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## He “Hears” the Siren Song of Research

Pneumococcal meningitis robbed Brad Buran of his hearing more than 20 years ago, when he was 14 months old, but Buran hasn't let that slow him down. Deafness didn't prevent him from earning a 4.0 academic average at Silver Spring, Maryland's Montgomery Blair High School or from running track, earning an Eagle Scout award, becoming a National Merit Scholar semifinalist and, ultimately, winning a Banneker-Key full scholarship to the University of Maryland.

Deafness hasn't hindered Buran in college, either. In four years at Maryland, he has made the Dean's List every semester, was a Rhodes Scholar finalist and a participant in the competitive Gemstones interdisciplinary research program, all while earning two bachelor's degrees—one in neurophysiology one in biological anthropology—which he'll receive this year summa cum laude.

And, he says, deafness isn't going to keep him from attending graduate school or pursuing a research career in developmental neurobiology of the auditory system.

"I've never let anyone tell me what I can or can't accomplish," Buran explains. "I'm certainly not going to let my deafness limit my future."

Since December 2001, Buran has been part of an HHMI-supported undergraduate research program at the College Park, Maryland, campus. He works in the lab of Arthur N. Popper, biology professor and director of the neuroscience and cognitive science program there. Like his mentor, he investigates the auditory neurobiology of deep-sea fish, working with graduate student Xiahong Deng, who studies the development of structures in the fishes' inner ears.

"We are trying to find a correlation between the environment and behavior of the fish and certain structures of the inner ear," Buran explains. "That may help us understand the evolution of the development of the ear."

Fish don't have a cochlea, as mammals do, but like mammals, they have sensory hair cells that play a key role in hearing. These cells are the same as the sensory hair cells found in the human ear. "If we can figure out how different characteristics of hair cells affect the fish's ability to hear, we may

be able to apply what we learn to the mammalian ear," he says.

Buran does have a cochlea, the spiral-shaped cavity of the inner ear that contains nerve endings essential for hearing. He also has a cochlear implant that enables him to hear environmental sounds such as traffic, rain, birds or a phone ringing, although not speech. When he recently presented a research poster at an international meeting of the Association for Research in Otolaryngology, the college student was especially thrilled to talk with one scientist, "the guy who gave me my cochlear implant at Johns Hopkins five years ago."

How does a young man who can't hear spoken words or speak clearly himself manage to rack up Buran's academic and extracurricular accomplishments?

One answer is named Susan Schleicher, a cued language transliterator from Baltimore whom Buran calls "my shadow." She started going to classes, labs and activities with him when he entered high school, and she's been with him ever since. Not a scientist herself, Schleicher says with a grin: "I've learned a LOT of science." Then she amends: "I've just learned a lot."

As Schleicher talks, her fingers and hands are dancing, letting Buran know what she—or a professor or research colleague—is saying. Different from American Sign Language, cued language uses its own signs for each vowel and consonant. It's a system Buran learned in the Montgomery County schools, one of the reasons his parents moved to Maryland. "Cued speech gives me English as my native language," says Buran. American Sign Language, which he also knows, is less suited to science. "You have to translate," he explains, "and there are no signs for many of the complex scientific terms." Lip-reading is not an option. "There is 80 percent ambiguity in lip-reading," says Buran. "Think about it. How can I tell the difference between bat, pat and mat? They look the same coming out of your mouth."

When Buran applied to work with Popper, the professor almost turned him down. "I had too many undergraduates in my lab," Popper explains. "Then I realized that we could learn a lot from him. He's teaching everyone in my lab how to work with someone with disabilities, although one of his great strengths is that he doesn't consider himself disabled. Brad is also helping us understand the real reasons we are studying the auditory system and how our work might impact people in the future."

So he put the young man to work in his lab. Then, says Popper, "I realized that he was extraordinarily bright as well." A neurobiologist who has been teaching undergraduates for more than 30 years, Popper says Buran is "among the very best undergraduates I've ever encountered."

Although he was doing honors research and working in Popper's lab, Buran decided to complete a second degree in biological anthropology because he wanted to study deaf culture and how American Sign Language affects its development. "I would like to help sensitize scientists to the ethical and cultural issues related to their research, to understand how the deaf culture views their work," he says, "and I'd like to help the deaf culture improve their

lives by finding ways to integrate scientific discoveries without losing a sense of who they are as deaf persons."

Buran also finds time to teach an undergraduate class on research, covering topics such as research ethics, the conduct of research and grantsmanship. "Half of my students are arts or business majors, so their research is very different from mine," he says, "but the underlying principles are the same: developing a question and a strategy to approach that question, collecting and analyzing data, and presenting it in a way that can be understood and replicated."

Buran and fellow HHMI undergraduate research scholar Soroush Rais-Bahrami conceived of and produce a journal, *Maryland Essays in Human Biodiversity*. He plans to continue on the editorial board of the journal, which he calls "an international forum for people from around the world to discuss topics in human variation," while attending graduate school at the University of Washington in Seattle.