2013–2014

InsideSARGENT

Boston University College of Health & Rehabilitation Sciences: Sargent College

THESE BONES WERE MADE FOR WALKING *AND* CLIMBING TREES

How a physical therapy professor helped solve the mystery of the early human with an ape-like foot

+

BOSTON UNIVERSITY

2013–2014

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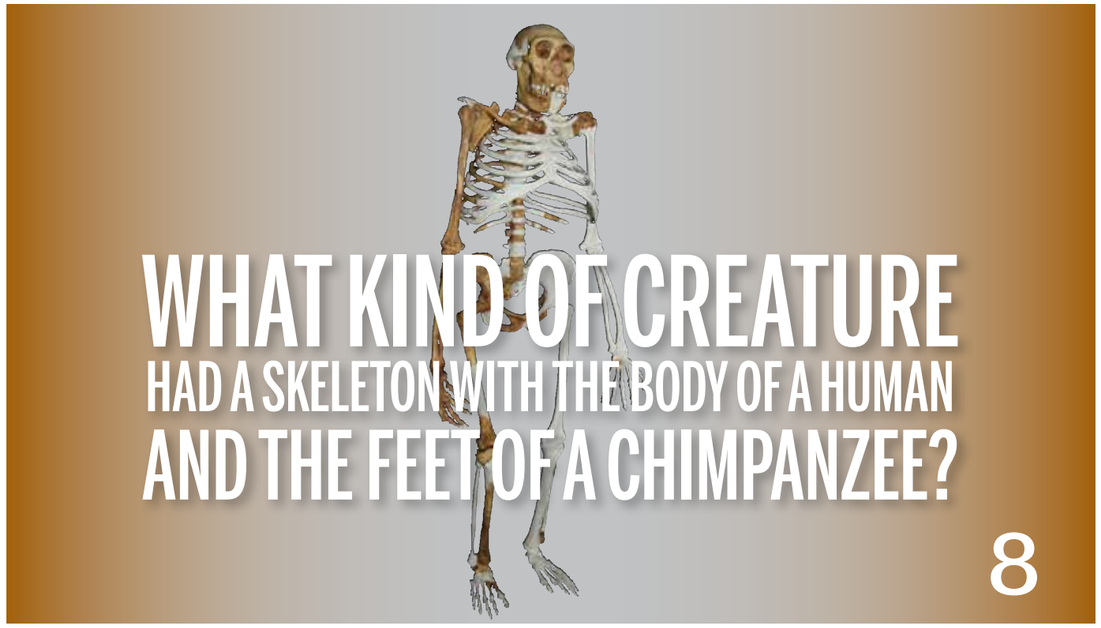
DISCOVERY



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How Early Humans Walked
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About
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Dear Friends,

It has been an exciting time of growth and transition for Boston University and Sargent College. In July 2013, I was honored to take on the Sargent deanship when Gloria Waters stepped down to assume her new role as vice president and associate provost for research for the University. In this challenging environment for funding, Gloria's leadership and experience as a researcher is an asset in exploring innovative ways to translate our research into life-changing reality. At the same time, we've continued to enhance and expand Sargent's facilities and academic offerings—introducing an undergraduate degree in behavior and health, growing our research faculty, and renovating our teaching lab space with state-of-the-art technology.

"Our work, like our world, doesn't operate in a vacuum. We're proud to be part of a broader research enterprise that spans institutions and disciplines."

Our peers and prospective students are taking notice. Sargent had a 67 percent increase in undergraduate applications for the Class of 2017 and an admission rate of just 22 percent, one of the most selective in the University. Our faculty continue to be recognized by professional associations and selected for prestigious fellowships—recent accolades include honors from the American Speech-Language-Hearing Association and the American Public Health Association. Additionally, BU joined the Association of American Universities, an invitation-only organization of leading public and private research universities in the United States and Canada.

Our work, like our world, doesn't operate in a vacuum. We're proud to be part of a broader research enterprise that spans institutions and disciplines. Consider our cover story: a physical therapy professor using his biomechanics expertise to fill in the missing piece of his former student's anthropological puzzle, leading to a widely publicized article in *Science*. Our students, too, use the knowledge they've gained at Sargent to propel them into a wide range of diverse experiences and careers. Recent graduate Kristen Wihera ('13) used the skills she learned as a human physiology major to fulfill her dream of joining the Navy as part of the highly selective Naval Nuclear Propulsion Program.

So, what's next?

In this issue of *Inside Sargent*, we feature the College's cutting-edge research: a visually guided hearing aid that amplifies sound based on eye movement, the use of brain imaging to detect the symptoms of ADHD, and a novel stroke treatment that patients can do at home using an iPad. You'll no doubt be hearing about these advances in the media soon. High-tech health care innovations of the future are being developed at Sargent College today.

I'm pleased to be a part of the exciting changes taking place at BU and Sargent, and I look forward to continuing to promote and advance our mission of research and clinical excellence.

With warm regards,

Kathleen G. Morgan

Kathleen G. Morgan
Dean ad interim and professor

THERAPY AT THEIR FINGERTIPS

AN INTERACTIVE IPAD APP ALLOWS PEOPLE WITH A SPEECH DISORDER TO CONTINUE TREATMENT AT HOME.

Robert Ziegler arrives at BU Sargent College for his weekly therapy session in a pressed shirt and slacks, with rain dripping from his nose. The 71-year-old has walked from his home in Cambridge, Massachusetts. He'd previously worked in that city, too, as a child psychiatrist and a Harvard professor, until he had a stroke that left him with aphasia. A language disorder caused by damage to parts of the brain, aphasia ranges in severity from difficulty remembering words to full loss of language. Three years ago, Ziegler began working with the Aphasia Research Laboratory at Sargent to relearn the skills he once took for granted.

Ziegler has made remarkable progress, thanks in part to Constant Therapy, an interactive aphasia therapy app that allows patients to continue their treatment at home on an iPad. Many patients require more treatment than is covered by their insurance, so Constant Therapy, which is available for download through iTunes, is reshaping the therapy field. Swathi Kiran, director of the laboratory and associate professor of speech, language & hearing sciences, developed the app with tech entrepreneur Veera Anantha and a team of BU student researchers, including Isabel Balachandran ('12), who is now Ziegler's clinician. A leader in the area of stroke and language, Kiran was recently named a fellow of the American Speech-Language-Hearing Association, one of her profession's highest honors.

At the weekly therapy session, Balachandran turns on Ziegler's iPad for his progress report. Ziegler can review his work at home on the app's user-friendly feedback screen, but prefers to

PHOTOS BY CYDNEY SCOTT

continued from previous page

have Balachandran talk him through his scores. In the last week, he has achieved a 95 percent score on his multiplication, and it's time to advance from level 1 (multiplying single-digit numbers) to level 2 (multiplying double-digit numbers by single-digit numbers). He is hesitant to leave the level in which he has gained competency, and the first new problem, 62 x 9, gives him pause. Balachandran helps him work through it, and when Ziegler finally reaches the answer, he slumps in his chair and says, "Oy."

"You're doing great!" Balachandran reassures him. And he is. Just a year ago, Ziegler was unable to add. He attributes his progress to Constant Therapy, which he uses for at least an hour every day to practice a wide range of skills, including reading maps, matching pictures by memory, and reconnecting everyday items with their names and sounds.

To develop these exercises, Kiran drew from her 12 years of experience in aphasia rehabilitation, her own and colleagues' research, and the comprehensive literature on cognitive therapy to determine the tasks that are most effective in helping those who have had a stroke recover their language and cognitive processing abilities. "Then we decided how to tweak the tasks and set them to be iPad deliverable," she says. "The app is personalized, so each person has a different set of exercises for their specific level." Balachandran can access Constant Therapy remotely to monitor Ziegler's progress, and the app sends her a report every night so she can modify his therapy as needed. "We can adapt the therapy based on what our patients want and need, and the app gives them control over their therapy," Kiran says.

"WE CAN ADAPT THE THERAPY BASED ON WHAT OUR PATIENTS WANT AND NEED, AND THE APP GIVES THEM CONTROL OVER THEIR THERAPY."
—SWATHI KIRAN

Since October 2012, 45 patients from Sargent's Aphasia Research Laboratory have used Constant Therapy on a trial basis as a part of a clinical research study, and "they see the power of it already," Kiran says. She hopes it will have even wider-reaching influence; the idea is for patients eventually to use the app as a social media device to communicate with other patients. "We are constantly connected to our friends and the larger world," Kiran says. "These individuals don't have any way to connect with other people, so the goal is for this app to become social, as well as clinical."
–Lara Ehrlich

WEB Extra
Visit **www.bu.edu/aphasiaresearch** to learn more about the Aphasia Research Lab and find links to a free trial of Constant Therapy.

BU RESTRUCTURES RESEARCH

Gloria Waters, former Sargent dean, has been appointed Boston University's vice president and associate provost for research as part of a restructuring of the University's research enterprise. Professor Kathleen G. Morgan (see her inside front cover message) is serving as dean ad interim at Sargent.

In her new position, Waters will streamline research functions, expand BU's research portfolio, and oversee the increasingly complex and challenging sweep of research administration. Waters plans to "expand the breadth and depth" of research on campus by seeking innovative funding sources. She'll also be working to nurture partnerships both within BU, where interdepartmental research projects are thriving, and outside of the University, with other universities as well as with corporations.

"A lot of the federal funding that's available requires multi-institution collaborations," with sharing of costly technology, says Jean Morrison, University provost. "Boston has a lot of possibilities for interaction," and collaboration among its major institutions is already fairly common, but the new structure "will make it easy for faculty to get engaged in multi-institutional proposals and help propel collaborations."

TOP AWARDS

Associate Professor Swathi Kiran (see above) has been named a fellow of the American Speech-Language-Hearing Association; two occupational therapy assistant professors, **Simone Gill and Jessica Kramer,** have been awarded Comprehensive Opportunities in Rehabilitation Research Training fellowships; and **Kee Chan,** assistant professor of health science, has been honored with the American Public Health Association Maternal and Child Health Section's young professional award.

KIRAN PHOTO BY KALMAN ZABARSKY

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IN PICTURES
A GLIMPSE INTO LIFE AT SARGENT

Clockwise from top left:

Eating Well Sargent Choice makes healthy eating easier at BU.

Getting Stronger The Ryan Center for Sports Medicine & Rehabilitation provides a real-world classroom.

Catch! Students can learn from research studies featuring the old, young, and very young.

Helping Boston Students learn about community needs at BCYF Blackstone, a neighborhood health center.

Don't Survive, Thrive The 2013 Dudley Allen Sargent lecturer, author Jothy Rosenberg, shares his journey from amputation to extreme sports.


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PHOTOS BY CYDNEY SCOTT (1,3,4), VERNON DOUCETTE (2), AND KALMAN ZABARSKY (5)

Hearing Aid of the Future

EYE-TRACKERS AND MICROPHONES HIDDEN IN GLASSES COULD HELP PEOPLE WITH HEARING PROBLEMS CUT THROUGH COMPETING SOUNDS—JUST BY LOOKING.

BY JULIE RATTEY

The White Stripes is one of Erick Gallun's favorite bands. But years before the rock duo officially split in 2011, he'd stopped going to see them. Gallun recalls his last, ill-fated attempt, when he was a postdoctoral fellow at BU and the band was performing in a New Hampshire hockey rink. His wife had a great time, but for Gallun, who's deaf in one ear, the experience was a bust. His right ear couldn't filter out the reverberations in the rink, making the event about as frustrating as a feedback-riddled cell phone conversation. "The concert was essentially ruined," says Gallun.

Though Gallun didn't have a hearing aid then, he doubts the one he's using now would have made much difference. But in 2012, he tested a device he believes could get him back into the rock music scene: the Visually Guided Hearing Aid (VGHA).

The VGHA can approximate or even surpass the normal human ear's ability to choose what to tune into and what to ignore. It does this by making two preexisting technologies—an eye-tracker and an acoustic beam-forming microphone array—work together to counter some of the problems in typical hearing aids. Right now, the VGHA is a lab-based prototype whose components connect via computers and other equipment, but with further development, it could become a pair of portable hearing aid glasses. Professor Gerald Kidd, a specialist in psychoacoustics (the study of the perception of sound), came up with the idea for the VGHA in 2011. He's now put it together at BU Sargent College's Sound Field Laboratory, with the help of an international research team and grants from the National Institutes of Health. As far as Kidd knows, his team, which includes Research Engineer Sylvain Favrot and Sensimetrics Corporation of Malden, Massachusetts, is the first to integrate these two technologies. And the test results are impressive: no other hearing aid, Kidd says, can do what this device can.

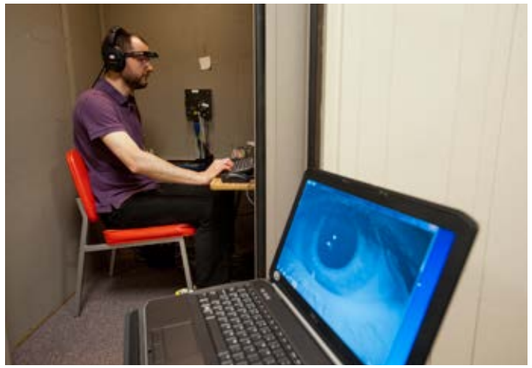
The VGHA is the latest advance in Kidd's work to solve "the cocktail party problem," in which people with hearing loss struggle to follow conversations in noisy environments. It's a big issue: nearly 20 percent of Americans age 12 or older have severe-enough hearing loss to make communication difficult, reported Johns Hopkins Medicine in 2011. Typical hearing aids may not help much in some situations, says Kidd; they amplify everything, even those voices and sounds you want to tune out. One hearing aid in development tries to fix this, says Kidd, by using the wearer's head movements to guide the aid's microphones. But this can tire the user, he says, and it's relatively slow: we can't turn our heads as quickly as we turn our attention. The VGHA addresses these problems by using eye movement (which is quicker than head movement) to steer the aid's microphones, "like an acoustic flashlight that you're shining on what you want to listen to."

Gallun, now a research investigator at the National Center for Rehabilitative Auditory Research, had the opportunity to test the VGHA as a consultant on the project—with exciting results. While sitting in a listening booth at Sargent and wearing the VGHA's eye-tracking component—Mobile Eye-XG—Gallun listened to recorded voices speaking from slightly different directions. He was told to pick out what one particular voice was saying—no easy feat with Gallun's impaired hearing, given that all the voices were speaking at once. But by looking in the direction of his cue, Gallun "told" the eye-tracker to make the VGHA's microphone component amplify the voice he wanted, thereby helping him hear what it was saying. "I'll take two!" an enthused Gallun quipped to the team. He's excited about the VGHA's potential not only for himself, but also for the veterans he works with at the Portland Veterans Affairs Medical Center in Oregon, many of whom are hearing impaired as a result of blast exposure.

Although the VGHA is still a prototype that needs further testing, Kidd hopes enthusiasm for the technology will propel its development. Interested hearing aid companies, he suggests, could make the device wearable and attractive. Kidd and Favrot also speculate that the VGHA could piggyback on emerging technologies like Google Glass—lightweight glasses whose capabilities range from projecting driving directions to responding to voice commands.

Whenever the VGHA reaches consumers, you can expect Gallun to get his hands on one. All he'll need then is a White Stripes reunion. IS

The Visually Guided Hearing Aid, says Gerald Kidd, works "like an acoustic flashlight that you're shining on what you want to listen to."



Research Engineer Sylvain Favrot wears the portable eye-tracker component of the VGHA developed with Professor Gerald Kidd (top) and other researchers.

ILLUSTRATION: KATH HARDING. PHOTOS: CYDNEY SCOTT (BOTTOM) AND CHITOSE SUZUKI (TOP)

WHAT KIND OF CREATURE HAD A SKELETON WITH THE BODY OF A HUMAN AND THE FEET OF A CHIMPANZEE?

A PHYSICAL THERAPY PROFESSOR SOLVED THE MYSTERY WITH ONE LOOK AT ITS HEEL

BY LARA EHRLICH

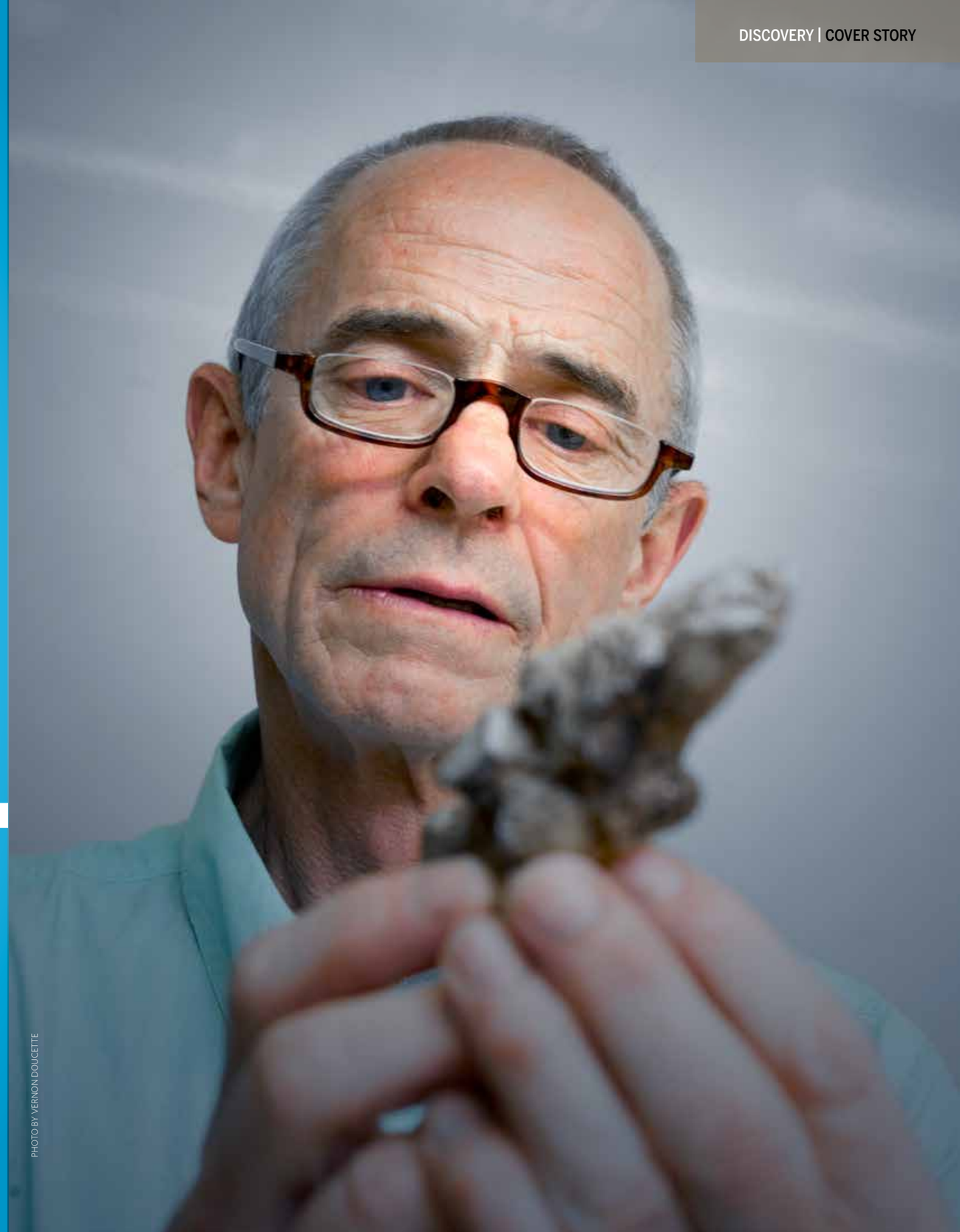


PHOTO BY VERNON DOUCETTE

The bones just weren't adding up. The human-like pelvis and spine, chimp-like torso and feet, primitive arm bones, and surprisingly modern hands belonged to a single 1.977 million-year-old skeleton that resembled no other early human ever found. Would this creature have walked like us, or climbed trees like a chimpanzee? Anthropologists were stumped—until a BU Sargent College physical therapy professor who treats the modern foot took one look at its ancient heel bone and solved the mystery.

STRANGE THINGS ARE AFOOT

Kenneth Holt ('83), associate professor of physical therapy & athletic training, was intrigued when he heard that one of his best students—now teaching at BU as an assistant professor of anthropology—would be presenting a lecture about the evolution of upright walking. It had been more than ten years since Jeremy DeSilva had taken his biomechanics class, but Holt had been telling students about him ever since.

For his final class project, DeSilva had studied the hip bone of the famous 3.2 million-year-old skeleton Lucy to determine how the forces that were operating at her hip joint allowed her to walk on two legs. "I always use Jeremy's project as an example of how you can use biomechanics to understand how bones work," Holt says, referring to the study of a living body's mechanics. "I tell my students to think of a question that they've never been able to answer, and see if biomechanics can help answer it."

Holt took a seat in the middle of the classroom, and DeSilva, who specializes in the locomotion of early humans and early apes, began his lecture by explaining the evolutionary tree. Chimpanzees and humans share a common ancestor and split into separate evolutionary paths around the time that the earliest humanlike creature, *Ardipithecine*, lived, 4 to 7 million years ago. This creature evolved into the *Australopithecine*, which lived 2 to 4 million years ago and is represented by Lucy. *Australopithecines* evolved into the genus *Homo* (2 million years ago), which developed into modern humans. Within each of these genera—*Ardipithecine*, *Australopithecine*, and *Homo*—existed multiple species with different anatomical combinations.

DeSilva paused to make sure his audience was still with him. So far, so good, and with the basics out of the way, he launched into the real subject of his lecture: the puzzling feet of the 1.977 million-year-old female skeleton that anthropologists have named Malapa Hominin 2 (MH2). This skeleton, along with at least four others, had been preserved in the bottom of a deep vertical cave in South Africa until the turn of the century, when mining explosives catapulted the fossilized bones to level ground. In a 2010 *Science* article, MH2 and her companions were named *Australopithecus sediba*, an entirely new species within the *Australopithecine* genus. MH2 is the most complete early human skeleton ever found—and also one of the strangest.

She has "a completely new combination of anatomies that frankly, prior to seeing this thing with my own eyes, I would not have thought possible in an early human. And yet, here it is," DeSilva says. "The foot is just strange. In some ways it's more primitive than Lucy's, and in some ways it's more human-like. Other parts of the foot are very chimp-like, especially the heel." While the base of a human heel bone is broad to accommodate the impact of our stride, MH2's heel bone comes to an almost beak-like point more commonly found in chimpanzees. "It was shocking to see a heel like this," DeSilva says. At the lecture held at Sargent, "I just threw my hands in the air and said, 'I have no idea what this means.'"

But Holt thought he might. The heel bone was making its way through the audience, and when he had the chance to study it up close, he thought, "This foot looks familiar." He raised his hand, and said, "I think I know the solution to this problem."

Physical therapy professor Kenneth Holt (left and previous page) and anthropologist Jeremy DeSilva.

PHOTO BY VERNON DOUCETTE

"This mode of locomotion may be a compromise between an animal that is adapted for extended knee bipedalism and one that either still had an arboreal component or had re-evolved a more arboreal lifestyle from a more terrestrial ancestor."

Writing in* Science *magazine, Professors Holt and DeSilva confound the theory that early humans stopped living in trees once they could walk on two legs.

HOLT'S HYPOTHESIS

Holt's interest in the body stems from his love for high-impact sports. "I really wanted to be a great athlete. I was a *good* athlete, but I was never a great athlete," he says. "So I thought if I could learn how people move, I would be able to move better." His desire for physical prowess, as well as his numerous stints in physical therapy due to injuries sustained in rugby and marathons, led him into the study of biobehavioral science and physical therapy. While working as a physical therapist, he "started applying the principles of biomechanics to feet, and came up with some unique ideas about how the biomechanics of the feet would affect the rest of the body."

Holt's theory was that the way the foot hits the ground influences the rotational forces that are generated around the foot and carried through the body. If the foot has a structural abnormality and hits the ground on the outside edge, for example, the ground pushes back with a force that drives the foot to roll onto its inside edge. Sometimes, that results in excessive hyperpronation, sparking a chain reaction throughout the body: one effect is that the body pitches forward, becoming unbalanced. To compensate, a hyperpronator leans backward to realign his upper body over his feet, resulting in exaggerated curvature in his spine. Without adjusting the head position, his eyes would point at the sky, so he tips his head forward, which can cause stress on the muscles supporting the head that, in turn, can cause stress on the vertebrae, atypical bone growth, and the appearance of a hunched upper back. The hunched back is an example of bones adapting to the stresses imposed upon them; to Holt, abnormal bone growths are hallmarks of problems that start in the feet. In short, he realized that the body adapts to the biomechanics of the foot, and that by treating the feet, he could treat the whole body.

Holt began to put his theory into practice by making custom orthoses, shoe inserts designed to accommodate the way a patient's foot hit the ground. "Different people have different foot structures and require different orthotics," he reasoned. Though it sounds simple, this was (and still is) an unconventional approach: most practitioners prescribing orthoses don't take into account the orientation of the foot as it hits the ground. When 80 percent of Holt's patients reported lasting relief from their symptoms, he thought, "Well, maybe I'm onto something here."

THE HEEL BONE'S CONNECTED TO THE…

"I think this person was a hyperpronator," Holt announced, holding up the fossilized heel bone. "Is her AIIS unusually big?" The AIIS, or anterior inferior iliac spine, is the bump on the pelvis where the rectus femoris muscle attaches. In a modern human hyperpronator, the AIIS bone would become enlarged because of the stress inflicted by the muscle.

The skeleton did have an enlarged AIIS, which not only indicated that its feet were hyperpronated—but that it was an upright walker. Chimpanzees do not possess this bone structure, "so if you find a pelvis with that bulge, it's a good indication that you've got something walking on two legs," DeSilva says. Holt added to the evidence for this theory by correctly predicting abnormal bone growth in key areas throughout the rest of the skeleton. "Even though Ken works on people who live today, and I think about the ones who lived millions of years ago and don't exist anymore, the same principles apply," DeSilva says. "So we can use humans and chimpanzees today as our models to come up with reasonable hypotheses for how the *Australopithecus sediba* were moving, based on the shapes of their bones. No one has ever described locomotion in early humans with this much specificity."

Holt and DeSilva detailed their research in "The Lower Limb and Mechanics of Walking in *Australopithecus sediba*," one of six articles on the new species' anatomy published by the prestigious *Science* magazine in April 2013. Their research shows that, while the human body is not built to walk on hyperpronated feet, MH2's body was. Its skeleton displayed an evolutionary progression uniquely adapted to both walking and climbing, which challenges the assumption that early humans stopped living in trees once they began to walk on two legs. "We can no longer generalize *Australopithecus* locomotion," DeSilva says. "The different species moved in different ways and utilized trees in different amounts. I have no doubt that this thing was living to some degree in trees."

Until now, anthropologists generally rejected the possibility that different species of early humans could have walked upright in different ways. Holt's and DeSilva's research proves that there were multiple ways to be an upright walker—and multiple possibilities for which of these upright walkers evolved into the modern human. "These things were living in their own little niches, but we don't know exactly which one of them survived long enough to evolve into our genus," DeSilva says.

Holt's and DeSilva's research has been picked up by journals and media outlets around the world, including the *Boston Globe*, *USA Today*, *BBC News*, and *National Geographic*, among many others. Holt calls his collaboration with DeSilva "fantastic and completely unexpected. It was fortuitous that I took the time out of a very busy schedule to go to his lecture that day." DeSilva readily agrees. While the anthropologist has just made an extraordinary contribution to his field, he considers this partnership with his former professor to be one of the most valuable outcomes of his work. "Ken was always somebody I looked up to and wanted to impress because I just found him so brilliant." When he first noticed Holt in the audience, "I was pleased to be able to show off the fossils I was working on. Little did I know that he would fill in the huge missing piece." IS

THE SUPERMAN SUIT

From the ancient past to the not-so-distant future, Kenneth Holt is collaborating with the Wyss Institute for Biologically Inspired Engineering at Harvard University to design what he calls "a Superman suit." Supported by a grant from the Defense Advanced Research Projects Agency, the suit is intended to improve soldiers' physical endurance. The goal is to build a suit from lightweight, wearable material with sensors that monitor the body's biomechanics and built-in muscles and tendons that will potentially allow the wearer to walk longer distances and carry heavy loads with less risk of injury. "We started designing this suit in order to help the soldiers, but you can imagine the physical therapy implications," Holt says.

CAN YOU TELL WHICH ONE HAS ADHD?*

*OFTEN DOCTORS CAN'T EITHER.

A NEUROSCIENTIST THINKS BRAIN IMAGING COULD HELP BRING AN END TO BEST-GUESS ADHD DIAGNOSES.

BY TRICIA BRICK

PHOTO BY BRAND NEW IMAGES

More than one in ten American children have been diagnosed with attention deficit/hyperactivity disorder (ADHD), according to a *New York Times* analysis of new data from the Centers for Disease Control and Prevention (CDC)—an estimated 6.4 million kids, or 11 percent, up from 7.8 percent a decade ago. Among high school-age boys, the figure soars to 19 percent, more than half of whom have been prescribed medication for the condition.

These numbers are adding fuel to an ongoing controversy over the diagnosis and treatment of ADHD. "There are two forces that drove this recent CDC data," says Associate Professor Marilyn Augustyn, director of the Division of Developmental & Behavioral Pediatrics at the BU-affiliated Boston Medical Center. "Some of these kids have ADHD we didn't recognize. And a lot of people are prescribing medication not specifically for ADHD but for cognitive neural enhancement for kids who could do better in school if they could pay attention better."

Left untreated, ADHD can cause hyperactivity, impulsivity, an inability to concentrate on schoolwork and other tasks, difficulties in forming healthy relationships, and self-esteem problems. But the stimulants widely used to treat ADHD can be harmful to those who don't have the disorder. In addition to side effects like appetite suppression and blood pressure elevation, which can affect an individual's growth and weight gain, Augustyn says: "There is the potential for abuse—and for medications to be diverted to those for whom they weren't intended."

Currently, diagnosing ADHD in children involves both a medical examination and extensive interviewing of not only the patient but also parents and teachers, a process that is often not possible to accomplish within the 15-minute appointment model of general medicine. The precipitous rise in diagnoses and the attendant risks to children's health have lent urgency to the search for an objective measure for identifying the disorder. "What people want is a biomarker for ADHD: a blood test or a biopsy, rather than a series of interviews," says Assistant Professor of Health Sciences Jason Bohland (GRS'07).

In his Quantitative Neuroscience Laboratory, Bohland and his colleagues are moving beyond the understanding of disorders of brain and behavior as collections of symptoms to seek the underlying mechanisms of these illnesses. His research uses computers to analyze large amounts of data gathered from brain imaging, genetic profiling, and other sources to better understand the connections among gene expression, neural pathways, brain anatomy, and behavior.

In 2012, as part of a competition sponsored by the ADHD-200 Consortium, Bohland developed computational models that could, using data from magnetic resonance imaging (MRI) of patients' brains, match the diagnoses made by physicians based on in-person examinations and interviews.

The consortium provided a data set from 776 children and young adults, with and without ADHD, that included basic information about each patient (gender, handedness, IQ), as well as two forms of imaging data: functional MRI measuring activity across the brain while subjects relaxed in the scanner, and structural MRI data providing an image of each subject's brain anatomy. Bohland's team analyzed more than 12,000 variables for each patient, looking for commonalities among the ADHD patients that distinguished them from non-ADHD patients. The team published its results in the journal *Frontiers in Systems Neuroscience*.

On the question of whether computers can diagnose ADHD as well as doctors, the answer is not yet. Indeed, the competition's results overall were disheartening to many; the most successful entry used no imaging data at all in creating its model.

Yet Bohland's team, which finished fifth in the competition, did find that a machine-learning algorithm incorporating all 12,000-plus variables from the imaging data was able to predict the presence or absence of ADHD with an accuracy far better than chance. "There absolutely is power in the imaging approach," he says.

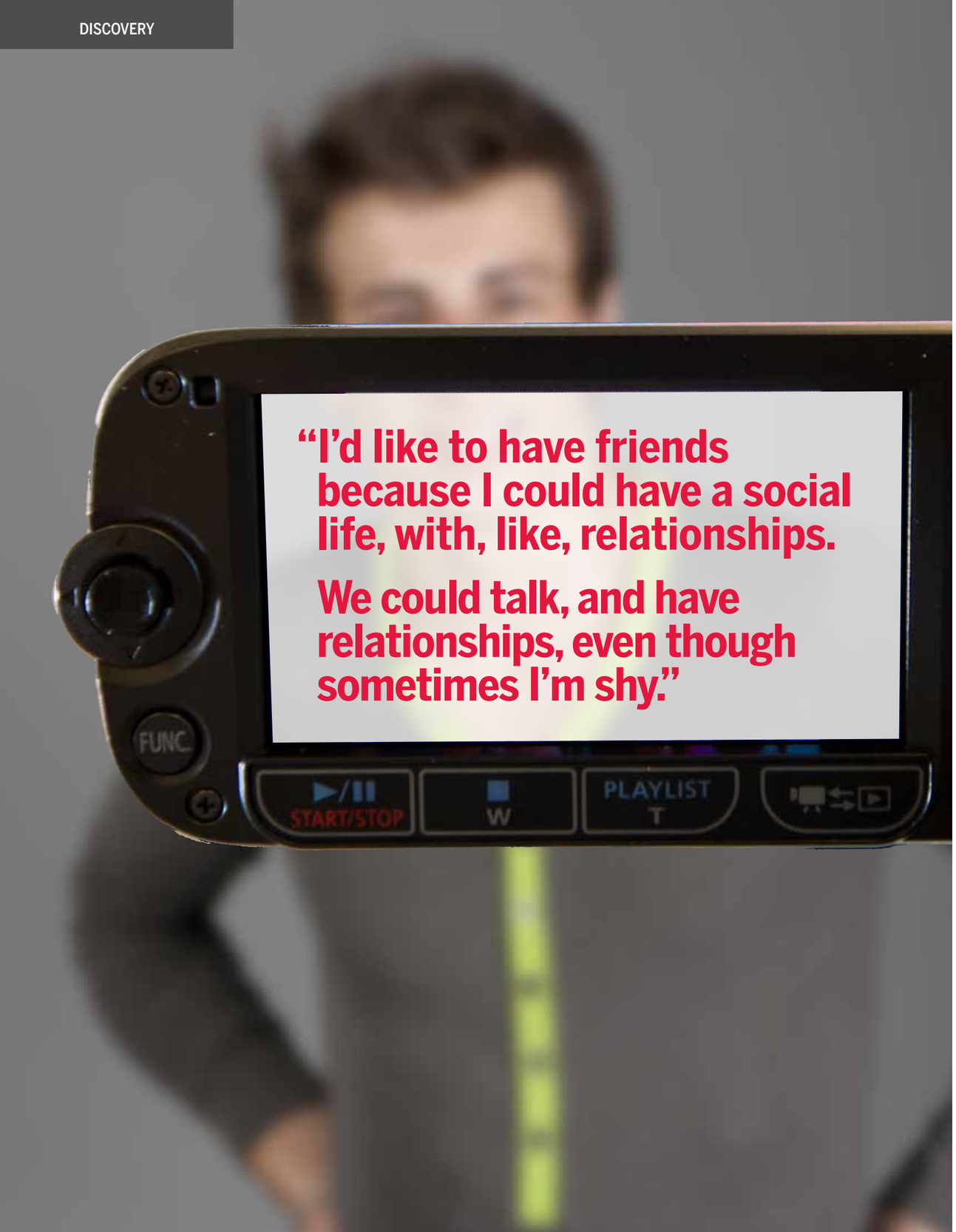
"What people want is a biomarker for ADHD: a blood test or a biopsy, rather than a series of interviews.... There absolutely is power in the imaging approach."
—Jason Bohland

PHOTO BY MELODY KOMYEROV

Bohland believes that his technological approach has promise, even in the near term. "This is really one of the first-of-its-kind efforts to systematically compile these data and let people have at it, and I really applaud the ADHD-200 Consortium for doing this," Bohland says. "It will undoubtedly provide us with more information about these disorders: whenever people have a hypothesis, they will have a data set to look at. That's critically important and has been missing from neuroscience for a long time."

A deeper understanding of the relationships of genetics, anatomy, brain networks, and behavior in ADHD could lead to valuable clinical applications. For example, it might aid physicians in distinguishing ADHD from illnesses with similar symptomology such as pediatric bipolar disorder. Or the data could be used to identify subsets of ADHD, which could be used by doctors to predict a prognosis or plan an optimal individualized course of treatment for each patient.

Bohland has referred to his work in computational neuroscience as a "hypothesis generator," both illuminating how the human brain functions and inspiring new directions of research, and this latest project is no exception. "The question is, Do you accept the results of the competition?" he asks. "Or do you build on that and say, 'Well, let's start with those features and see if we can do better?'" IS



CAMERA PHOTO BY KALMAN ZABARSKY

HOW TALKING ON CAMERA COULD HELP TEENS WITH AUTISM BUILD STRONGER FRIENDSHIPS

BY SHERYL FLATOW

A 14-year-old boy looks into a video camera and reflects on the need for friendship. “I think you want friends because people are social beings and we’re all born to want to be around other people,” he says. “It’s just how we are.”

On the surface, there’s nothing particularly notable about that statement. But it was made by an adolescent with an autism spectrum disorder (ASD), which gives those words a powerful resonance. Most people with ASDs, regardless of their age, have difficulty developing and maintaining friendships. They want friends, as that 14-year-old attests and research confirms, but generally lack the social skills to create those bonds.

Now, two occupational therapy professors are examining whether video might be a tool in helping effect change in high-functioning adolescents with an ASD. Associate Professor Gael Orsmond and Clinical Professor Ellen Cohn are conducting a feasibility study, Videos of Important People (VIP), to determine whether the use of video can help teens improve social skills and strengthen friendships. The quoted 14-year-old boy was among the first five participants in the ongoing intervention project.

“Much of the research in the autism field has been focused on the social impairments of people with autism,” says Cohn. “But some people with ASDs do have friends, and we thought, ‘Rather than focusing on their social communications deficits, why don’t we flip this paradigm on its head and try to understand what adolescents who have autism are doing that works for them. How are they relating to their friends? What do they think about friends?’”

A WINDOW INTO AUTISM

In a pilot project, five adolescents on the autism spectrum were given disposable cameras and asked to take pictures of their social experiences, of things that were meaningful to them. Those photos were then used as prompts in the interviews that followed, and proved to be effective at eliciting responses. A second BU-funded study used video cameras.

“Adolescents on the autism spectrum [generally] like technology, and we thought that video cameras might give us a window into their perspectives,” says Orsmond. “We worked with three adolescents and got really interesting data. One of the things we saw is that oftentimes these adolescents do have a good understanding of friendship, but they can’t apply it to their everyday life. We also became aware that the camera seemed to be a facilitator of friendship.”

Excited by the possibility that the video camera had the potential to strengthen and promote friendship among adolescents with an ASD, Cohn and Orsmond wanted to find out whether an intervention was, in fact, feasible with this population.

In September 2012, they began an 18-month study with support from the Deborah Munroe Noonan Memorial Research Fund. The plan is to collect data from 20 teenagers, ranging in age from 12 to 17, before the study is completed. Any adolescent taking part in the study must already have a friend, which has made recruitment challenging.

The first group was made up of five boys, ranging in age from 13 to 16. (Autism is nearly five times more prevalent in males.) Pre- and post-intervention measures were taken, both quantitative and qualitative; Orsmond specializes in quantitative research, Cohn in qualitative. Each boy was given a video camera for three weeks and asked to turn it on when he was doing something with a friend. They also received an instruction book with weekly assignments and suggested questions for interviewing friends, such as, “How did you become friends?” “What do you like to do together?” The other major component of the video was a weekly monologue, in which the adolescents talked directly to the camera and reflected on their friendships, again with specific prompts.

“We do what we call a positive self-review,” says Cohn. “Each week, we edit the video clips and show the adolescents examples of themselves engaging in positive behavior.” One boy jokes and laughs with a friend. Three boys (in separate videos) share memories with friends by talking about something they experienced together. A research assistant meets with the adolescent at home, watches the clips with him, and discusses and reinforces his display of positive behavior. The boy keeps the video clip collection during the week, and is asked to watch it at least three times.

“It’s video self-modeling: if you see yourself doing something well, you’re more likely to do it again,” says Orsmond. “What’s interesting is that some of these kids are surprised when we totally disregard the negative stuff, because so much of their intervention has been people telling them what they’re not doing right.” →

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"Why don't we flip this paradigm on its head and try to understand what adolescents who have autism are doing that works for them. How are they relating to their friends? What do they think about friends?"—Ellen Cohn

LIMITLESS POTENTIAL

Orsmond and Cohn hope that, over time, video will help improve the quality of life for these adolescents. First, though, they have to determine whether the intervention is even viable on a larger scale. "We're looking at its feasibility both logistically and in terms of the research design," says Cohn. "Is it feasible to recruit people? Is it feasible to send research assistants to their houses? Is this something families and adolescents can do in their daily lives? Are our measures sensitive enough to capture change? And is there change in their self-perception of their social competence? We want to identify characteristics of high-functioning adolescents who will most benefit from the intervention. From a qualitative perspective, we want to try to understand what the friendship experience is about, and the things that they're doing that are working well."

The feedback from families has been enthusiastic. "Some of the parents have told us that they're going to continue the video approach with their kids," says Orsmond. "They also felt that three weeks was not enough time. We were concerned that it would be burdensome, but the parents said that their kids were just getting into it, and it was done. We had asked them to give us six hours of video in those three weeks, and we learned we were expecting too much. We received anywhere from half an hour total to five hours. So we're submitting a proposal to change the protocol, to give them up to six weeks to complete the video."

If the use of video proves to be effective, its potential is limitless. "It could influence service systems and researchers, because it could be replicated and delivered by a range of different professionals in a range of settings," says Cohn.

Orsmond adds, "Our eventual goal would be to develop a manual of procedures so that any clinician could do this; this isn't an approach that needs to be done by a certain discipline. We're also hoping that clinicians will learn to focus on the positive: What is this child doing well, and how do we increase the frequency with which he does it? We don't have a good way to capture it yet, but it's so meaningful to a kid when you say, 'Look at what a great job you did in this interaction.' The theory is that it increases self-esteem and self-concept related to social competence. If it works, and we can capture it and measure it, that could be really powerful." IS

Occupational therapy professors Gael Orsmond (left) and Ellen Cohn

MAKING MUSEUMS INCLUSIVE

"I am going to the Boston Children's Museum today. When I see the Hood Milk Bottle I will know I am there!" This is the first page of a booklet designed to make the museum more inclusive for visitors with an autism spectrum disorder. It includes simple tips ("If the museum gets too loud, my family and I can find a quiet space on the third floor bridge to sit and take a break") for parents and educators to review with children in advance of their visit so they will know what to expect and how to behave. Ellen Cohn and Gael Orsmond worked with graduate student Allison Boris ('15) to develop the booklet as part of a grant from the Institute of Museum and Library Services, through which they are collaborating with the Museum of Science, the Boston Museum of Fine Arts, and the Children's Museum to cultivate more inclusive environments.

Cohn and Orsmond were also invited by the Kennedy Center, Washington, DC, to develop a guide to help performing arts organizations create programming for visitors with sensory, social, and learning needs. The guide outlines a step-by-step process for producing performances that promote inclusivity throughout the theater experience, from the stage (adapting sound and lighting) to the lobby (training front-of-house staff). As the guide states, "People with sensory, social, and learning disabilities have the capacity to participate in a range of community activities when provided the opportunity and appropriate supports."–*Lara Ehrlich*

WEB Extra

Visit **www.bu.edu/autismconnections** and click on Community Inclusion and Accessibility to download the museum guides.

PHOTO BY KALMAN ZABARSKY

NUCLEAR-POWERED

ARMED WITH A HUMAN PHYSIOLOGY DEGREE, **KRISTEN WIHERA ('13)** IS JOINING THE NAVY—TO RUN A NUCLEAR REACTOR.

BY RACHEL JOHNSON

She could be running the nuclear generator on an aircraft carrier and might even be in charge of the missiles. Kristen Wihera ('13) isn't following the usual health care career path of most BU Sargent College graduates. Recently accepted into the prestigious Naval Nuclear Propulsion Program, she is headed to the USS *Momsen* for a two-year tour, learning the ins and outs of surface warfare. The highly selective propulsion program trains those who will design, develop, and maintain the nuclear-powered vessels in the Navy's fleet.

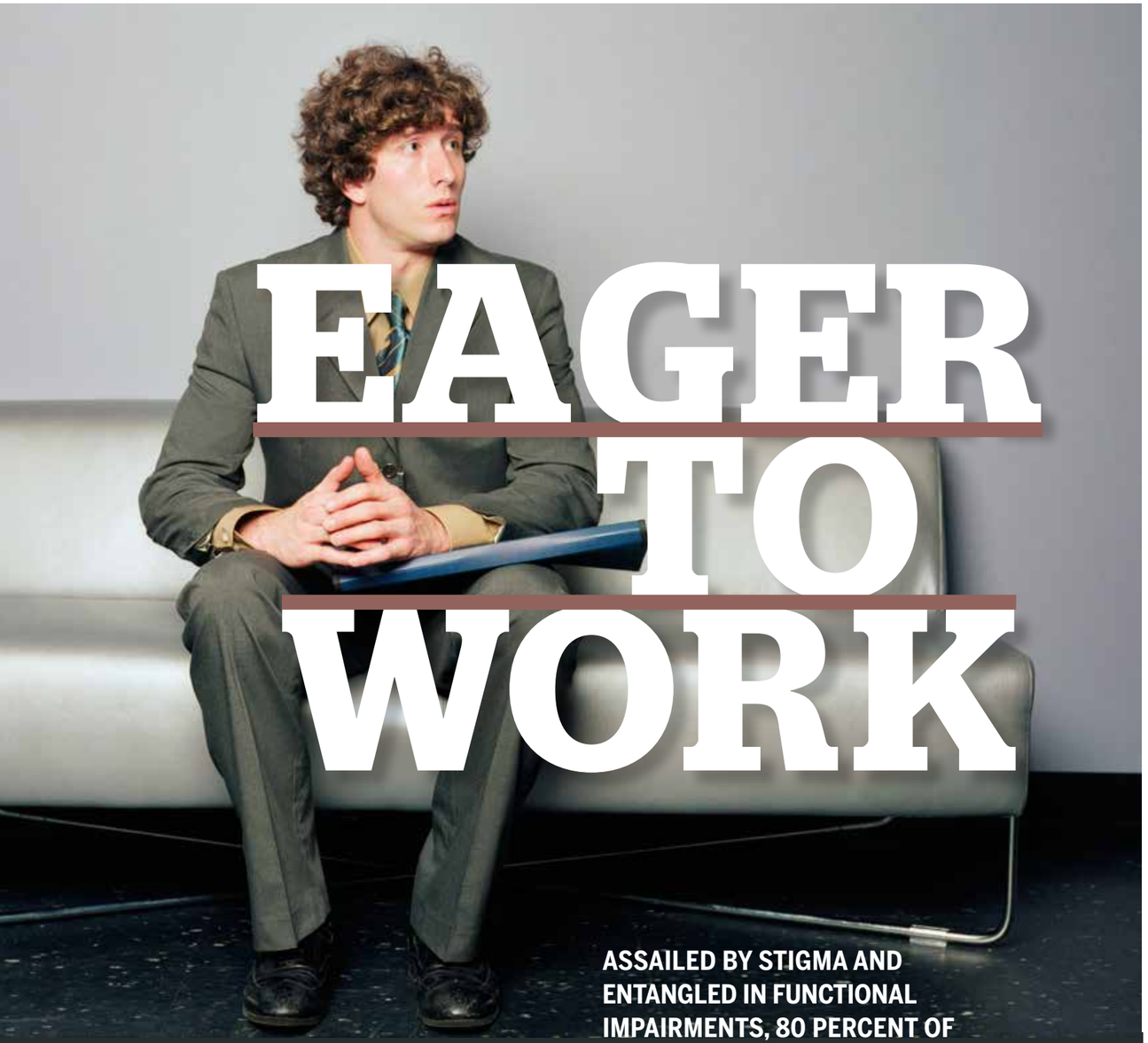
Switching from college final exams to a naval destroyer in a few short weeks would be daunting for most people, but Wihera has been looking forward to joining the Navy since high school. "I'll have a division," she says, "which can be five to fifteen people I'll be in charge of. I don't know which one I'll have yet, but it could be something like communications or strike—in charge of the missiles."

Wihera says she was asked at her naval interview how she would be able to use her degree in human physiology when charged with maintaining a nuclear reactor. "I got the base at Sargent," she says, "that foundation of physics, calculus, chemistry—which is what they need, what they look for. And those earlier classes in physics and calculus really influenced me in getting that nuclear propulsion option. But my classes also taught me different ways to think—ways to take in and use information—and that's what's going to benefit me most." She says performing well in those foundation courses at Sargent made her an appealing candidate for the program, but learning how to think creatively and on her feet is what will set her apart in the long run.

That academic base will be essential when Wihera joins the Naval Nuclear Power School in South Carolina upon finishing her tour of duty on the USS *Momsen*. There, instead of studying the cardiopulmonary system of the human body, her classwork will be scrutinizing old nuclear reactors, practicing how to maintain them safely—basically a "crash course, drinking-from-the-fire-hose version of how nuclear physics works and how to run a nuclear reactor," she says.

At Sargent, she learned to balance all types of responsibilities, from ROTC training to setting up public health infrastructure projects in developing countries. She's counting on those time-management skills to carry over. "It's going to be a lot of work," she says, "just tons of information getting thrown at me and I have to take in as much as I can, as quickly as I can." Later, she'll be stationed at a nuclear-powered aircraft carrier to put her instruction into practice. And while her plans for the foreseeable future are exclusively Navy-related, she doesn't rule out returning to civilian life when her first stint in the service is up. "I could see myself working in public health—if I leave the Navy, or maybe even with the Navy. I think that's a really interesting field." IS

PHOTO BY CYDNEY SCOTT



EAGER TO WORK

ASSAILED BY STIGMA AND ENTANGLED IN FUNCTIONAL IMPAIRMENTS, 80 PERCENT OF PEOPLE WITH A SEVERE MENTAL ILLNESS ARE OUT OF WORK. A PROFESSOR'S PROGRAM IS HELPING MORE FIND—AND KEEP—EMPLOYMENT.

BY SHERYL FLATOW

PHOTO BY LELAND BOBBE

In Brooklyn, New York, a man with a bipolar disorder who long had difficulty attaining the work he wanted, now owns a limousine company and holds down a second job. In Portland, Oregon, a man with schizophrenia who never had the confidence to seek employment unassisted, recently prepared a job application and went on an interview by himself.

Their triumphs are both unusual and encouraging: despite a desire to join the workforce, roughly 80 percent of people with a severe mental illness are unemployed. But these men participated in Thinking Skills for Work (TSW), a cognitive remediation program developed by neuropsychologist Susan McGurk that is having considerable success in enabling those with a severe mental illness to better compete for—and maintain—a job.

"Part of the criteria used to define severe mental illness and eligibility for disability benefits is functional impairment," says McGurk, associate professor of occupational therapy and a senior researcher at the BU Center for Psychiatric Rehabilitation. "There are a variety of symptoms that interfere with working and those include cognitive difficulties: deficits in areas such as paying attention, learning new information, remembering what you learn, planning, and following through on a plan. These skills tend to be hit rather hard by severe mental illnesses such as schizophrenia and major depression, making it difficult for people to find and keep work."

McGurk's program uses complementary approaches that consist of assessing people's cognitive strengths and weaknesses, examining their work experiences to identify obstacles, providing intervention, assisting with job-search strategies, and developing coping skills to help compensate for persistent problems. The program is combined with vocational rehabilitation programs such as supported employment.

"The client works with a cognitive specialist, who facilitates the program and is part of a vocational rehabilitation team that includes an employment specialist," says McGurk. "The relationships with the specialists have proved to be very important to the client. A person needs both a good cognitive program and good vocational rehabilitation program to attain the work they want."

A standardized, 24-session computer intervention, which is based in part on cognitive training software known as Cogpack, is one of the standout aspects of TSW. "We developed a training curriculum and tested it in six randomized controlled trials," says McGurk. "We have found that it benefits cognitive functioning across the different trials."

The computer program offers exercises in a range of skills, including memory, attention, reasoning, planning, and processing speed. One exercise, called Route, is a street map with five circles representing destinations. The goal is to visit each destination in the shortest distance possible, staying on the street grid. "Some people in our New York City studies want to get a job as a courier," says McGurk. "We use this task to highlight the planning involved, for example, in being a courier. We've had people enrolled in our studies who had lost jobs in the past because they hadn't planned the route ahead of time and took too long to deliver the packages."

McGurk recalls a client who lost a restaurant job because he lacked the necessary coping strategies and couldn't finish his tasks on time. Initially, speed seemed to be the issue. "But we saw that he tried to avoid some of the more sustained attention tasks on the computer, and it turned out that he'd had trouble focusing," says McGurk. "So we kept an eye on the attention tasks that came up in the curriculum to make sure that he was progressing." When the client eventually got a job, he and his cognitive and vocational specialist determined that he needed a discreet prompt that would help him stay on task. "They came up with a vibrating watch, so that his coworkers have no idea that he's receiving prompts every 10 minutes."

Studies show that working has huge benefits for people with severe mental illness. "It can aid symptom management because people have a regular schedule," says McGurk. "It reduces stigma. Coming in contact with other people, they often make more friends. And people who are working report a higher quality of life."

Jeff Krolick, administrator of the Oregon Supported Employment Center for Excellence, brought together seven community health programs across his state in fall 2012 to launch TSW. "The program is so thorough," he says. "It enables you to look at the job-retention process in a skill-development way. As people worked with the computer-assisted cognitive software, it allowed us to see, in a very real situation, what kind of supports they needed. And I saw people gain confidence as they practiced the skills through the cognitive strategy class."

"[Working] can aid symptom management because people have a regular schedule. It reduces stigma. Coming in contact with other people, they often make more friends. And people who are working report a higher quality of life." —Susan McGurk

PHOTO BY VERNON DOUCETTE

McGurk and her colleagues recently received a $2.7 million grant from the National Institute of Mental Health for a five-year study to evaluate TSW. "Cognitive programs have become increasingly bundled, as ours is, so it's not clear what's necessary," says McGurk. "We know it works: we've done multiple randomized controlled trials. We've decided to see whether the computer cognitive training—the most expensive component—is critical to improving cognition and work outcomes or whether it's enough to provide coping and compensation strategies for dealing with cognitive challenges."

Early in her career, McGurk heard a participant in a study tell a psychiatrist, "I want a job because I want to be like everybody else." She says that simple declaration "struck me more than any other statement I've heard." That life-changing goal now seems to be within reach for those with cognitive impairment, thanks to McGurk's work. IS

After a stroke, former school principal Mary Borrelli (main picture, highlighted) came to Sargent to get her life back on track. Now, she volunteers at the College as a patient for physical therapy students—and she's returned to teaching (below, with a second grader).

STROKE SURVIVOR TURNS TEACHER—AGAIN

SARGENT COLLEGE HELPED MARY BORRELLI RECOVER FROM A STROKE; NOW SHE'S BACK TO GUIDE THE NEXT GENERATION OF CLINICIANS.

BY LESLIE FRIDAY

Mary Borrelli leaned closer to second grader Kaylee James, who sat like a statue during an early-morning reading comprehension quiz.

"You, something's wrong," Borrelli said. The blonde girl dressed in neon colors didn't respond. She stared down at the exam while her English Language Learner (ELL) teacher at the Lincoln-Thomson Elementary School in Lynn, Massachusetts, pushed on. "You have to help me," Borrelli said, implying the rest of the sentence—"before I can help you."

Borrelli and James scrutinized the multiple-choice question. When it was time to pick a response, the girl looked pleadingly at her teacher.

"It's your choice, because it's a test," Borrelli said. "I can't help you."

Borrelli knows well what it's like to struggle with language, but it wasn't always that way. In 2009, the Lynn native experienced a debilitating stroke that froze her dominant right side, robbed the natural storyteller of her gift of gab, and cruelly convoluted numbers for the onetime math teacher. In her mid-40s and at the prime of her career as an elementary school principal, she feared that life as she had known it would no longer be possible.

Yet Borrelli isn't one to throw a pity party. She followed her poststroke rehabilitation regimen, and two years later, sought

additional help at BU Sargent College. Faculty enrolled her in the College's first intensive treatment program for stroke survivors, one that combined nutrition classes with speech, occupational, and physical therapy. By month's end, she had regained the confidence and skills she needed to return to teaching. With help from Sargent faculty, Borrelli approached Lynn public school administrators to discuss how she could best achieve that goal. By fall, she was back in the classroom as an ELL teacher, helping students with their math and reading lessons.

"I know that I will always have this weakness," says Borrelli, who still has trouble with speech and uses a cane and a foot brace, "but I know coping mechanisms that I didn't know before. I thank God every day that I had this program."

As well as working full time, Borrelli volunteers as a patient in physical therapy labs for Sargent graduate students who need to practice their assessment and treatment skills.

PHOTOS BY KALMAN ZABARSKY (TOP) AND CYDNEY SCOTT (BOTTOM)

During one Friday morning lab, half a dozen students holding clipboards surrounded her as they instructed her to sit, stand, turn around, pick up a shoe from the floor, and stretch out her hand perpendicular to her body. Each time she performed a task, they jotted down numbers that when totaled would indicate her risk for a fall.

Always the instructor, Borrelli gave students hints if they forgot a key part of the exercise. "Mary, don't give it away," playfully chided Terry Ellis (MED'05), assistant professor and director of the Center for Neurorehabilitation. Borrelli flashed a broad smile and stuck out her tongue.

When students asked her to balance on her right leg for 10 seconds, Borrelli leaned hard to the right and gingerly attempted the move three times before settling her left foot on the floor, letting out a light sigh.

"What does that mean to you guys?" asked Sara Crandall ('10, '12), a resident and lecturer in the Neurological Physical Therapy Residency Program, who was observing the session. One student thought Borrelli was more at risk for a fall. Ellis turned to her patient, asking if she agreed.

"I don't think so anymore," said Borrelli, who last fell nine months ago during a physical therapy session at Spaulding Rehabilitation Hospital and then again shortly afterward at home while trying to get out of bed. She had to use her Lifeline button, hanging around her neck, to call 911 for help.

Patients like Borrelli, who arrive with a range of conditions, from cerebral palsy and multiple sclerosis to Parkinson's and traumatic brain injury, enrich students' lab experiences enormously. "If we didn't have her" and other volunteers, Ellis says, "we'd be practicing on each other" to test for balance, coordination, sensation, and muscle weakness.

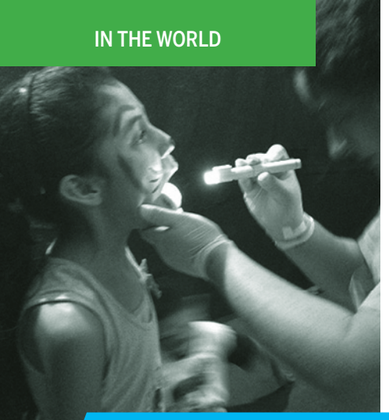
But lab sessions go far beyond assessing physical impairments. "You get an emotional insight into what these patients are going through that you wouldn't get if you were doing these tests just on a student," says Natalie Coviello ('16).

Coviello and her colleagues describe Borrelli as positive, selfless, and determined. "It takes a very strong person to keep her head up in this situation," says Lauren Murphy ('15), "and that is motivating for us, and I think motivating for the other patients who come in. She makes me very excited about our field."

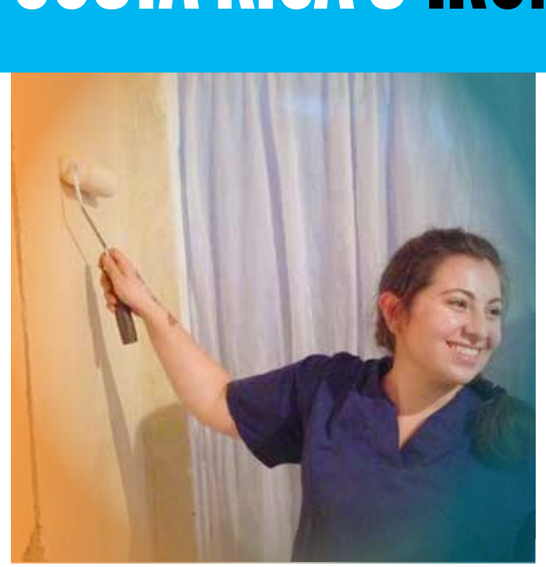
Volunteering as a patient allows Borrelli to give back to Sargent while continuing her physical therapy. Stroke survivors, Ellis says, often receive little to no follow-up therapies after their initial incident, even though speech and mobility can continue to improve for years.

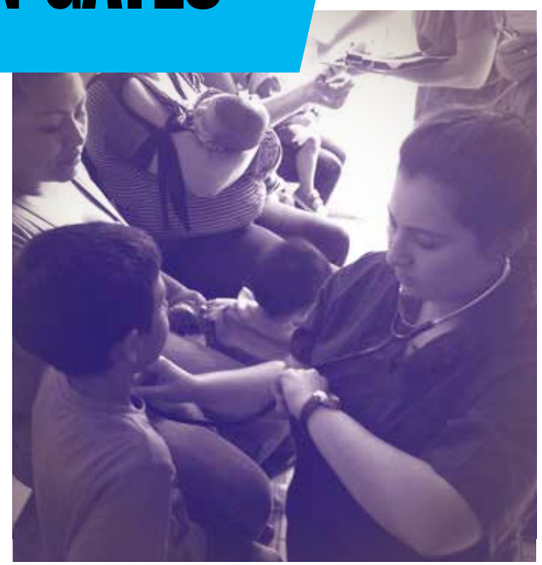
Back at Lincoln-Thomson Elementary School, Borrelli painstakingly led James through the rest of her quiz. She gave her no answers, but was there whenever the girl got stuck.

Success—in all its forms—comes with patience and persistence, but it helps to have a cheerleader along the way. That's a lesson Borrelli has learned, and teaches, well. IS



BEYOND COSTA RICA'S IRON GATES





THE PATIENTS WAITED IN LINE FOR FOUR HOURS; MANY HADN'T SEEN A DOCTOR IN MONTHS OR YEARS. THE STUDENTS RUNNING CLINICS IN A SQUATTER TOWN IN SAN JOSÉ WERE IN FOR A BUSY 10 DAYS.

BY LARA EHRLICH

Nine students from BU Sargent College filed onto the bus in front of their hostel's iron gates. As the bus wound through the San José streets, they tried to reconcile their preconceived vision of Costa Rica—beaches, trees, umbrellas—with this forbidding city of barbed wire, graffiti, and stray dogs.

The interdisciplinary group of students had dedicated their spring break to a service-learning trip providing free health services to Costa Rican residents without access to care. During the 10-day medical crash course, the Sargent team would help treat more than 300 patients; for many of the students, it was their first clinical experience. "I didn't know what to expect because I had never done anything like it before," says health science major Kate Festa (CGS'11, SAR'13, SPH'13). "I just went in with an open mind and was willing to do whatever they needed me to do." To enhance their medical work, the students engaged in cultural education programs, including a lecture about the health care system and an intensive Spanish class, as well as visits to a women's hospital, a nursing home, and a day care center.

ONE DAY, EIGHTY PATIENTS

The bus pulled up to a church in the heart of a squatter town that is home to some of the capital's poorest residents. A team of volunteers from Conexión, a local grassroots organization that develops social projects to help those in need, was already setting up at the church. The students and Conexión volunteers assembled two medical tents, two nutrition tents, and a pharmacy tent, and then people arrived in droves, says Anna Monahan, clinical administrator in the Department of Health Sciences, and one of the two Sargent internship coordinators leading the trip. The scene quickly took on a festive atmosphere; Conexión had a trampoline for the kids, a face-painting station, and even a DJ who alternated between playing music and inviting patients into the tents.

The Sargent students—from the nutrition, human physiology, physical therapy, and health science programs—spread out, filling in wherever they were needed. Nutrition graduate student Kate Donovan ('16) took up a post in the nutrition tent, while Festa manned the triage area—checking blood pressure, respiration, pulse, weight, and height, and working with translators to record patient intakes. "At first, it was scary to do medical things that are really important to these people," Donovan says. "But once I jumped in and did it, I realized that I knew a lot more than I'd thought. And the patients were just so happy that we were there and that we cared." In the first day alone, the students helped to treat more than 80 people, many of whom had waited in line for more than four hours.

Costa Rica's universal health care system, *la Caja*, covers the majority of citizens. However, the country is also home to an estimated 300,000–500,000 Nicaraguans, many of whom are thought to be illegal immigrants, who must wait for volunteer medical service teams to address even basic →

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health needs. Most of the patients waiting in line for the Sargent students required treatment for conditions that could have been prevented or treated with regular care—a man with a painful rash, a woman with asthma, an older man suffering from an enlarged spleen. "It was hard to realize that when we left, they may not have care again for another five years," Festa says.

Even Costa Ricans who have health insurance experience long delays in scheduling physicals and checkups due to a reported shortage of physicians and equipment. Conexión told the Sargent team an infamous story about a pregnant woman who tried to book an ultrasound. "It was scheduled for 2020," Monahan says. "So even when they do have health insurance, they don't have access to what the system considers nonessential tests."

UNDERSTANDING A CULTURE

While working alongside Conexión volunteers, the students got an inside look into the country's approach to health care. "They're all about the experience," Monahan says. "The volunteer doctor had a big heart, but he would spend two hours with a patient who had a cold, and meanwhile we were trying to move people along. That's how most of the patients got seen."

"We found out later he was also praying with them," adds Shelley Brown, clinical instructor in the health science program and the trip's coleader. "I wanted to be able to say, 'Okay, great,' but you're going to lose all those other patients who are waiting." With a line at least twenty patients deep at any one time, the students were hesitant to even take a lunch break. At noon, the community insisted they stop working and sit down for a feast the local women prepared and served in the church. "Even if you have 100 people waiting, when it's time for lunch everyone stops what they are doing and eats," Monahan says. "It's part of the culture."

Understanding the culture was crucial to the students' ability to serve their patients—and to accept their own capacity as health care workers. For Festa, whose duties included house visits, limits became especially important. The community guided Festa door-to-door through the squatter town, ensuring that everyone who required medical attention had the opportunity to be seen. One of their most urgent stops was to the house of a 15-year-old girl who was nine months pregnant.

"She was due in just days, and she was telling the translators that she would have to walk two miles uphill to the clinic when she's ready to give birth. She looked terrified, and I tried to comfort her," Festa says. "You can tell when someone really cares, no matter what language you're speaking. It sounds so clichéd, but it was important to smile and shake people's hands and speak enthusiastically. It can be tempting to move patients along, especially when we were so busy, but we tried to connect with everyone."

With only a small window of time for each patient, the students struggled with the desire to connect more, to *do* more. Donovan recalls one of many women who visited the nutrition tent for advice on losing weight. "What do you eat on a daily basis, and how do you exercise?" Donovan asked, only to discover that the woman, like most of the people in line, could only afford rice and beans. Compounding the nutrition problem, the San José residents "don't feel safe enough to go for a walk outside," Donovan says. "It's not like in Boston when someone who wants to lose weight can get a gym membership, a personal trainer, and a nutritious diet."

The students needed to find creative ways to counsel their patients. For those who were unable to exercise outside, "we suggested they march in place while cooking," Donovan says. The students made body mass index charts so people could monitor their weight and showed them how to approximate healthy serving sizes (a fist = one cup). "Culturally, they're not going to be able to change certain habits, so it's important to meet them in the middle and give them sustainable ways to take corrective steps in their own health," Festa says. "This trip made me realize how important it is to see what's going on in a community before you try to change it." IS

"Once I jumped in and did it, I realized that I knew a lot more than I'd thought. And the patients were just so happy that we were there and that we cared."
—Kate Donovan ('16)

MEASURABLE IMPACTS

300,000–500,000 Nicaraguans in Costa Rica who don't have access to health care

300 patients treated by Sargent students in the 10-day service trip

8 clinical centers on BU's campus for students to develop their skills under supervision of experienced clinicians

1,400 Sargent- or BU-affiliated clinical sites throughout the world, including top hospitals, clinics, and private practices, as well as nonmedical settings such as schools and community agencies

BECOMING AN ADVOCATE

AS A YOUTH, **DANA ARAVICH ('14)** CLEARED THE HURDLES THROWN IN HER PATH BY A DISABILITY; AS A STUDENT, SHE LEARNED TO HELP OTHERS DO THE SAME.

BY RACHEL JOHNSON

Born with impaired vision, Dana Aravich ('14) knows firsthand how frustrating it can be to have a disability. As a youth, she faced obstacles, from a lack of services in her rural community to difficulty navigating the complex health care system, that left her determined to help people facing similar challenges.

Occupational therapy student Aravich recently completed an Albert Schweitzer fellowship, which offers the chance to devote a year to health-related service initiatives aimed at supporting society's most vulnerable. Aravich chose to spend her Schweitzer year at the Boston Home in Dorchester, Massachusetts, a residential community for adults with progressive neurological diseases like multiple sclerosis (MS). She originally planned to set up technology services for the residents—helping them reconnect to friends and family through social networking platforms like Skype and Facebook. "Research shows that people with MS have lower levels of social support and connection to their communities," she says, "so I thought, 'This is easy, we'll teach them how to use computers; it'll be empowering.'"

The problem was, the computers in the Boston Home's cybercafe—all acquired through donations—had never been upgraded. In fact, they were so old, they couldn't be updated. Aravich's original ideas had to be discarded, but ultimately, she says, the project became much more meaningful.

Aravich began to show the residents how to promote changes at the Boston Home themselves, to take ownership in their lives. "My project became teaching the residents advocacy skills," she says. "Residents helped collect data used to write a grant and gather information on how many people were using the cybercafe. We were able to hold a meeting with the administration and really talk for the first time about what the problems were and how to address them." Aravich explained the kinds of technology that would help, the residents told their own stories, and the administration addressed budgetary limitations. Together, the group came up with a technology plan that worked for everyone. "It's about helping people say, 'This is my life, I'm not going to sit back and be passive,'" says Aravich. "Having had to fight for various things through the government and other programs, I realize that I, as a person with a disability, have a hard time navigating that system. And then I work with other individuals who don't have the support that I have, but they know what's going on with themselves, and their stories have to be told."

Not only did the Boston Home solve the immediate computer problem—new computers and equipment were funded through donations and grants—but it also created a system for continuing resident self-advocacy in the future. "The residents really took off with the idea and made it their own," Aravich says. Today, several of the residents are on a technology council that meets regularly with the administration to address resident needs. Aravich plans to continue exploring advocacy skills for people with disabilities after graduating. "Professionals and residents can, as a team, come together and address those issues. Ideally, what we are supposed to do as occupational therapists is help people find meaning, meaning through occupation—those activities that we find important in our lives. If given the opportunity to advocate, anyone with or without a disability can make those changes and improve people's lives." IS

PHOTO BY CYDNEY SCOTT

Grant Awards

BU SARGENT COLLEGE'S FACULTY RECEIVED **$10,792,130** IN RESEARCH FUNDING IN 2012–2013. HERE IS A LIST OF OUR PROJECTS AND THE AGENCIES AND FOUNDATIONS SUPPORTING THEM.

PRINCIPAL INVESTIGATOR	TITLE OF PROJECT	AGENCY/FOUNDATION	FUNDS AWARDED/ AVAILABLE 2012–2013	TOTAL AWARD
Sudha Arunachalam, assistant professor of speech, language & hearing sciences	A Non-Interactive Method for Teaching Noun and Verb Meanings to Young Children with ASD	Autism Speaks	$118,886	$118,886
	Toddlers' Representations of Verbs: Effects of Delay and Sleep on Verb Meaning	National Institutes of Health (NIH) (Northwestern University subcontract)	$54,505	$116,646
	Effects of Sleep on Word Learning in Preschoolers	Sleep Research Society Foundation	$20,000	$20,000
	Individual Differences in Toddlers' Abilities to Learn New Verbs from Their Linguistic Context	Language Learning	$10,000	$10,000
	Two-Year-Olds' Use of Linguistic Information to Acquire the Meaning of Verbs	American Philosophical Society	$3,123	$4,000
Helen Barbas, professor of health sciences	Organization of Prefrontal Feedback Circuits	NIH/National Institute of Mental Health (NIMH)	$420,594	$2,375,077
	Prefrontal Anatomic Pathways in Executive Control	NIH/National Institute of Neurological Disorders and Stroke (NINDS)	$368,848	$2,008,051
Helen Barbas and Jamie Bunce, postdoctoral scholar	Prefrontal and Amygdalar Pathways to Memory-Related Medial Temporal Cortex	NIH/NIMH	$41,577	$159,882
Helen Barbas and Clare Timbie, predoctoral student	Circuitry of Emotion: Integration in Orbitofrontal Cortex	NIH/NIMH	$32,614	$178,140
Jason Bohland, assistant professor of health sciences	The Online Brain Atlas Reconciliation Tool	NIH (Cold Springs Harbor subcontract)	$26,490	$76,501
Kee Chan, assistant professor of health sciences	Intergovernmental Personnel Agreement (IPA): MultiVISN Implementation of a Program to Improve HIV Screening and Testing	Dept. of Veterans Affairs (VA)	$21,124	$31,686
L. Clarke Cox, clinical associate professor of speech, language & hearing sciences	Hearing Acuity, Cognitive Aging and Memory for Speech	NIH/National Institute on Aging (NIA) (Brandeis University subcontract)	$16,370	$81,850
Terry Ellis, assistant professor of physical therapy	A Multifactorial Exercise Program to Reduce Falls in People with Parkinson Disease	BMC Pepper Award	$32,400	$64,800
	Intergovernmental Personnel Agreement (IPA)	VA	$27,761	$27,761
	Unveiling of the Natural History of Quality of Life and Mobility Decline in Persons with Parkinson's Disease	Davis Phinney Foundation	$23,500	$96,000
Marianne Farkas, director of training & international services, BU Center for Psychiatric Rehabilitation	Improved Employment Outcomes for Individuals with Psychiatric Disabilities	Dept. of Education (ED)	$850,000	$4,245,042
Marianne Farkas	Toolkit of Recovery-Promoting Competencies for Mental Health Rehabilitation Providers	National Institute on Disability and Rehabilitation Research (NIDRR)	$199,714	$599,504
Marianne Farkas and E. Sally Rogers, director of research, BU Center for Psychiatric Rehabilitation	Bringing Recovery Supports to Scale Technical Assistance Center Strategy	Substance Abuse & Mental Health Services Administration (SAMHSA)	$61,841	$708,521
Mahasweta Girgenrath, assistant professor of health sciences	Modulation of Inflammation and Fibrosis in the Context of Regeneration in MDC1A	Muscular Dystrophy Association	$119,133	$357,465
Jennifer Gottlieb, research assistant professor, BU Center for Psychiatric Rehabilitation	Improving Quality and Reducing Cost in Schizophrenia Care and New Technologies and New Personnel	Center for Medicaid/Medicare Innovation	$244,333	$409,022
	Internet-Based CBT for Schizophrenia: A Pilot RCT Computer-Based Program for Auditory Hallucinations	Brain & Behavior Research Foundation (formerly NARSAD)	$21,891	$21,891
Frank Guenther, professor of speech, language & hearing sciences	Minimally Verbal ASD: From Basic Mechanisms to Innovative Interventions	NIH	$364,658	$1,982,833
	Neural Modeling and Imaging of Speech	NIH/National Institute on Deafness and Other Communication Disorders (NIDCD)	$353,515	$1,777,490
	Sequencing and Initiation in Speech Production	NIH/NIDCD	$330,469	$1,703,678
Frank Guenther and Emily Stephens, predoctoral fellow	Decoding Imagined Vowel Productions Using Electroencephalography	NIH/NIDCD	$34,139	$101,984
Christine Helfrich, assistant professor of occupational therapy	Life Skills: Transitioning from Homelessness and Isolation to Housing Stability and Community Integration	ED/NIDRR	$117,426	$599,990
Kenneth Holt, associate professor of physical therapy	Smart Exoskeleton Suit—Biomechanically Synergistic Body Support and Protection System	Harvard Wyss Center (subcontract)	$67,370	$67,370
Norman Hursh, associate professor of occupational therapy	The City Connects Model of Student Support: Building a K–12 Student Support Practice and Process	Boston College (subcontract)	$46,601	$91,847
Dori Hutchinson, director of services, BU Center for Psychiatric Rehabilitation, and Margaret Ross, director of behavioral medicine, BU Student Health Services	Boston University Suicide Prevention Program	SAMHSA	$99,230	$293,876
Susan Kandarian, professor of health sciences	The Molecular Basis of Muscle Wasting in Cancer Cachexia	NIH/National Institute of Arthritis and Musculoskeletal and Skin Diseases (NIAMS)	$368,325	$1,841,213
	Regulation of Gene Expression in Skeletal Muscle: NF-KB Signaling in Atrophy	NIH/NIAMS	$171,620	$1,835,850
Julie Keysor, associate professor of physical therapy	ENACT: Enhancing Activity and Participation for Persons with Arthritis	ED/NIDRR	$799,992	$3,999,924
Gerald Kidd, professor of speech, language & hearing sciences	Central Factors in Auditory Masking	NIH/NIDCD	$533,202	$2,714,796
	Spatial Hearing, Attention, and Informational Masking in Speech Identification	US Air Force	$223,562	$685,945

PRINCIPAL INVESTIGATOR	TITLE OF PROJECT	AGENCY/FOUNDATION	FUNDS AWARDED/ AVAILABLE 2012–2013	TOTAL AWARD
Gerald Kidd	Core Center Grant—Sound Field Laboratory (Core 1)	NIH/NIDCD	$207,979	$1,516,663
Swathi Kiran, associate professor of speech, language & hearing sciences	Theoretically Based Treatment for Sentence Comprehension Deficits in Aphasia	NIH/NIDCD	$584,717	$2,399,432
	The Neurobiology of Recovery in Aphasia: Natural History and Treatment-Induced Recovery	NIH/NIDCD (Northwestern University subcontract)	$241,073	$1,299,549
	Application of Multimodal Imaging Techniques to Examine Language Recovery in Post Stroke Aphasia	NIH/NIDCD	$125,102	$250,204
	Semantic Fracture Analysis in the Treatment of Lexical Retrieval Deficits in Spanish-English and French-English Bilingual Aphasia	American Speech-Language-Hearing Foundation (ASHFoundation)	$1,741	$50,000
Swathi Kiran and Chaleece Sandberg, graduate student	Changes in Neural Patterns in Persons with Aphasia Following Theory-Based Generative Naming Treatment (NRSA)	NIH	$29,672	$83,600
Swathi Kiran and Cara Stepp, assistant professor of speech, language & hearing sciences	Validation of an iPad-Based Therapy Program for Individuals with Aphasia	Wallace H. Coulter Foundation	$64,000	$124,000
Jessica Kramer, assistant professor of occupational therapy	Evaluation of Project TEAM (Teens Making Environmental and Activity Modifications)—Effectiveness, Social Validity, and Feasibility	ED	$199,696	$597,509
	Giving Youth a Voice: A Collaborative Evaluation of the Effectiveness and Feasibility of a Novel Environmental Modification Training for Youth with Disabilities	Noonan Memorial Research Foundation	$432	$75,000
Cara Lewis, assistant professor of physical therapy	Sex-Specific Movement Pattern Differences in Young Adults with and without Hip Pain	NIH/NIAMS	$184,163	$405,158
	SBIR Phase II: Compliant Nonlinear Quasi-Passive Orthotic Joint	Adicep Technologies	$70,000	$70,000
Jessica Maxwell, clinical assistant professor of physical therapy	Limitations in Participation Following Knee Replacement	American College of Rheumatology Research and Education Foundation (REF)	$74,884	$173,052
Susan McGurk, associate professor of occupational therapy and senior researcher, BU Center for Psychiatric Rehabilitation	A Dismantling Study of Cognitive Remediation for Supported Employment	NIH/NIMH	$522,678	$2,771,031
	Neuroscience-Guided Remediation of Cognitive Deficits in Schizophrenia	NIH	$47,463	$72,857
	Cognitive Training & Supported Employment in Severe Mental Illness	ED/NIDRR	$40,898	$86,043
Kathleen Morgan, dean ad interim and professor of health sciences	Dynamics of the Vascular Smooth Muscle Cytoskeleton	NIH/National Heart, Lung, and Blood Institute	$987,822	$8,786,466
Kim Mueser, executive director, BU Center for Psychiatric Rehabilitation	Recovery After an Initial Schizophrenia Episode (RAISE)	NIH/NIMH	$62,132	$143,267
Kim Mueser	Enhancing Assertive Community Treatment with CBT and SST for Schizophrenia	NIH/NIMH	$40,086	$192,913
	Integrating Illness Management & Recovery with Assertive Community Treatment	NIH/NIMH	$20,162	$58,246
	Integrating Illness Management & Recovery with Assertive Community Treatment	NIH/NIMH	$19,712	$52,419
	Illness Management and Recovery Treatment	NIH	$15,740	$64,812
Gael Orsmond, associate professor of occupational therapy	Impact of Parenting Adolescents and Adults with Autism	NIH (University of Wisconsin subcontract)	$52,265	$726,874
Gael Orsmond and Ellen Cohn, clinical professor	The VIP Intervention: Using Video to Enhance Social Well-Being for Adolescents with an Autism Spectrum Disorder	Noonan Memorial Research Foundation	$80,000	$80,000
Paula Quatromoni, associate professor of nutrition	KickinKitchen.TV—An Innovative Digital Learning Interactive Educational Program on Nutrition, Cooking and Active Lifestyles to Prevent Childhood Obesity	US Dept. of Agriculture	$75,000	$75,000
	The Foxboro Model for Lifestyle Nutrition and Physical Fitness for Students in Grades 1–8	Aetna Foundation	$4,569	$25,000
E. Sally Rogers, director of research, BU Center for Psychiatric Rehabilitation	Evaluation Plan for Collaborative Pathways Project with Advocates Inc.	Advocates Inc.	$16,000	$16,000
Elliot Saltzman, associate professor of physical therapy & athletic training	RI: Medium: Collaborative Research: Multilingual Gestural Models for Robust Language-Independent Speech Recognition	National Science Foundation	$52,627	$52,627
	Modeling the Behavioral Dynamics of Social Coordination and Joint Action	NIH/National Institute of General Medical Sciences (University of Cincinnati subcontract)	$24,900	$124,500
Cara Stepp, assistant professor of speech, language & hearing sciences	Automation of Relative Fundamental Frequency Estimation	NIH/NIDCD	$153,527	$480,927
	Improving the Reliability of Estimates of Voice Relative Fundamental Frequency	ASHFoundation	$10,000	$10,000
	Voluntary Control of Anterior Neck Musculature in Parkinsonian Dysphagia	American Laryngological Association	$10,000	$10,000
	Voluntary Control of Anterior Neck Musculature in Dysphagia	ASHFoundation	$3,890	$10,000
Gloria Waters, professor of speech, language & hearing sciences	Assessment of Comprehension Skills in Older Struggling Readers	ED	$399,387	$1,597,065
Daniel White, research assistant professor of physical therapy	Factors for Change in Day-to-Day Walking in Knee OA	REF	$125,000	$250,000
	Factors Associated with Day-to-Day Walking in Older Adults with Knee OA	Foundation for Physical Therapy	$20,000	$40,000
Total:			**$10,792,130**	**$52,017,853**

Faculty in Print

OUR FACULTY'S RESEARCH REACHES AUDIENCES ACROSS THE GLOBE. HERE'S A SELECTION OF PUBLICATIONS AND ARTICLES WRITTEN BY BU SARGENT COLLEGE FACULTY DURING 2012–2013.

Arunachalam, S., Escovar, E., Hansen, M., and Waxman, S. (2013). "Out of Sight, But Not Out of Mind: 21-Month-Olds Use Syntactic Information to Learn Verbs Even in the Absence of a Corresponding Event." *Language and Cognitive Processes*, 28, 417–425.

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De Luca, C. J., and Contessa, P. (2012). "Hierarchical Control of Motor Units in Voluntary Contraction." *Journal of Neurophysiology*, 107(1), 178–195. PMID:21975447.

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VERNON DOUCETTE

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BU Sargent College

WHO WE ARE

STUDENTS	UNDERGRADUATE	GRADUATE
Number of full-time students (as of spring 2013)	1,152	335
Average SAT	2008	n/a
Average GRE	n/a	311*
Faculty		
Full-time	67	
Part-time	69	
Alumni	**16,014** in **61** countries	
Clinical Sites	More than 1,400 in all 50 states and 4 countries	

PHOTO BY KALMAN ZABARSKY

PROGRAMS OF STUDY

Athletic Training
Audiology
Behavior & Health
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 graduate programs are officially among the nation's best—Sargent programs tracked by *U.S. News & World Report* all rank in the top 8 percent in their respective fields:

- **Occupational Therapy Program** ranked number 2 out of 156 programs
- **Physical Therapy Program** ranked number 16 out of 201 programs
- **Speech-Language Pathology Program** ranked number 21 out of 250 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 (data averaged over the past three years):

Nutrition	100%
Occupational Therapy	98%
Physical Therapy	99%
Speech-Language Pathology	100%

ABOUT US

Boston University College of Health & Rehabilitation Sciences: Sargent College has been defining health care leadership for more than 130 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 communication, and clinical skills that distinguish outstanding health professionals. Our curriculum also includes an important fieldwork component, providing students in every degree program with substantive clinical experience. Clinical internships are available at more than 1,400 health care facilities across the country. The College also operates outpatient rehabilitation centers that offer a full range of services to the greater Boston community.

*Based on the GRE revised General Test Scores (for tests taken on or after August 1, 2011).

Boston University College of Health
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