TAKING HEALTH CARE HIGH TECH
Sargent uses technology to develop innovative solutions for people with disabilities

WHERE THE TROUBLE BEGINS
There is more to dyslexia than meets the eye. One researcher believes it starts with sound

TO MOOP OR NOT TO MOOP
Nonsense verbs have broadened our understanding of how children learn to speak

HEARING AID OF THE FUTURE
How people with hearing problems could cut through competing sounds—just by looking

CAN HE READ YOUR MIND?
Neuroscientist Frank Guenther doesn’t read lips, he reads brain waves
Dear Friends,

As Sargent College’s dean, it is my honor and privilege to highlight our faculty, our programs, and our extraordinary students in the Department of Speech, Language & Hearing Sciences (SLHS). During my first year at Sargent, I have been astounded by the trajectory of growth and accomplishment here at Boston University, at Sargent College, and particularly in SLHS. Our program in Speech-Language Pathology is supported by a broad research base that brings the innovations of tomorrow to today’s classrooms.

The foundation of any academic program is its faculty, and I am thrilled to be working with such a distinguished group of scholars. In this issue, you’ll read about a few of these exceptional individuals, including Professor Frank Guenther and his internationally recognized work in the DIVA neural network model of speech motor skill acquisition and speech production. In addition, Professor Swathi Kiran’s breakthrough aphasia rehabilitation therapies incorporate advanced approaches to telemedicine that have been particularly successful for bilingual patients. This issue also features Professor Gerald Kidd’s technological innovation in visually guided hearing, which promises to drastically reduce the auditory clutter that is so frustrating for many hearing aid users.

The SLHS faculty also includes some of the discipline’s rising stars. Assistant Professors Cara Stepp, Tyler Perrachione, and Sudha Arunachalam are leading active lab groups addressing challenging questions in voice production, velopharyngeal insufficiency, language impairment, language processing, neuroplasticity, and auditory processing. Included in this issue are highlights of Professor Perrachione’s remarkable work on dyslexia as well as Professor Arunachalam’s research on language acquisition, especially with regard to children with autism. These researchers are making new discoveries about the nature of these phenomena while at the same time uncovering new paths for effective diagnosis and treatment.

Our eight clinical centers on the BU campus offer multidisciplinary treatment options for our patients and invaluable hands-on learning opportunities for our students. Our innovative Intensive Stroke Program, run by Clinical Associate Professor Elizabeth Hoover, has operated since 2011, serving 25 participants and our extraordinary students in the Department of Speech, Language & Hearing Sciences (SLHS). This inter-professional program brings together students and faculty from speech, language & hearing sciences, occupational therapy, physical therapy, and nutrition to maximize patient outcomes and student learning opportunities. These clinical opportunities ensure that is so frustrating for many hearing aid users.

I’m extremely proud that the program in Speech-Language Pathology continues to advance as a leader in our discipline. Our faculty are foremost authorities in their respective areas and are committed to the development of advanced clinical procedures. Recent faculty honors included the recognition of Professors Kiran and Elizabeth Gavett as ASHA Fellows and Professor Stepp as a National Science Foundation Career Award recipient.

It is my absolute pleasure to be part of the team at Sargent College. I hope that you will enjoy reading this special issue of Inside Sargent, and I welcome your thoughts and feedback at mooreca@bu.edu.

Sincerely,

Christopher A. Moore
Dean and Professor

Boston University College of Health & Rehabilitation Sciences: Sargent College

Dean
Christopher A. Moore
Department Chair
Meredith D. Matthews
Communications Manager
Stephanie Rotondo

Contributors
Laura Dinh-Chung, Rachel Johnson, Patrick L. Kennedy, Julie Rebney, and Andrew Thronton

Designers
Kim Cable and Hy Zhitnik

Photography
Boston University Photography, unless otherwise noted

Produced by Boston University Marketing & Creative Services

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What’s going on acoustically when someone with dysarthria utters a vowel? Can people with swallowing disorders control their throat muscles for tasks other than swallowing? How might computers help stroke patients recover their speech production?

Ask Cara Stepp, an assistant professor of speech, language & hearing sciences and biomedical engineering, who brings her engineering training to the study of normal and disordered speech and voice. The STEPP Lab’s long-term goal is to use its findings to help rehabilitate people who have experienced a stroke, Parkinson’s disease, brain injury, or other conditions that impair speech and swallowing.

Two of its five projects use interactive computer games for assessment and rehab. “In upper limb rehab,” Stepp says, “there are lots of studies showing that engaging individuals in motor rehab with a video game is really effective.” The release of dopamine during game play actually encourages brain plasticity, improving one’s ability to learn new muscle functions. “We’re adapting that to swallowing and velopharyngeal dysfunction.”

In the first project, Stepp wants to train people with dysphagia, those whose normal swallowing function has been impaired by a brain injury, to control their anterior laryngeal musculature in response to visual stimuli. A test subject wears four sensors on her neck, three to record signals and one to send signals to a computer game in which she moves a fish up or down, eating smaller fish and avoiding a big shark. The subject sends these signals by tensing the muscles normally used for swallowing. “We’re not asking anybody to do anything more, activity-wise, than they already can. So it’s not strength-building; it’s coordination. So far nobody can’t do it.” Stepp found that someone who has had a stroke, over time, was able to sync up both sides of her neck: “That was pretty promising, that the impaired side started to look more like the healthy side as she was playing the game.”

The other study of this type concerns individuals with velopharyngeal dysfunction. At the back of the throat, the velum is responsible for closing off the nasal cavity when we speak. “When it’s open, we produce speech without any of the acoustic energy going through our nose,” says Stepp. “When it’s open, we purposefully, usually, do that to create nasal sounds—nnn, mmm, nng. But if you don’t have control over this, then you get nasalization when you don’t mean to. And that’s extremely common in individuals with hearing disorders.” That’s because the difference isn’t perceptible by sight: if you were to watch a clip of someone saying, “Mom” (nasal), with the sound muted, it would be indistinguishable from “Bob” (nonnasal). “If you don’t have good auditory feedback, then you don’t learn how to control this,” Stepp explains.

To pinpoint the subtle acoustic differences, the lab has developed a sensor and signal processing system in which a microphone measures acoustic energy emitting from a subject’s mouth and nose while an accelerometer picks up vibrations from his nose as he plays a game involving a paper airplane, moving it up and down based on his nasalization of words. “The visual feedback should motivate people to try to rehab,” says Boris Vnirk (ENG’12), who helped design the program. “That’s really important. So we’re trying to make the sensor something that’s fun to use.”
A SMILE THAT CONTROLS MACHINES

SLHS STUDENT CAROLYN MICHENER’S RESEARCH HELPS PEOPLE USE TECHNOLOGY THROUGH FACIAL MOVEMENT

Imagine turning on the lights, adjusting the thermostat, or operating a DVD player simply by smiling. For people who are visually or verbally impaired, or who have limited motor skills, this could be a major advance in communication. Carolyn Michener (16) is working to make it a reality.

An undergraduate in the speech, language & hearing sciences program, Michener says her lifelong stutter and interest in engineering sparked a passion to develop technology to help others communicate. Working in the STEPP Lab for Sensorimotor Rehabilitation Engineering at Sargent College, she’s collaborating on a project to help people use facial movement and sound to interact with machines.

“For a person with cerebral palsy, or who has limited motor skills, this could be a major advance in communication. Carolyn Michener is working on a project to help people use facial movement and sound to communicate,” says Michener.

A ‘butterfly’ of electric signals in the speech of people newly diagnosed with Parkinson’s disease. “By the time someone is diagnosed, they may have been living with it for eight to ten years, and have lost half their brain stem,” Stepp explains. “How is it that nobody notices it until then? One reason I believe is that humans are so good at compensating [while listening]. Our speech perception is specifically trained to hear intelligible speech. What I wonder is whether we can identify the perceptually subtle changes using acoustic analyses.”

The BU undergraduates have developed a system that is not common.

Currently, the velopharyngeal study is gathering data from healthy adults, and the plan is to test the sensor on children with hearing disorders as well as cerebral palsy and cleft palate.

Other STEPP Lab projects include a study of the acoustic signals in the speech of people newly diagnosed with Parkinson’s disease. “The DB-U undergrads are phenomenal,” she says. “They bring hours of work, of course, but it’s more than that; they take responsibility and they contribute creatively. That’s a combination that is not common.”

Therapy at Your Fingertips

AN INTERACTIVE IPAD APP ALLOWS THOSE WITH SPEECH DISORDERS TO CONTINUE TREATMENT AT HOME

Obert Ziegler arrives at B.U. 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 aphasology 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).
“We can adapt the therapy based on what our patients want and need, and the app gives them control over their therapy.” — Swathi Kiran

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 randomly feedback screen, but prefers to 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. Balachandran helps him work through it, and when Ziegler finally reaches the answer, he slumps in his chair and says, “Oy.”

“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.

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.”

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.
HEY DON’T TALK MUCH, but they listen. Even the youngest toddlers are rapidly building a vocabulary, even if they aren’t able to reproduce aloud all they’ve learned. In fact, when a child hears an unfamiliar verb, even absent a visual cue, she will usually figure out from the context of the sentence whether it’s transitive or intransitive, then file it away and retrieve it when she encounters a likely definition. (She sees her brother rubbing Fido, then remembers Mommy spoke of petting the dog.)

That’s the finding BU Child Language Lab Director and Assistant Professor of Speech, Language & Hearing Science Sudha Arunachalam published in a 2012 edition of the Journal Language and Cognitive Processes.

“Learning language is really one of the great mysteries of human cognition,” says Arunachalam. “Children understand more than they say.”

In the past, the language scientist explains, studies of lexical acquisition focused on nouns, because generally, the first words out of a child’s mouth are indeed nouns. Parents naturally think teaching words means, “I hold up a ball and say, ‘Look, here’s a ball.’ Do you see the ball?” Arunachalam says. “But real-world learning is much more complicated than that, and verbs in particular are more complicated, which is why we choose to look at them.”

In a 2010 study, Arunachalam and colleagues established that 27-month-olds are capable of correctly identifying a verb’s syntactic properties. They showed children a video of a conversation with a made-up verb cast as either transitive (“The boy wants to moop the ball”) or intransitive (“The boy and the dog want to moop”). Then, the toddlers watched two scenes side by side: one depicted a boy spinning a girl in circles; the other, the boy and girl each waving one hand. Finally, the kids were asked to point to the scene that showed mooping.

Those who’d started with the dialogue video in which moop was transitive picked the transitive scene (the boy acting upon the girl by spinning her) and those who’d watched the intransitive dialogue picked the intransitive scene (the boy and girl together performing an action, waving, with no object).

In her latest study, Arunachalam tried the same experiment but with even younger children—most 21 months, some just 19 months—and with a technological twist: instead of asking the toddlers to indicate their choice by pointing, she used a corneal reflection monitor to track their eye movements upon hearing the question. “It’s kind of extraordinary,” she says. “We can measure their comprehension by almost literally looking through their eyes.”

Despite the challenges of working with such young subjects (the journal article notes that “nine toddlers were excluded from analysis due to fussiness”), Arunachalam and colleagues again found that most kids got the transitive-intransitive distinction.

“Clearly, then, 21-month-olds have what it takes to benefit from cross-situational learning,” she wrote, meaning “they can glean whatever information is available about a novel verb in one encounter, and access that information in a subsequent encounter.”

That held true for the study’s few 19-month-olds, Arunachalam adds. “Most 19-month-olds are barely putting words together in a sentence—and they aren’t producing transitive or intransitive structures. But our study made clear that not only can they learn new verbs, they can learn them just from hearing this kind of syntactic information.”

It’s a remarkable advance in our understanding of how children learn words, and Arunachalam isn’t finished. “Most 19-month-olds are barely putting words together in a sentence—and they aren’t producing transitive or intransitive structures. But our study made clear that not only can they learn new verbs, they can learn them just from hearing this kind of syntactic information.”

It’s too early to draw a conclusion, she says, but so far, “The trend is in the right direction. They do seem to be learning.”

This study may have implications for teaching language to children suffering from autism. “Perhaps this would be helpful for them,” Arunachalam says. “Maybe they would learn more easily in a context in which they didn’t have to sit next to somebody or look at some'

body or be explicitly taught something, but rather they could pick up information more from ambient noise.” At the least, she says, this exercise could provide the children a foundation for later learning.

The biggest challenge for the language lab is simply getting participants. “We need 80 kids per study—80 kids whose data we can use,” Arunachalam says. “Occasionally a kid will walk in the room and just want to leave. Or he’ll keep holding a cup of Cheerios in front of his face, and we cannot get him to put that cup of Cheerios down.” Nevertheless, she adds, “We’ve had tremendous success.”

For Inside Sargent readers who are parents of toddlers, Arunachalam offers this takeaway: “Children are listening and learning, even when they are just overhearing speech that isn’t directed specifically to them. So keep the house-hold conversation going!”

To Moop or Not to Moop

KIDS COMPREHEND VERBS LONG BEFORE THEY CAN SPEAK THEM.

BY PATRICK L. KENNEDY
HE 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 he recently 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’s 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.”

This article was originally published in the 2013–2014 issue of Inside Sargent.
For thousands of years, before humans ever wrote anything down, we spoke. Noam Chomsky and many other linguists argue that speech is what sets Homo sapiens apart in the animal kingdom. “Speech,” wrote Aristotle, “is the representation of the mind.” It is a complex process, the series of lightning-quick steps by which your thoughts form themselves into words and travel from your brain, via the tongue, lips, vocal folds, and jaw (together known as the articulators), to your listeners’ ears—and into their own brains.

Complex, but mappable. Over the course of two decades and countless experiments using functional Magnetic Resonance Imaging (fMRI) and other methods of data collection, neuroscientist Frank Guenther has built a computer model describing just how your brain pulls off the trick of speaking.

And the information isn’t merely fascinating. Guenther—a professor in Sargent’s speech, language & hearing sciences department—believes his model will help patients suffering from apraxia (where the desire to speak is intact, but speech production is damaged), stuttering, Lou Gehrig’s disease, throat cancer, even paralysis.

“Having a detailed understanding of how a complex system works helps you fix that system when it’s broken,” says Guenther, a former engineer who left Raytheon (“I hated being a corporate cog”) to earn a PhD in cognitive and neural sciences from BU. “And a model like this is what it takes to really start understanding some of these complicated communication disorders.”

PURPOSEFUL BABBLE

Guenther’s virtual vocal tract, Directions Into Velocities of Articulators (DIVA), is the field’s leading model of speech production. It is based on fMRI studies showing what groups of neurons are activated in which regions of the brain when humans speak various phonemes (the mini-syllables that compose all words). The DIVA system imitates the way we speak: moving our articulators (tongue, etc.) and unconsciously listening to ourselves and auto-correcting. When Guenther runs a fresh program, the model even goes through a babbling phase, teaching itself to produce phonemes, just as human babies do.

Guenther and colleagues in his lab, which he recently moved to Sargent from BU College of Arts & Sciences, continue to perfect the model, but primarily, they’re focused on “using insights from the model to help us address disorders like stuttering,” Guenther says. “What we’ll do is modify the model by damaging it to mimic what’s going on in these disorders.” As they learn more about the physiological differences in the brains of stutterers, for example, Guenther’s team comes closer to “having more precise hypotheses about which receptor systems a drug should target, which should lead us more quickly to a drug that doesn’t cause other behavioral problems.”

GIVING VOICE TO A THOUGHT

A large part of Guenther’s work consists of devising “brain-computer interface methods for augmentative communication,” he says. The most dramatic example has been a collaboration with pioneering neuroscientist Phil Kennedy of Neural Signals, Inc., in Georgia, in which software developed by Guenther’s lab helped a paralyzed man articulate vowels with his mind.

“In locked-in syndrome, the cortex, the main parts of the brain that the model addresses, are actually intact,” says Guenther, explaining the condition of a patient who is physically paralyzed but mentally sound. “What’s messed up is the motor output part of the brain. So the planning of speech goes on fine, but there’s no output.” Guenther had speculated that, “If we knew what their neural signals were, how they were representing the speech, then we should be able to decode the speech.

And it turned out that Kennedy and his team had implanted somebody with an electrode in that part of the brain—the speech motor cortex—but were unable to decode the signals.”

“IT WONT COST PATIENTS $50,000 AND THEY WONT HAVE TO UNDERGO BRAIN SURGERY. IT’S THE KIND OF OFF-THE-SHELF THING THAT THEY CAN BUY AND USE TO COMMUNICATE WITHIN A DAY OR TWO OF PRACTICING.”

—FRANK GUENTHER
DISCOVERY

Pick a letter and these caps can probably guess which one you’re thinking of. Sensors in the caps—the red one manufactured by Frank Guenther, the gray one modified by his team from an existing product—pick up the brain’s electrical signals and transmit them to the computer screen. Another method involves choosing letters by staring at them on an alphabet grid.

The volunteer who received the implant was Erik Ramsey; he had suffered a severe stroke following a car crash, and could communicate only by answering questions with “yes” or “no” using eye movements. With a grant from the National Institutes of Health, Guenther and colleagues built Ramsey a neural prosthesis in 2008. With his electrodes hooked up to a wireless transmitter, Ramsey imagined speaking vowels, “ah, u, o,” while the sizer (emitting a robotic “ahhhhoooooeeee . . . ”) while the computer would pick up these signals. “For real-time control of a synthesizer to produce conversational speech, I think the best way is going to be intracortical, intracranial, because you’re always going to get higher-resolution signals.” And Ramsey succeeded in producing vowels with about two output channels, while “the next system will have up to 96 channels.”

Guenther points out that “these are the initial attempts. It’s like the first rockets that went up but didn’t even go into orbit. This is going to get more and more refined over the next decades. But it will happen. … I can imagine a day when these surgeries become so routine that it’s not a big deal. Somebody might wear such a device as a necklace with a speaker on it.”

FUZZY MIND READING

There are less invasive neural-prosthetic options, which Guenther’s lab is also pursuing. Electroencephalography, or EEG, involves picking up the brain’s electrical signals through sensors that rest on the subject’s head, externally. Guenther’s colleague Jon Brumberg (now an assistant professor at the University of Kansas in the department of Speech-Language-Hearing) is testing an EEG system in which one imagines moving one’s left or right hand or foot, thereby moving a cursor on a screen. Another method involves choosing letters by staring at them on an alphabet grid.

These laborious methods have advantages, Guenther says. “First of all, it won’t cost patients $80,000, and they won’t have to undergo brain surgery. It’s kind of off-the-shelf thing that they can buy and use to communicate”—albeit slowly—“within a day or two of practicing.” However, Guenther says, thanks to interference from the skull, EEG signals have limited value. “Imagine an old TV antenna where you get a fuzzy picture. That’s what EEG is like. For real-time control of a synthesizer to produce conversational speech, I think the best way is going to be intracortical, intracranial, because you’re always going to get higher-resolution signals.” And Ramsey succeeded in producing vowels with only two output channels, while “the next system will have up to 96 channels.”

Guenther explains that “by the end of the experiment, he was hitting the auditory targets about 80 percent to 90 percent correctly.”

INSIGHTS FOR CLINICIANS

Guenther relishes his work as a pioneer at the nexus of engineering, neuroscience, and now rehabilitation. “Coming to Sargent College has been good timing for me because my earlier career was building up this model of normal human brain function, and now that we’re starting to look at the disorders, like stuttering, we’re getting insights by talking to clinicians, and getting access to clinical populations, at Sargent.”

What hasn’t changed is Guenther’s fascination with the human brain. “It’s such an unbelievable machine. I’ve studied computers, and the brain does many things so much better than computers. And if you figure out how the brain works, you understand the mind, and you understand some of life’s great mysteries.”

STARTING A CONVERSATION WORKING WITH PATIENTS MOTIVATES A DOCTORAL STUDENT TO PUSH BOUNDARIES IN THE LAB AND THE CLINIC

By Rachel Johnson

Imagine knowing what you want to say but not being able to say it. For people recovering from acquired brain injuries (ABI)—such as those resulting from accident, stroke, surgery, or cancer treatment—language problems can pose one of the greatest challenges in their recovery, affecting their ability to resume a normal life. Will Evans, ‘10, ‘13 has seen how devastating these impediments can be during his clinical fellowship at Boston’s Massachusetts General Hospital (MGH), part of his PhD work in SLHS. “There’s a lot of grieving,” he says, “because people are dealing with the realization that they might not get to live the life that they were expecting.” Witnessing language loss has motivated Evans to help develop therapies that bring back some level of communication to patients.

He works with adult outpatients at MGH, treating a number of language-related disorders, including aphasia, a problem with the ability to produce or understand language, and dysarthria, a muscle control impairment. The work allows Evans to put abstract classroom concepts into action. “An adult already had a fully developed language system, that was fine to begin with,” he says, “but now something’s happened to it. So I have to think, ‘How do I get the best sense of where they are?’ What are the difficulties that they’re having?” Then I can come up with the strategies and training that will help.”

Evans is working behind the scenes in Sargent’s Language Science Lab to help develop some of those strategies. He’s been at the lab for the past five years and has won plaudits for research on the use of eye-tracking technology to monitor language processing. “The major benefit to using eye-tracking is that you can present slightly different versions of similar sentences and see in real-time if the way people read them changes,” he says. “If they reread certain parts more often or take longer on a specific word in one sentence than they do in a similar sentence, you can draw conclusions about how their language processing system is set up.”

But, even as Evans and other researchers make technical advances in diagnosis and treatment, regaining speech functions after an ABI can be a daunting process—for both patient and clinician. “It’s really important to address these emotional aspects,” says Evans. “I don’t own too much distance from my patients because I want to help people, and I think that becomes harder if you cut yourself off. There are all these life-changing events that we can’t fix, but there are other things we can take on.”

Eventually, Evans wants to research, teach, and work with patients. Earning his PhD will enable him to do all three: “Being a professor lets you add to the body of knowledge, so people in general can receive better help. But I love working directly with patients, too.” Although his current dilemma is whether to teach, study, or treat first, he says all three routes are driven by the same ambition: “I want to help increase the knowledge of how the brain works and how knowledge is processed, and also to connect that to helping actual patients in the real world.”

This article was originally published in the 2011–2012 issue of Inside Sargent.
**Grant Awards**

BU SARGENT COLLEGE’S SLHS FACULTY RECEIVED $3,787,792 IN RESEARCH FUNDING IN 2014-2015. HERE IS A LIST OF OUR PROJECTS AND THE AGENCIES AND FOUNDATIONS SUPPORTING SLHS RESEARCH.

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<th>PRINCIPAL INVESTIGATOR</th>
<th>TITLE OF PROJECT</th>
<th>AGENCY/FOUNDATION</th>
<th>FUNDS AWARDED 2014-2015</th>
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<tr>
<td>Sudha Arunachalam, assistant professor of speech, language &amp; hearing sciences</td>
<td>A Non-Interactive Method for Teaching VISN and Verbal Meanings to Young Children with ASD</td>
<td>Autism Speaks</td>
<td>$18,000</td>
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<td>Sudha Arunachalam, assistant professor of speech, language &amp; hearing sciences</td>
<td>Toddlers’ Representations of Verbs: Effects of Delay and Sleep on Verb Memory</td>
<td>Northwestern University</td>
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<td>Sudha Arunachalam, assistant professor of speech, language &amp; hearing sciences</td>
<td>Mechanisms Underlying Word Learning in Children with ASD: Non-Social Learning and Memory Consolation</td>
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<td>Frank Guenther</td>
<td>Minimally Verbal ASD: From Basic Mechanisms to Innovative Interventions</td>
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<td>Gerald Kidd, professor of speech, language &amp; hearing sciences</td>
<td>Central Factors in Auditory Masking Top Down Control of Selective Amplification</td>
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<td>Swathi Kiran, professor of speech, language &amp; hearing sciences</td>
<td>The Neurobiology of Recovery in Aphasia: Natural History and Treatment-Induced Recovery</td>
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<td>Swathi Kiran, professor of speech, language &amp; hearing sciences</td>
<td>Thrombus-Based Treatment for Sentence Comprehension Deficits in Aphasia</td>
<td>Subaward—Northwestern University</td>
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<td>Susan Langmore, clinical professor of speech, language &amp; hearing sciences</td>
<td>Non-Invasive Brain Stimulation for Developing Recovery After Cerebrovascular Stroke</td>
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<td>Carey Stepp, assistant professor of speech, language &amp; hearing sciences</td>
<td>Career-Enabling Enhanced Communication through Human-Machine-Interfaces</td>
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<td>Automation of Rearrange Fundamental Frequency Estimation</td>
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<td>Carey Stepp, assistant professor of speech, language &amp; hearing sciences</td>
<td>Development of an Electrophysiologically Controlled Stimulation System (TMS-EEG) Voice Production</td>
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<td>Glorina S. Waters, professor of speech, language &amp; hearing sciences</td>
<td>Assessment of Comprehension Skills in Older Apartment Communities</td>
<td>US Department of Education (ED)</td>
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<td>Attention and Executive Control During Local Processing in Aphasia (NGA)</td>
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**Speech, Language & Hearing Sciences**

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- **Sudha Arunachalam**: Clinical Associate Professor and Clinic Director
- **Diane Constantine**: Clinical Associate Professor
- **Ann Ellis**: Clinical Assistant Professor
- **Frank Guenther**: Clinical Associate Professor and Clinic Director
- **Eloise Moore**: Clinical Assistant Professor and Coordinator of Clinical Education
- **Karlo Horsfield**: Clinical Assistant Professor and Coordinator of Clinical Education
- **Gerald Kidd**: Professor
- **Sudhi Kiran**: Professor
- **Swathi Kiran**: Professor
- **Susan Langmore**: Professor
- **Melanie Matthews**: Assistant Professor and Chair, Associate Dean
- **Michelle Motto**: Clinical Professor and Director, Master of Science Program
- **Christopher Moore**: Dean and Professor
- **Barbara Oppenheimer**: Professor
- **Tyler Perrachon**: Associate Professor
- **Cara Stepp**: Assistant Professor
- **Kristine Strand**: Clinical Associate Professor and Director, Bachelor of Science Program
- **Gloria Waters**: Professor
- **Helen Tager-Flusberg**: Senior Research Scientist and Clinic Director

**Programs of Study**

- Bachelor of Science in Speech, Language & Hearing Sciences
- Combined Bachelor of Science in Speech-Language Pathology and Bachelor of Arts in Speech, Language & Hearing Sciences
- Combined Bachelor of Science in Speech-Language Pathology and Master of Science in Speech-Language Pathology
- Master of Science in Speech-Language Pathology
- Combined Bachelor of Science in Speech-Language Pathology and PhD in Speech, Language & Hearing Sciences

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Email: slhs@bu.edu
Phone: 617-353-3188
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