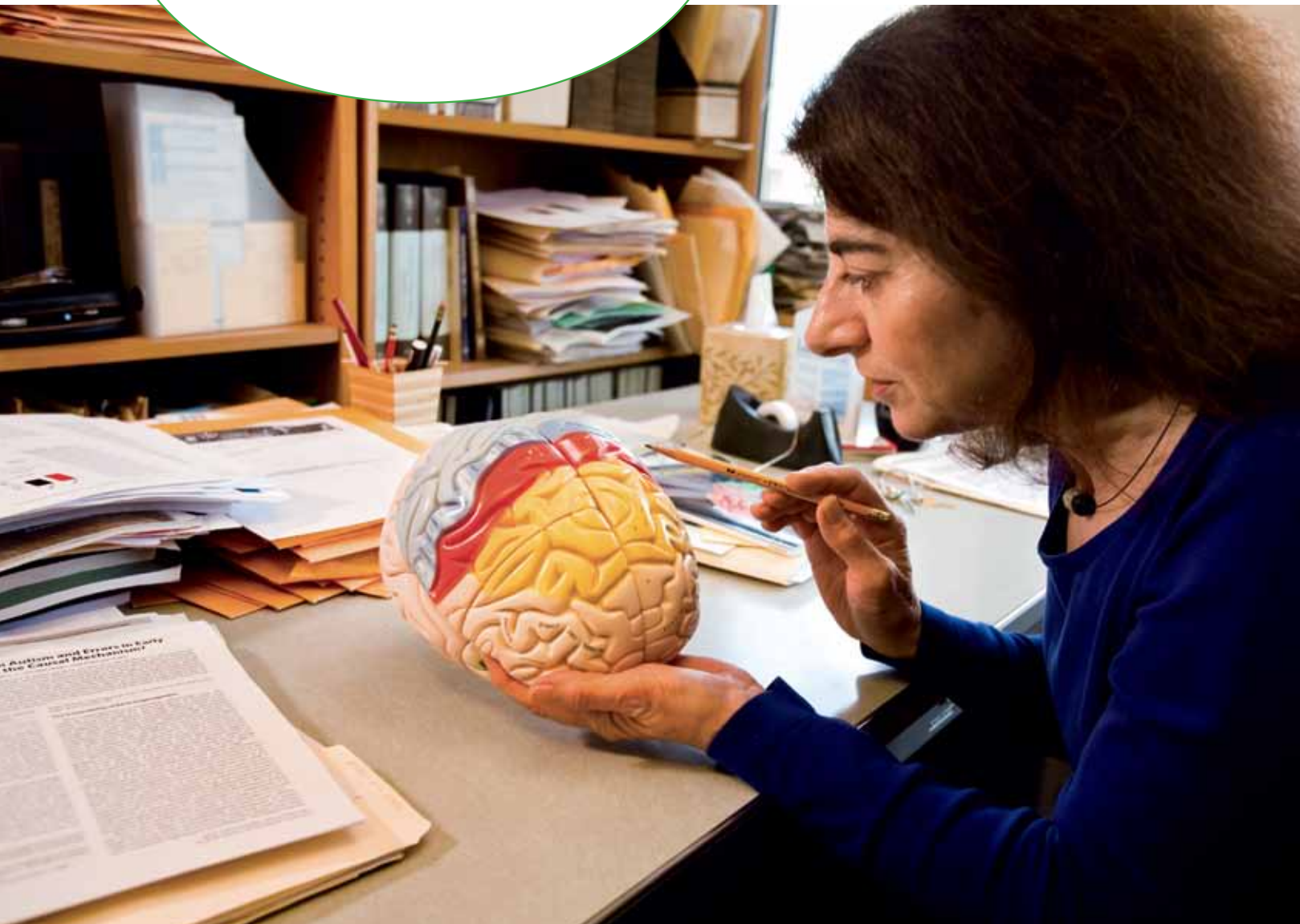
“It’s giving youth the knowledge that they’re not the problem,” says Kramer. “Your body might be a little bit different from *most* people’s, your mind might work in a different way from *most* people’s, but you have the right to access and have the same opportunities as everyone else. Whether or not you choose to take those, that’s up to you.”

Katie has made her choice and it involves a tiger-striped guitar—she’s going to make as much noise as possible. Another typical teen ready to ignore sensible parental suggestions for as long as she can.

BY STUDYING THE WAY OUR BRAINS TRANSFORM AN INSTINCTIVE EMOTION INTO A CONSIDERED ACTION, NEUROSCIENTISTS ARE OPENING UP NEW TREATMENT OPTIONS FOR EVERYTHING FROM AUTISM TO SCHIZOPHRENIA.

By Tricia Brick

Rethinking Thought



Photograph © Paula Lerner, 2010

As we go about our daily lives, our brains are flooded with information. Our eyes take in everything around us. We are bombarded by sounds and smells. We feel the temperature of the air, the clothes against our skin, minor aches and pains. And the outside world isn't the only source of data: the limbic system, a network of relatively primitive structures deep within the brain, provides emotional and experiential context for this sensory input.

Processing all of this information is the prefrontal cortex, the foremost area of the cerebral cortex. Like an air-traffic controller, the prefrontal cortex sorts and synthesizes huge amounts of input, separating the essential from the nonessential to determine what actions need to be taken. In BU Sargent College's Neural Systems Laboratory, Professor Helen Barbas and her colleagues are studying the communication system that enables this filtering to take place. They are mapping the circuitry of the brain from the level of neurons and neurotransmitters to the system of pathways that link the many discrete areas of the prefrontal cortex to one another and to other brain areas. "These areas act in concert to help us solve the problems of everyday life, from small to large,"

< The pathways that send signals darting across our brains could hold the key to understanding psychiatric conditions, according to Helen Barbas.

Barbas says. "Each receives input from other areas in a system of pathways. We are trying to understand how these pathways are organized—and how they may be disrupted in disease." The proper functioning of these pathways allows us to stay focused enough to follow the thread of a conversation or even a train of thought, for example, by tuning out the chatter in a noisy coffee shop so we can focus on the person we're conversing with. These pathways also aid in decision-making, enabling us to formulate a quick and appropriate response to a stimulus—an ability which is particularly important when we must identify and respond to some kind of danger. Barbas offers an example: You are walking down a poorly lit street at night and see something moving up ahead. How do you react?

In determining what action to take, your brain must figure out what the movement *means*. To do so, your prefrontal cortex needs to resolve the emotional danger signal of a potential threat lurking in the bushes with the rational knowledge that what you are seeing is most likely only some shrubbery blowing in the wind. "It used to be thought that thinking and emotions were separate, but we know from the pathway studies that they are not. They are very intricately synthesized in the prefrontal cortex," Barbas says.

Her research is illuminating how the brain carries out this kind of decision-making via the intricate network of pathways connecting highly specialized brain areas. For example, the orbitofrontal cortex is a heavily connected region of the prefrontal cortex that synthesizes data from the brain's sensory centers with contextual information from the amygdala, the brain's emotional center. Also linked to this pathway is another prefrontal area, the anterior cingulate cortex, a part of the limbic system that is richly connected with prefrontal areas known to be involved in determining where our atten-

tion should be focused at a given moment. Should you continue to daydream about your weekend plans, or should you be concentrating on that shadow in the dark?

"We're beginning to see how the brain can direct our attention to something that becomes important and then, if that changes, to shift attention to something else," Barbas explains. That flexibility is key: Once the brain determines that the shadowy figure is likely just a bush blown by the wind, healthy people with this circuitry intact can relax and continue with their walk.

But when something goes wrong with these neural pathways, even ordinary decision-making can become a difficult task. "You have activation in these brain areas in anxiety disorders—in people who have phobias, panic disorders, PTSD," Barbas says. "If those pathways are partially disconnected, the activity of the amygdala, which has to do with emotion, might be unchecked. So you have a disconnect about the significance of the stimulus, and you're anxious all the time."

Her laboratory's study of this and other neural pathways holds the promise of offering insight into a number of psychiatric conditions, from anxiety disorders to autism and schizophrenia. New information about how the neurons communicate—what neurotransmitters they use, whether the neurons are inhibitory or excitatory—can be used in the development of pharmacological or other treatments targeting specific systems affected in psychiatric disorders such as depression or obsessive-compulsive disorder. The research can also help clinicians rethink established treatments. For example, older people who have trouble following conversations amid background noise, as in a crowded restaurant, are often given hearing aids. But Barbas's research suggests that the problem may not be in their ears at all. Rather, prefrontal cortex dysfunction accompanied by the mild cognitive decline associated with aging can cause people to have difficulty filtering the signal from the background noise. (You can read about research on helping people hear in noisy environments on page 12.)

"Every time we design an experiment, we have the big picture in mind," says Basilis Zikopoulos, a research assistant professor in the Neural Systems Laboratory. "So we're thinking, 'How does a specific function affect the brains of schizophrenics? How are repetitive behaviors manifested in autistic people?'"

It is becoming clear that our higher brain functions are not based in isolated locations of the cerebral cortex but instead require the coordinated activity of many areas processing information simultaneously. The research of Barbas and her colleagues is providing fundamental insight into how this cooperation works and how clinicians might respond to the many diseases in which the brain's communication system is disrupted.

Additional reporting contributed by Paula Lerner.



Take a tour of the brain's highways, and BU's Neural Systems Lab, with Helen Barbas at www.bu.edu/sargent/features/professor-helen-barbas.

WHY ARE NOISY ROOMS SO
CONFOUNDING FOR PEOPLE
WITH HEARING LOSS, AND WHAT
CAN BE DONE TO HELP THEM
MAKE SENSE OF THE DIN?

By Corinne Steinbrenner



HEARING IN A NOISY WORLD



If you're among the 38 million Americans with some form of hearing loss, you know the scenario all too well: You have no problem listening to a friend when you're talking one-on-one in a quiet room, but move that same conversation to a busy restaurant or a lively party, and suddenly you can't follow a word your friend is saying. You may even be among the many who find noisy situations so frustrating that you avoid social gatherings altogether.

The difficulty people with hearing loss can have in noisy environments is sometimes called "the cocktail party problem." It's the problem Professor Gerald Kidd is trying to solve.

A specialist in psychoacoustics (the study of the perception of sound), Kidd aims to understand why people with hearing impairments have so much more difficulty in complex listening environments than other people and, ultimately, what can be done to help them. It's a tricky problem to study, Kidd says, because focusing on a specific voice in a noisy room is a complicated task that humans accomplish using a wide variety of cues, from the sound of the voice and the location of the speaker to the meaning and context of the speaker's words.

To understand what happens in human ears—and brains—in these complex situations, Kidd and his research associates design experiments to isolate and study specific components of the listening task. Kidd conducts much of his research in the Sound Field Laboratory at BU Sargent College (see "Something to Shout About," page 14, for a glimpse into the lab) and invited me to visit so I could experience a typical experiment firsthand: How would I fare when confronted with the cocktail party problem?

I step into a large booth and sit in a chair facing an array of five loudspeakers. A staff member at the lab tells me to listen for the instructions that begin with my call sign, "Baron."

During the first round of the experiment, I hear three similar-sounding female voices all coming simultaneously from the middle loudspeaker. The voice I'm trying to listen to says, "Baron, go to red five now." At the same time, a second voice says, "Eagle, go to blue three now," and a third voice says, "Charlie, go to green seven now." I tentatively press the "red" button and then the "five" button on my handheld device, not entirely sure I've got it right. The situation repeats several times with different color and number commands and with the target and competing voices set at different volumes. Sometimes I can decipher the target voice; sometimes the other voices drown it out and I just guess at which buttons to push.

During the second round, the experiment is the same except that, this time, the sounds are spatially separated: The target voice comes from the loudspeaker directly in front of me, while the competing voices come from speakers off to my right and left. This round is easier. Now that I can focus on a specific loudspeaker, I can pick out the target voice much more often.

When researchers in his lab originally conducted this experiment, Kidd explains, they repeated this scenario hundreds of times with research subjects of normal hearing ability and with subjects with hearing loss—with and without their hearing aids. The researchers varied the distance between the loudspeakers and the acoustic conditions of the booth, adding Plexiglas panels to the walls to create reverberations. The study was designed to help Kidd and his colleagues better understand how our ability to untangle a jumble of sounds is affected by the distance between the sound sources. Among the things they found, Kidd says, is that people with hearing impairments benefit much less from spatially separating the sounds than people with normal hearing do.

Spatial separation is just one piece of the hearing puzzle Kidd has explored. In study after study, he has experimented with the pitch, timing, speed, intelligibility, and other aspects of sounds, gradually building his understanding of the many components involved in hearing in noisy environments—and how that complex process breaks down for people with hearing impairments.

Barbara Shinn-Cunningham, director of graduate and undergraduate studies at BU's Department of Cognitive & Neural Systems, says Kidd's work is critical for engineers >>



"IT'S ALL VERY COMPLEX. EVERY TIME YOU THINK YOU KNOW SOMETHING, THERE'S AN ASTERISK, AND THERE ARE TWO OTHER QUESTIONS YOU FEEL YOU NEED TO ANSWER."
GERALD KIDD

SOMETHING TO SHOUT ABOUT



Professor Gerald Kidd is the director of BU's Sound Field Laboratory, a research facility housed at Sargent College and funded by the National Institutes of Health that brings together members of the hearing research community from across the University—and around Boston.

While most psychoacoustics research on campus is done in small booths where subjects wear headphones, the Sound Field Lab includes a 13-foot-long by 12-foot-wide steel booth where researchers conduct experiments using loudspeakers, and where they can change the booth's acoustics by covering the walls with Plexiglas to create echoes or with sound-absorbing polyurethane foam to create a nearly anechoic environment. The booth is the only such research space in the Boston area, says Kidd, and is used by researchers from BU Sargent College, the College of Arts & Sciences' Department of Cognitive & Neural Systems, and the Department of Biomedical Engineering, as well as from industry and other Boston-area universities.

In addition to being an invaluable technical resource, Barbara Shinn-Cunningham, a BU professor of biomedical engineering and cognitive & neural systems who specializes in acoustics and hearing, says the lab "is a community builder." Students from various departments interact with one another at the lab, gaining exposure to other academic disciplines and their varying approaches to similar problems, she says.

"People share software, techniques, ideas, findings," adds Kidd. "The lab has helped build substantial acoustics communities here at BU and in Boston."



Researchers in Sargent's Sound Field Lab often recruit students from across campus to test their experiments. Here, Samantha Amick, a senior at BU College of Communication, confronts the cocktail party problem via five speakers (one hidden).

>> trying to build better hearing aids. Today's hearing aids, she says, don't help much in noisy environments. "If you understood what the brain needs in order to separate sounds," she says, "you could do things like build a smart hearing aid that preprocessed sound," sending only the most important sounds along to the brain and thereby easing the burden on the brain.

Such sophisticated hearing aids are still in the "science fiction phase," says Kidd, because—as his research constantly reveals—the process humans go through to selectively attend to one sound while ignoring a cacophony of others is difficult to understand, let alone to duplicate.

"It's all very complex," Kidd says. "Every time you think you know something, there's an asterisk, and there are two other questions you feel you need to answer.

"When you have the brain involved, you shouldn't expect that the answers are going to be simple and easy. They're going to be very complicated. That's why you have to study them as carefully as you can."

Student Experience

Healthy Eating 2.0



A STUDENT-BUILT SMARTPHONE APP SHARES HEALTHY EATING EXPERTISE IN A COUPLE OF CLICKS.

By Rachel Johnson

Do you listen to all the nutrition advice out there? The contradictions, backtracks, and reversals can set your head spinning. The near-impossibility of getting a straight answer on healthy eating encouraged Larry Istrail ('09, '10) to help develop an iPhone app to cut through the bad science and give users a simple, clear idea of their own food intake.

PhotoCalorie is a free food journal for Apple's iPhone that calculates a meal's nutritional information and records eating habits. Istrail started work on the app during a summer 2009 research project with Harvard Medical School Research Associate Mark Boguski.



Although nutrition apps are common, Istrail says PhotoCalorie's simplicity gives it a competitive edge. "For a lot of other apps," he says, "you have to search for each item; it's very tedious, and we wanted to eliminate that." Users type a meal in one line ("poppy seed bagel, cream cheese, iced coffee") and the app, which fellow BU alum Vince Fusaro (ENG'05, '09) helped to program, tallies the meal's nutrition: calories, protein, fat, and carbs. Rival programs don't have PhotoCalorie's Google-like search component. The photo aspect is also unusual.

"You take a picture of the food as a way of personalizing your journal," says Istrail, who used the U.S. Department of Agriculture's nutrient database to compile the extensive food list that powers the app. "A lot of people have told us that they just take the pictures, that's it, and they have a visual food journal."

Istrail also runs the PhotoCalorie blog, dispensing timely nutritional news and tips, and offering a science major's take on the latest dietary trends.

His interest in seeking out the truth behind ever-changing healthy eating advice was encouraged in Associate Professor of Nutrition Paula Quatromoni's Nutritional Epidemiology class. Quatromoni says nutrition is such a hot topic right now that more people are seeing it as a career path. And she says that students need to understand the truth behind these studies because there is so much confusion.

Healthy eating? There's an app for that, thanks to Larry Istrail. He helped develop PhotoCalorie while studying at Sargent College.

"Any tool that helps people increase their awareness of their personal habits ... has the potential to shift behaviors," she says. "The average person has difficulty identifying reputable sources of nutrition information and distinguishing fact from fiction. On the web, in magazines, on TV, and in the aisles of health food stores, it is easy for consumers to be misled and fall prey to false hope."

Istrail is optimistic the app will make it easier to get nutrition facts into the open and help inform some of the millions of people who suffer from nutrition-related health problems. With the app picking up new users every month, Istrail plans to go to medical school and then focus on research full time. "If you can do a good study that is novel and actually shows something," he says, "you can change the world; you can influence billions of people."

WEB Extra

Watch Larry Istrail demonstrate PhotoCalorie—and find out how to download the free app—at www.bu.edu/today/node/10524.

NEARLY ONE-FIFTH OF UNDERGRADUATES HAVE CONSIDERED SUICIDE, BUT MANY DON'T KNOW WHERE TO TURN FOR HELP. BU'S SUICIDE PREVENTION PROGRAM TRAINS THEIR PEERS TO SPOT THE DANGER SIGNALS.

By Jennifer Burke

Helping Students in Distress



Two-thirds of students battling depression turn to their peers for help. The "BU Secret" campaign aimed to raise awareness of mental health issues on campus.

The students let go of their deepest secrets in a very public way, their innermost thoughts emblazoned on gaudily decorated postcards and pinned to campus bulletin boards. "I am absolutely terrified my friends will leave me," admitted one. "I feel like a fraud," said another.

Along with nearly 1,000 others, they were taking part in BU Secret, a project sponsored by the student mental health advocacy group Active Minds. The group distributed blank postcards, which included information about where to find counseling on campus, to all students, asking them to write a never-before-revealed message and return the card—all with the promise of anonymity.

Unfortunately, worrisome numbers of college students let their secrets fester. It's a problem compounded at many schools, particularly larger ones, because students don't always know where to get help, says Adjunct Assistant Professor Dori Hutchinson, an advisor to Active Minds. Hutchinson is a coinvestigator for the BU Suicide Prevention Program, a federally funded research grant to raise awareness about mental health issues and train students to help their peers.

While suicide is thankfully rare at BU, there are more students using support services. "And that really echoes what is happening around the country at other colleges, which is why there is this funding," explains Hutchinson. The reason for the increase? Hutchinson, who is also director of services for BU Sargent College's Center for Psychiatric Rehabilitation, believes that students are experiencing greater stress in a variety of forms. Certain groups are particularly vulnerable: international students, minority students, athletes, gay/lesbian/bisexual/transgender students, and members of sororities and fraternities.

"When stress isn't attended to, people reach a point where they feel that suicide is an option. We want to shift the culture here so that people don't ever reach that point," Hutchinson says. It's why she advocates that mental health promotion play a key role in the prevention of suicide: "There's a lot of stigma; there's a lot of discrimination and prejudice around seeking help when you're in trouble on campus. It's seen as a weakness," she says. But with suicide being the second leading cause of death among college students, this is a problem that cannot be ignored; Hutchinson adds that according to the Suicide Prevention Resource Center 15 percent of graduate and 18 percent of undergraduate students have seriously considered attempting suicide in their lifetimes.

By offering education and promotional campaigns and opening up communication among mental health services, substance abuse services, faculty, staff, students, and families, the Suicide Prevention Program hopes to target those student groups believed to be at higher risk. The University's many care providers recently launched a frank new website, www.bu.edu/mentalhealth, which includes video of students discussing how they have struggled with anxiety, self-harm, sleep disorders, and other issues. Their common message? "I got help." The site provides a much-needed resource to parents, who are often unsure of what steps to take when they suspect their children are distressed.



"WHAT WE PROPOSED WAS TO HELP STUDENTS DO WHAT THEY'RE ALREADY DOING, BUT TO DO IT BETTER—WHICH IS TO LISTEN REALLY WELL WITH EMPATHY AND THEN HELP THEIR PEERS SEEK SUPPORT ON CAMPUS."
DORI HUTCHINSON

But those who can be most valuable to students in distress are their peers. "We know from the national data that kids don't seek services, they seek each other," says Hutchinson. She points to national figures that show 44 percent of college students have felt so depressed during the academic year that they found it difficult to function. Of those students, two-thirds approached their friends for help—not adults or on-campus resources. These students, therefore, need to be armed with the appropriate skills.

As part of the Suicide Prevention Program, Hutchinson launched a program to train students how best to respond to a friend in need. Student Support Network training began in 2010 with two pilot groups of a dozen students who took part in 6 one-hour training sessions.

"We're helping students do what they're already doing, but to do it better—which is to listen really well with empathy and then help their peers seek support on campus," Hutchinson says. "We're not training them to be care providers or health ambassadors; we're training them to be good listeners and good referrers."

"I think one of the biggest parts of the training is to get kids to avoid doing what seems natural, which is to try to fix the problem right away or diminish it," says Director of Development at the Center for Psychiatric Rehabilitation Larry Kohn, one of the network's trainers.

The students were nominated by faculty based on their demonstrated willingness to help others—students whom Kohn describes as being leaders in character. Julia Bantimba ('11) was one of them: "We were all able to open up a lot about our own lives and learn from one another," she says. "We found that we tended to quickly offer solutions like, 'If I were you, I would...' We learned to just listen and let the person talk."

The training has since been offered to students from across BU. The aim is to ensure that students no longer have to suffer in silence and can develop into healthy, resilient adults.

The BU Suicide Prevention Program received a Garrett Lee Smith Campus Suicide Prevention Program grant from the Substance Abuse and Mental Health Services Administration of the U.S. Department of Health & Human Services.

Additional reporting contributed by Susan Seligson.

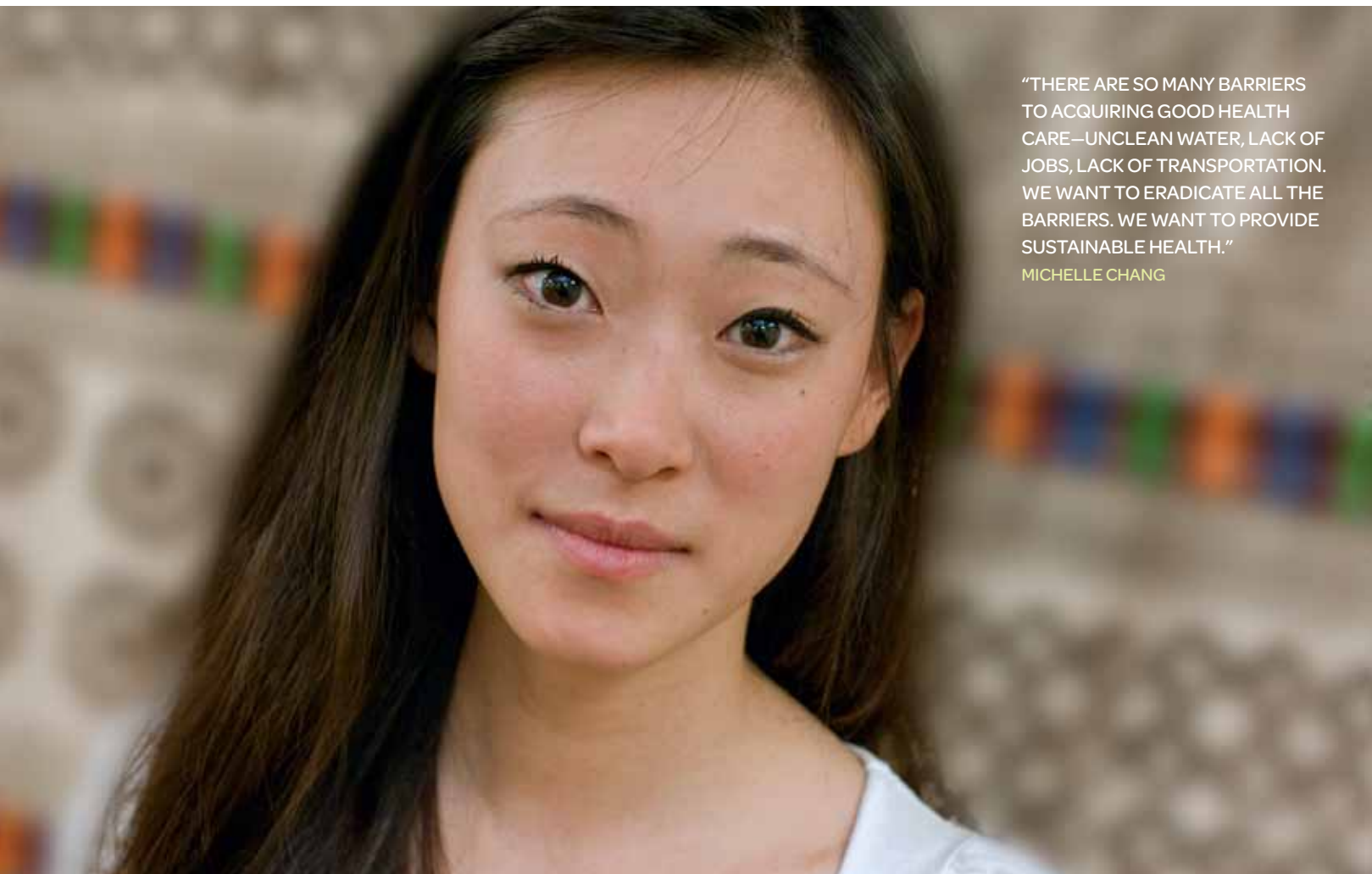


Shhh! Read other BU Secret postcards and learn more about the campaign at www.bu.edu/today/node/10747.

WITH A NONPROFIT FOUNDED BY A BU SARGENT COLLEGE STUDENT ON ITS SIDE, THE SMALL AGRICULTURAL TOWN OF KITALE IN WESTERN KENYA DOESN'T HAVE TO FIGHT ITS HEALTH CARE CRISIS ALONE.

By Sheryl Flatow

Attacking a Crisis in Kenya



"THERE ARE SO MANY BARRIERS TO ACQUIRING GOOD HEALTH CARE—UNCLEAN WATER, LACK OF JOBS, LACK OF TRANSPORTATION. WE WANT TO ERADICATE ALL THE BARRIERS. WE WANT TO PROVIDE SUSTAINABLE HEALTH."

MICHELLE CHANG

Michelle Chang launched Ambassadors for Sustained Health to address immediate health concerns and their root causes in Kenya.

Michelle Chang ('10) cannot abide human suffering. That may be true of most people, but Chang is a rarity: altruistic and tenacious, fiercely determined to effect change.

In the summer of 2007, following her freshman year at the BU College of Arts & Sciences, Chang participated in service trips to Bangladesh and Cambodia, where she was placed with hospital groups that needed extra hands. She spent a few weeks assisting doctors and handing out antibiotics and vitamins. "And then we walked away," she says. Concerned about what happened after they left, Chang made a decision. "If I wanted to continue overseas service and help the underprivileged, I had to be a doctor."

Before the start of her junior year, Chang transferred to BU Sargent College and changed her major from biology to human physiology. She also took another trip, this time to Kenya, where she volunteered at a hospital. "I wanted to learn more about hospital systems in impoverished countries, in order to determine what kind of doctor to be and how to approach health care in that kind of setting." She stayed for two months, accompanying doctors and nurses to slums and villages, handing out medicine, and removing chiggers—parasitic arthropods—from people's feet. "I would go back to these same slums, and see the same people, with the same diseases, in the same tattered clothes. The chiggers would return, because these people had no shoes and no floors. And I thought, 'I'm not really doing anything.' It broke my heart. I decided that I couldn't return until I became a doctor. I promised to send money, and said, 'I'll be back in 10 years.'"

But when she returned home, Chang couldn't stop thinking about Kenya. "And then it hit me one day," she says. "I didn't have to wait 10 years. I could go back and take professionals with me."

That was the beginning of Ambassadors for Sustained Health (ASH), a nonprofit organization founded by Chang that aims to focus on one specific, impoverished community—Kitale, in western Kenya—and address immediate health issues, as well as their root causes. "There are so many barriers to acquiring good health care—unclean water, lack of jobs, lack of transportation," says Chang. "We want to eradicate all the barriers. We want to provide sustainable health, and use all of our resources in a multidisciplinary, holistic, grassroots approach over an indefinite period of time."

Chang says that her Sargent experience has been invaluable in helping her focus on her goals. When she was writing her business plan for ASH, she was guided through the process by Health Sciences Clinical Instructor Shelley Brown; Chang also took a class in international public health. "I am so grateful for the opportunities that Sargent has provided me," she says.

Although Chang took the initiative to work overseas before attending Sargent College, there are more than 70 study-abroad options at BU that permit students to earn credits. And more international opportunities are being developed.

For Chang's graduating class, clinical experience was an option; it is now a requirement. "It's so clear that their real-world experience helps them see things in a new way when they're back in class," says Clinical Associate Professor and



Average life expectancy in Kenya is 59 years—Chang (second from right with other health care workers) hopes to improve health care in the country. Kenyan street and group photos courtesy of Michelle Chang.

Human Physiology Program Director Judith Schotland. "And our classes prepare them before they go off into the world. They arrive there with a solid background in human physiology, and having learned such hands-on procedures as applying electrocardiogram electrodes and recording the EKG, and taking blood pressure."

At her graduation, Chang received a Twiness Award, which recognizes "seniors who exemplify the ideals of service, loyalty, thoughtfulness, and excellence of scholarship." She then returned to Kenya, delaying medical school for a year. Under the auspices of ASH, she was joined by a group of students—mostly from BU—and young professionals. "For our first year we want to go from house to house and do something like a health census," says Chang. "Then our organization will have measurable data." Other urgent concerns include combating malaria with proper medication, and establishing a microfinancing program that will enable villagers to create jobs. A team of architects from the Boston chapter of Architecture for Humanity is among the experts traveling with Chang and is seeking to create a model for better flooring and roofing. "We want to empower native community members and the native hospital, so that they can sustain these measures when we leave," says Chang.

"Michelle is amazing," says Schotland. "She has done this on her own. Her international experiences have profoundly influenced her own career goals, and her energy has influenced many of her peers."

Chang says that as a result of her work abroad, she is leaning toward a career as a surgeon. "Surgery really appeals to me because it's attacking the problem," she says.

WEB Extra

Watch a student from Ghana talk about her mission to prevent the spread of HIV/AIDS in her homeland at www.bu.edu/sargent/features/karen.

COOKING LESSONS FOR PATIENTS WITH BRAIN INJURIES. AFTER-SCHOOL PROGRAMS THAT HELP TEENS CONNECT WITH SOCIETY. STUDENTS ARE FINDING FUN, INSPIRING, AND PRACTICAL WAYS TO GIVE BACK.

By Sheryl Flatow

Giving Back to Boston



Vanessa Lau (left) and Jennifer Grasso taught real-life skills, from laundry to cooking, to people with brain injuries.

It sounds like a typical conversation between friends. “I had a really bad day today,” says one girl. “What happened? Can you tell me about it?” responds the other.

But there was nothing ordinary about this particular exchange. It took place at TILL (Toward Independent Living and Learning) Trase, an after-school program in Boston’s Hyde Park neighborhood for adolescents with developmental disabilities. The young woman showing concern had a history of behavioral challenges, including an unwillingness to participate with others. The fact that she reached out to another person “is just one example of how we saw an improvement in members of our group,” says Carolyn Rosca (’09, ’11), who, along with Danielle Angueira (’11), planned and ran a group designed to facilitate social interaction in high-functioning young people ranging in age from 12 to 21.

This encouraging moment is just one indication of the impact that BU Sargent College’s occupational therapy students are having through the Group Leadership Experience (GLE) program. During their final semester, students team up, usually in pairs, to co-lead a weekly occupational therapy group in a community setting. It’s an opportunity to implement all they’ve learned in the master’s program. “We had 47 students in 23 settings during spring 2010,” says Clinical Professor Ellen Cohn. “It’s a capstone experience for them. The students develop a tremendous sense of competence and self-efficacy because they see that they can design an intervention and lead a group.”

The 2010 cohort worked with people of all ages, in groups ranging in size from two to 15, in a variety of locations and programs. Two students led a group for adolescents with an autism spectrum disorder, facilitating social interaction while exploring the Museum of Science, Boston. Another pair volunteered at Let’s Get Movin’, an after-school program in East Boston, where they worked with 8- to 10-year-olds at risk for obesity. At an inpatient rehabilitation center, students used a combination of sports and trivia questions to address the physical and cognitive needs of adults who had experienced a stroke.

“The clients who participate in these groups greatly benefit from them,” says Cohn. “They are able to make some changes in the way they structure their daily life. The agencies benefit as well, because the students are providing a very structured group experience. It’s theory-driven and evidence-based. The supervisors receive a copy of their group protocols, and the community agencies can, and sometimes do, replicate the protocol to run the group themselves.”

At TILL Trase, Rosca and Angueira worked with up to eight adolescents with a variety of disorders and conditions, including Down syndrome, autism, and psychosocial difficulties. They made the decision to focus on social interaction skills, and each week focused on a specific function, such as maintaining eye contact, initiating conversation, and teamwork. “We used cooking as our theme,” says Rosca. “We decided to do healthy snack preparations, because a lot of them also have weight problems. As they were learning cooking skills, they were also learning social interaction skills.”



“THE STUDENTS ARE TEACHING REAL-LIFE SKILLS, THINGS THESE CLIENTS NEED TO BE DOING FOR THEMSELVES EVERY DAY.”

ARIEL ZWELLING

Rosca says she was learning, too. “Our biggest challenge was being able to appropriately respond to the students without being condescending,” she says. “Eventually, I realized that you just talk with them, so I learned how to interact with them on an age-appropriate level.

“Danielle and I did not know what their diagnoses were when we started—that turned out to be a good thing, because we didn’t have any preconceived notions. We got to know them on an ability level, rather than from a piece of paper. That was a very valuable lesson.”

Vanessa Lau (’09, ’11) and Jennifer Grasso (’09, ’11) also devised a cooking theme for their group, but for a different population and with a different purpose. They volunteered at Community Rehab Care (CRC) in Quincy, Massachusetts, an outpatient clinic for people who’ve sustained brain injuries. Lau and Grasso ran an open group, usually with three or four adults attending each week. “They were at different levels,” says Lau, “so Jen and I had to plan a lot to figure out how to challenge those with a higher cognitive capacity and those with a more severe impairment.”

Their cooking sessions encompassed everything from money management and grocery shopping to planning and making a meal. “Planning is something that this population has trouble doing,” says Lau.

CRC Supervisor Ariel Zwelling (’09) says that GLE students play an important role at her facility. “The students are teaching real-life skills, things these clients need to be doing for themselves every day,” she says. “So it has an impact. And the students get so much out of it, too. I think Vanessa and Jennifer both grew in terms of confidence.”

Cohn says that one of the great joys of seeing the students run a group is watching them blossom in perhaps unexpected ways. “Sometimes students who may not be the strongest in the academic environment, shine in front of a group. They have great interpersonal skills, or they’re very in tune to clients. There’s always this serendipitous learning that emerges from the situation of practice.”



Watch an occupational therapy student give back to Boston at www.bu.edu/sargent/features/shonali.



Internships prepared Danielle Berkowitz (left) and Chris Caravanos for the next steps in their clinical careers.

Getting Their Hands Dirty

PAPER EXAMS CAN'T TEACH YOU ABOUT BEDSIDE MANNER OR HOW SOMEONE WILL REACT IN A MEDICAL EMERGENCY, WHICH IS WHY EVERY HUMAN PHYSIOLOGY MAJOR AT BU SARGENT COLLEGE HAS TO MAKE THE GRADE IN THE CLINIC TOO.

By Sheryl Flatow

Chris Caravanos (10) spent most of his final semester at BU Sargent College experiencing his future.

The human physiology major interned at Massachusetts General Hospital, Boston, where he assisted in a neuroendocrinology clinical study exploring the effects of growth hormones on cardiovascular risk factors and obesity. For 20 hours each week, he did everything from manage data to interact with participants in the study to being a gofer. The internship, he believes, is a big advantage as he begins his studies at the University of Medicine and Dentistry of New Jersey.

“The great thing about this kind of experience is the human contact. Medical schools love to see that you are compatible working with your peers,” says Caravanos. “And it was great to work with individuals in the study, learning how to reassure them and keep their mood positive, because that’s something I will have to handle someday. The internship is a great head start, and definitely gives me more confidence as I begin medical school.”

Internships are now considered such an important component in the development of human physiology students that, beginning with those who were freshmen in 2009, participation is mandatory.

“Not only does the internship help them figure out what they want to do, but it also helps them figure out what they don’t want to do,” says Anna Monahan, internship coordinator. “Sargent in general is putting so much support behind clinical education for every department. It’s really important to be able to take what you’ve learned in the classroom and apply it to the real world. And the sites absolutely love us.

“The students become an integral part of their teams for three months, and they’re given important roles. That’s why they’re not allowed to do internships until they’re seniors. They have to have the proper coursework, and the maturity, to work in a clinical environment.”

Danielle Berkowitz (’09, GSDM’13), now in her second year at BU’s Henry M. Goldman School of Dental Medicine, interned there in 2009, assisting the molecular and cell biology department with research on salivary glands of mice, shadowing student dentists, and helping out when needed. She says the 10 hours she put in each week reaped enormous dividends during her first year at dental school.

“The student dentists had given me a lot of good advice, and taught me how to be prepared. So I think I felt more comfortable here than a lot of people did. When I had to assist in a clinic,

I knew what I was doing because of the internship. I’m a very hands-on learner, so that was probably the most important aspect of the internship.”

The Human Physiology program currently has about 85 community partners offering internship opportunities. Janet Staab, research physiologist for the Thermal and Mountain Medicine Division of the U.S. Army Research Institute of Environmental Medicine in Natick, Massachusetts, has been employing interns since 1991. “We conduct studies to evaluate and help improve soldier performance in different environments,” she says, “and the students work hands-on during data collection. They also get involved in data compilation and analysis.

“They require minimal training, adapt to whatever situation we put them in, and seem genuinely interested in the research. I think they’re the cream of the crop.”

WEB Extra

Watch a Sargent College student intern as he adjusts to life in the emergency room at www.bu.edu/sargent/features/scott.

Grant Awards

BU SARGENT COLLEGE RECEIVED \$8,872,280 IN RESEARCH FUNDING IN 2009–2010. HERE’S A SAMPLE OF SOME OF OUR PROJECTS AND THE AGENCIES SUPPORTING THEM.

Principal Investigator	Title of Project	Agency	Funds Awarded 2009–2010
Helen Barbas, professor of health sciences	Organization of Prefrontal Feedback Circuits	National Institute of Mental Health (NIMH)	\$457,191
	Prefrontal Anatomic Pathways in Executive Control	National Institute of Neurological Disorders and Stroke	\$402,186
	Prefrontal and Amygdalar Pathways to Memory-Related Medial Temporal Cortex	National Institutes of Health (NIH)/NIMH	\$50,706
Kee Chan, assistant professor of health sciences	IPA: MultiVISN Implementation of a Program to Improve HIV Screening and Testing	Dept. of Veterans Affairs	\$29,435
Jeffry Coady, assistant professor of speech, language & hearing sciences	Lexical Influences on Nonword Repetition by Children with SLI	National Institute on Deafness and Other Communication Disorders (NIDCD)	\$81,250
Ellen Cohn, clinical professor of occupational therapy	IPA: Culture and Communications in Hypertension Management	Dept. of Veterans Affairs	\$4,498
Wendy Coster, professor of occupational therapy	Computer Adaptive Testing of Adaptive Behavior of Children and Youth with Autism Spectrum Disorders	NIH/National Institute of Child Health & Human Development (NICHD)	\$284,375
	Development of Measures of Participation and Environment for Children with Disabilities	Dept. of Education	\$197,023
L. Clarke Cox, clinical associate professor of speech, language & hearing sciences	Hearing Acuity, Cognitive Aging, and Memory for Speech	National Institute on Aging (NIA)	\$10,253
Terry Ellis, clinical associate professor of physical therapy	Unveiling the Natural History of Quality of Life and Mobility Decline in Persons with Parkinson’s Disease	Davis Phinney Foundation	\$32,000
Marianne Farkas, director of training, Center for Psychiatric Rehabilitation	Improved Employment Outcomes for Individuals with Psychiatric Disabilities	Dept. of Education	\$849,535
	Innovative Knowledge Dissemination and Utilization for Disability and Professional Organizations and Stakeholders	Dept. of Education	\$491,473
	Research and Training on Disabilities in Rural Communities	Dept. of Education	\$25,000

Principal Investigator	Title of Project	Agency	Funds Awarded 2009-2010
Mahasweta Girgenrath, assistant professor of health sciences	A Combinatorial Strategy to Treat Congenital Muscular Dystrophy	National Institute of Arthritis and Musculoskeletal and Skin Diseases (NIAMS)	\$214,500
	Triggering Regeneration and Tackling Degeneration: A Comprehensive Approach for Treating Muscular Dystrophy	Cure CMD	\$50,000
Christine Helfrich, assistant professor of occupational therapy	Life Skills: Transitioning from Homelessness and Isolation to Housing Stability and Community Integration	Dept. of Education/ National Institute on Disability and Rehabilitation Research (NIDRR)	\$186,906
Kenneth Holt, associate professor, and Elliot Saltzman, associate professor of physical therapy & athletic training	CPS Collaborative Research, Medium: Programmable Second Skin to Re-educate Injured Nervous Systems	National Science Foundation (NSF)	\$49,787
Norman Hursh, associate professor of occupational therapy	The Boston Connects Model of Student Support: Expanding Technical Assistance & Evaluation	Boston College	\$33,879
	Boston Connects Consortium for Counseling Services: A Whole School Approach to Counseling Services	Dept. of Education/ NIDRR	\$30,000
	The Boston Connects Model of Student Support: Expanding Technical Assistance & Evaluation	Mathile Foundation	\$15,846
Dori Hutchinson, director of services, Center for Psychiatric Rehabilitation, and Margaret Ross, director, behavioral medicine, Student Health Services	Boston University Suicide Prevention Program	Substance Abuse & Mental Health Services Administration	\$95,831
Karen Jacobs, director, online programs, and clinical professor of occupational therapy	University Students and Their Notebook Computer Use—Phase II and III (Harvard/NIOSH subcontract)	Prevention/National Institute for Occupational Safety and Health Education and Research Center (NIOSH)	\$10,000
Susan Kandarian, professor of health sciences	Regulation of Gene Expression in Skeletal Muscle: NF-kB Signaling in Atrophy	NIAMS	\$342,388
	Regulation of Gene Expression in Skeletal Muscle: NF-kB Signaling in Atrophy	NIH/NIAMS	\$325,000
Gerald Kidd, professor of speech, language & hearing sciences	Central Factors in Auditory Masking	NIDCD	\$451,999
	Spatial Hearing, Attention and Informational Masking in Speech Identification	Air Force	\$216,681
	Core Center Grant—Sound Field Laboratory (Core 1)	NIDCD	\$191,384
Swathi Kiran, associate professor of speech, language & hearing sciences	Theoretically-Based Treatment for Sentence Comprehension Deficits in Aphasia	NIH/NIDCD	\$264,813
Melanie Matthies, professor of speech, language & hearing sciences	Effects of Hearing Status on Adult Speech Production	NIDCD	\$38,287

Principal Investigator	Title of Project	Agency	Funds Awarded 2009-2010
Kathleen Morgan, professor of health sciences	Dynamics of the Vascular Smooth Muscle Cytoskeleton	National Heart, Lung, and Blood Institute (NHLBI)	\$1,749,580
	Subcellular Organization of Signaling in Smooth Muscle	NHLBI	\$394,469
	Regulation of Contraction of Blood Vessels	NHLBI	\$346,679
Gael Orsmond, associate professor of occupational therapy	Impact of Parenting Adolescents and Adults with Autism	University of Wisconsin (subcontract)	\$135,351
Zlatka Russinova, senior research associate, Center for Psychiatric Rehabilitation	Advanced Research Training Program in Psychiatric Rehabilitation	Dept. of Education	\$149,995
Leher Singh, associate professor of speech, language & hearing sciences	Effects of Variability on Early Word Learning	NSF	\$84,481
Robert Wagenaar, professor of physical therapy & athletic training	Continuous Monitoring of Functional Activities in the Home and Community-Based Setting (Boston Medical Center subcontract)	NIH/NIA	\$65,000
	Continuous Monitoring of Functional Activities and Movement Disorders in Parkinson's Disease	2010 Coulter Translational Partnership Program	\$50,000
Gloria Waters, dean and professor of speech, language & hearing sciences	Assessment of Comprehension Skills in Older Struggling Readers	Dept. of Education	\$398,614
	Functional Neuroimaging Studies of Syntactic Processing (Massachusetts General Hospital subcontract)	NIDCD	\$65,885

Dudley Allen Sargent Research Fund

The Dudley Allen Sargent Research Fund helps graduate students, faculty, and alumni of BU Sargent College meet the expenses of research projects. Initiated in 1966 by the Class of 1921, and supported by contributions from alumni and friends, as well as by indirect funds from sponsored research, this fund helps foster innovation in health care research. Listed below are the 2010 recipients.

Evangeline Cornwell ('13), doctoral student	Identification of the Mechanism of Skeletal Muscle Wasting in Cancer
Karen Jacobs, director, online programs, and clinical professor of occupational therapy	A Pilot Study to Evaluate the Feasibility of the Telerehabilitation Computer Ergonomics System (tele-CES) in Addressing Computer Use Problems in Persons with Rheumatoid Arthritis
Poonam Pardasaney ('12), doctoral student	Development of a Comprehensive Balance Tool for Community-Dwelling Older Adults
Paula Quatromoni, associate clinical professor	Analytical Plan to Complete the IMOVE Study
Chaleece Sandberg ('14), doctoral student	Abstract and Concrete Word Processing in Persons with Aphasia
Stacey Zawacki, clinical assistant professor and director, Nutrition & Fitness Center	Introducing an Integrated, Comprehensive Healthy Food and Education Program to Entry-Level College Students: A Randomized Controlled Trial

OUR FACULTY'S RESEARCH REACHES AUDIENCES ACROSS THE GLOBE. HERE'S A SELECTION OF PUBLICATIONS AND ARTICLES WRITTEN BY BU SARGENT COLLEGE FACULTY DURING 2009–2010.



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Sue Berger



Sara Brown



Kee Chan



Ellen Cohn



Cara Lewis



Paula Quatromoni



Joan Salge Blake

Award-Winning Faculty and Students

HERE WE OFFER A SELECTION OF THE AWARDS AND HONORS GIVEN TO OUR FACULTY AND STUDENTS IN 2009–2010 FOR THEIR PROFESSIONAL CONTRIBUTIONS, COMMITMENT TO SERVICE, AND ACADEMIC EXCELLENCE.

CAREER DEVELOPMENT ADVANTAGE

Assistant Professor **Cara Lewis** has been named a Peter Paul Career Development Professor. The honor includes \$40,000 annually for three years to support Lewis's research.

The Peter Paul award is given to exceptional Boston University faculty with less than two years' teaching experience. Lewis says the funding will help her complete the preliminary research needed to win bigger grants.

"To obtain large grant funding, you often need to have pilot data," she says. "It shows the funding institution you can really do what you say you're going to. The Peter Paul professorship will give me more time and money to get the pilot data, so that I can compete for larger funding opportunities."

Lewis hopes the Peter Paul award will further her work on modifying walking styles to prevent later-life hip problems. You can read more about her research in "The Race for a Nimble Old Age" on page 4.

OTHER FACULTY AWARDS

Clinical Assistant Professor **Sue Berger** won BU's Outstanding Faculty-in-Residence Award and the Gerontology Book Award for Outstanding Dissertation from the University of Massachusetts Boston.

Sara Brown, director of programs in athletic training, was given the New Initiative Service Award from the NATA Research and Education Foundation.

Assistant Professor **Kee Chan** was awarded a Mary Erskine (Women in Networks) grant and a BU Center for Excellence & Innovation in Teaching Grant. Chan also completed an Institute of System Science and Complexity Training Fellowship, sponsored by the National Institutes of Health and the University of Michigan.

Clinical Professor **Ellen Cohn** received the Whitney R. Powers Award for Teaching Excellence and a Service Commendation Award from the American Occupational Therapy Association. Cohn was also given the 2010 Massachusetts Association for Occupational Therapy Herbert Hall Award.

Associate Professor **Paula Quatromoni** was invited to become a member of the Boston Obesity Nutrition Research Center. Quatromoni is also the media spokesperson on childhood obesity for the American Heart Association and an advocacy captain for the organization's *You're the Cure* obesity campaign.

Clinical Associate Professor **Joan Salge Blake** was again named the Massachusetts Dietetic Association Outstanding Dietitian and selected by the American Dietetic Association as a national media spokesperson.

OUTSTANDING SENIOR AWARDS



BU Sargent College's outstanding seniors. Front row (left to right): Molly Daniels, Trang Vu, Jacqueline Markowitz, and Julianne Cargill. Back row (left to right): Michelle Chang, Michael Meinzer, Nicole Santomauro, Amanda Frank, Larissa Sachs, Rebecca Fink, and Sara Crandall.

BERNARD KUTNER AWARD

Julianne Cargill won the Bernard Kutner Award, given to a senior with exceptional health care leadership potential.

About the winner: Julianne Cargill volunteered as a head math coach at Let's Get Ready, a higher education preparation program for low-income or first-generation college applicants, and participated in BU's Alternative Spring Break, during which students give up their vacation to join a nationwide volunteer effort. She was also an intern at a Healthworks fitness center, peer tutor, resident assistant, vice president of the BU Sargent College Honor Society, and a student representative on the College's academic policy committee.

COMMUNITY SERVICE AWARD

Amanda Frank and **Jacqueline Markowitz** received the Community Service Award for students who volunteer outside the University.

About the winners: Amanda Frank was an outreach volunteer with Project Health, a national program that places undergraduates in inner-city health clinics. She was also a personal care attendant, and worked for the Peer Health Exchange and the Massachusetts Alliance on Teen Pregnancy. Jacqueline Markowitz served as an aide for a young boy with severe disabilities, a teaching assistant, and a camp counselor. Markowitz also volunteered with Boston Home, Franciscans Children's Hospital, Perkins School for the Blind, and Royal Free Hospital, London, England.

PROFESSIONAL CONTRIBUTION AWARD

Molly Daniels, Rebecca Fink, and **Michael Meinzer** received the Professional Contribution Award, which honors students who show great professional potential through scholarship, research, clinical experience, and community programs.

About the winners: Molly Daniels gained significant clinical experience with local sports organizations, including BU Women's Ice Hockey and Boston College Football, where she supported athletes with recovery and prevention education. Rebecca Fink interned with the Walter Reed Army Institute of Research, the Association of Public Health Laboratories, and the Cambridge Health Alliance. Michael Meinzer held lab and research positions at Harvard's Judge Baker Children's Center and the Language in the Aging Brain Center at a Boston-area Veterans Affairs hospital. Meinzer was also the treasurer of the volunteer organization Global Medical Brigades, which provides relief programs in communities with limited access to health care resources.

STUDENT ACTIVITY AWARD

Sara Crandall, Nicole Santomauro, and **Trang Vu** were given the Student Activity Award, which recognizes students who make strong contributions to extracurricular activities.

About the winners: A resident assistant and tutor at BU's Educational Resource Center, Sara Crandall was also captain and president of Women's Club Volleyball at the University. Nicole Santomauro was a teaching fellow, a member of the Boston Medical Reserve Corps Flu Clinic Support team, a Boston Medical Center research assistant, and a United States Association of Independent Gymnastic Clubs team coach. Trang Vu served as an EMT, peer counselor, and orientation student advisor. She was also a human body connection interpreter at the Museum of Science, Boston, where she ran interactive activities to help promote interest in the life sciences.

TWINESS AWARD

Michelle Chang and **Larissa Sachs** were presented with the Twiness Award by an honor society first established by the Class of 1921. The award recognizes seniors who exemplify service, loyalty, thoughtfulness, and excellence of scholarship.

About the winners: Michelle Chang was a research assistant at Boston's Brigham and Women's Hospital and a summer intern in the J. Craig Venter Institute, a genomic research collaborative. She also founded a nonprofit organization to promote health care in rural Kenya—you can read more about Ambassadors for Sustained Health on page 18. Larissa Sachs was a mentor for high school students in Boston, interned at St. Vincent's Private Hospital, Sydney, Australia, volunteered at the Perkins School for the Blind, and worked in an occupational therapy practice in New City, New York.

ALBERT SCHWEITZER FELLOWSHIP



Photo courtesy of Laura Seidel

HELPING FAMILIES BUILD HEALTHY RELATIONSHIPS

The kids at Elizabeth Stone House, a support center for victims of domestic abuse in Boston's Roxbury neighborhood, have had tough lives—their formative years racked by violence, trauma, mental illness, substance abuse, and neglect.

Laura Seidel (12) has designed a program to improve their prospects and help their families build healthy relationships.

In March 2010, Seidel (above left with a child from the house) was awarded a prestigious Albert Schweitzer Fellowship, which aims to develop "leaders in service" by engaging an annual cohort of just 200 students from across the nation in yearlong community health projects. The fellows are expected to design and run their own programs alongside their regular studies.

"I really wanted to do something that would help me integrate what I'm learning in the classroom with where I see myself going," says Seidel, a graduate student in BU Sargent College's occupational therapy program.

Before she came to Boston, Seidel had spent time as a foster parent in Texas and says that seeing "young children in crisis" inspired her to work with families on a more preventative basis.

With support from her mentors at Sargent College, Seidel kicked off her fellowship with a literacy drive for the children of Elizabeth Stone House: "That's something a lot of kids struggle with," she says. "[They've] gone to many schools and a lot of their parents aren't highly educated."

She's also planning a series of low-cost outings, including visits to Boston tourist sites and local farms, "so that the families have time to be together in a positive and healthy setting."

At the end of her project, Seidel will be named a Schweitzer Fellow for Life and hopes it'll help her launch a career supporting families with early intervention programs.

BU Sargent College: At a Glance

WHO WE ARE

Students	Undergraduate	Graduate
Number of full-time students (as of spring 2010)	935	437
Average SAT	1269	n/a
Average GRE	n/a	1220
Faculty		
Full-time	59	
Part-time	49	
Alumni	13,914 in 51 countries	
Clinical Sites	1,400 in all 50 states and 4 countries	



PROGRAMS OF STUDY

Applied Anatomy & Physiology
 Athletic Training
 Health Science
 Human Physiology (Pre-Med)
 Nutrition
 Occupational Therapy
 Physical Therapy
 Rehabilitation Sciences
 Speech, Language & Hearing Sciences
 Speech-Language Pathology

SPECIAL PROGRAMS

Combined BS and MPH in Public Health
 Combined BS in Athletic Training and Doctor of Physical Therapy
 Combined BS in Health Studies and Doctor of Physical Therapy

U.S. News & World Report Best Graduate School Rankings

Our professional graduate programs are ranked within the top 15 percent in the country. Specific rankings include:

- **Occupational Therapy Program** ranked number 1 (tied) out of 152 programs
- **Physical Therapy Program** ranked number 24 out of 210 programs
- **Speech-Language Pathology Program** ranked number 25 out of 244 programs

National Certification Board Exam Passing Rates

Percentage of BU Sargent College students in entry-level graduate programs who passed the exam the first time (figures for past three years):

Nutrition	99%
Occupational Therapy	95.3%
Physical Therapy	100%
Speech-Language Pathology	100%

About Us

Boston University College of Health & Rehabilitation Sciences: Sargent College has been preparing health care leaders and defining health care leadership for 129 years. As knowledge about health and rehabilitation increases and society's health care needs become more complex, BU Sargent College continuously improves its degree programs to meet the needs of future health professionals. Our learning environment fosters the values, effective communica-

tion, and clinical skills that distinguish outstanding health professionals. The curriculum also includes an important fieldwork component, providing students in every major with substantive clinical experience. Clinical internships are available at 1,400 health care facilities across the country. The College also operates outpatient rehabilitation practices that offer a full range of services to the Greater Boston community.



Where Our Work Comes to Life

At BU Sargent College's clinical centers, everything gets connected. Our breakthrough discoveries leap from the lab to the real world; students first taste the thrill of changing a life; and the people of Boston and beyond receive one-on-one attention from tomorrow's health care leaders.

Visit www.bu.edu/sargent/clinical-centers to see how our work is changing lives—and find out how our advances could improve your health.

People who've had a stroke learn to enjoy using language again at the Aphasia Resource Center, www.bu.edu/aphasiacenter.



Players get stronger and reduce their injury risk at the Athletic Enhancement Center, www.bu.edu/aec.



The Center for Neuro-rehabilitation helps people with neurological disorders, www.bu.edu/neurorehab.



www.bu.edu/sargent/clinical-centers

The Nutrition & Fitness Center provides nutrition, health, and wellness services, www.bu.edu/nfc.



The Physical Therapy Center helps people return to activity, www.bu.edu/rehab.





Boston University College of Health
& Rehabilitation Sciences: Sargent College

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