

Undergraduate Research

Dorothy Yang

This Pitt junior has found a long-term home in a lab that studies communication disorders caused by brain damage

This is the fifth in a series of *Pitt Chronicle* articles profiling outstanding University of Pittsburgh undergraduate researchers

By Daniel Bates

While some of her high school classmates were hanging out at the mall, **Dorothy Yang** was spending her extracurricular hours shadowing an audiologist and speech-language pathologist at Children's Hospital in her hometown of Richmond, Va.

Following her freshman year at Pitt, Yang could have gone home for a summer break from her studies. Instead, she stayed in Pittsburgh to familiarize herself with research in the laboratory of Malcolm R. McNeil, Distinguished Service Professor and chair in the Department of Communication Science and Disorders in Pitt's School of Health and Rehabilitation Sciences.

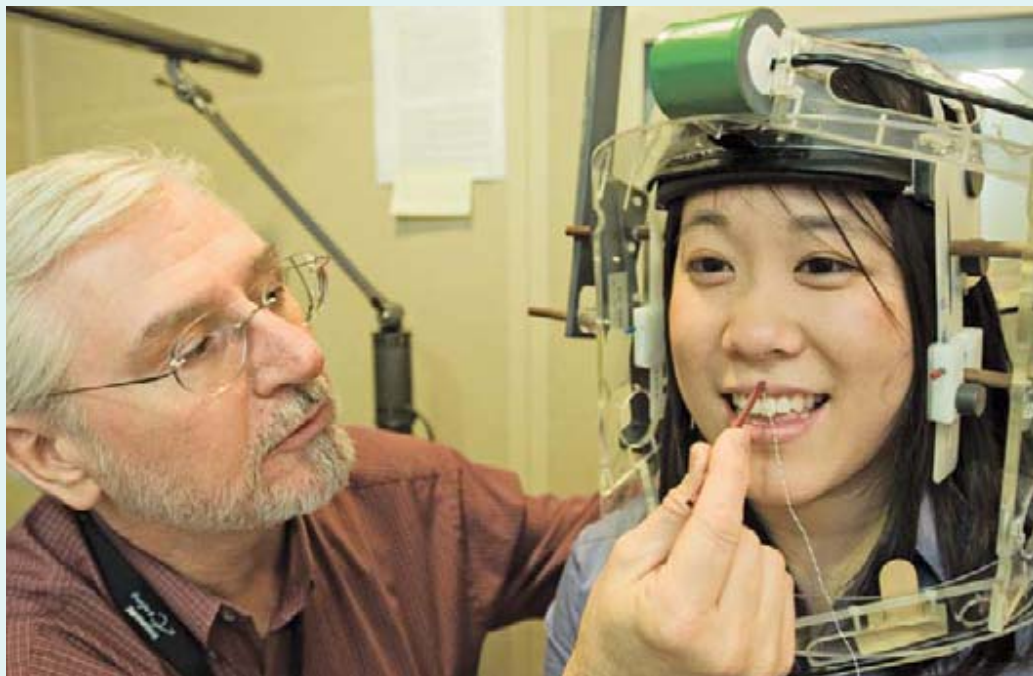
Now a junior, Yang is still "hanging out" (as she modestly describes it) in McNeil's lab, but no longer as just an interested bystander.

Having devoted summer 2004 and much of her sophomore year to shadowing McNeil and his research collaborators around a maze of sound-proof testing chambers and other lab facilities, attending meetings with a half-dozen of McNeil's graduate student researchers, and helping those grad students with their own research assignments, Yang today is contributing significantly to McNeil's work on communication disorders caused by stroke, brain tumors, and other brain-damaging head traumas.

McNeil says that Yang, 20, is able to "hold her own" as an undergraduate member of his research team, even among the more scientifically advanced graduate students in his lab, which is supported by competitive research monies from the Veterans Administration (VA) Rehabilitation Research and Development Service and the Geriatric Research, Education, and Clinical Center at the Highland Drive VA Hospital.

Specifically, Yang participates in McNeil's research on people with aphasia, a disorder caused by damage that affects the language-processing parts of the brain. Aphasia typically causes people to struggle with expressive language (i.e., what they are trying to say) through speech and gesture, as well as with reading and with understanding spoken language. Often their aphasia is accompanied by motor speech disorders as well.

Most of McNeil's work—performed in collaboration with Patrick Doyle and Sheila Pratt, both Pitt professors of communication science and disorders and VA researchers—is aimed at developing measurement instruments for assessing



Dorothy Yang and her faculty adviser, Malcolm McNeil, demonstrate an instrument that measures movements of the tongue and the facial muscles involved in speaking. The piece of equipment, called an electromagnetic midline articulography instrument, typically is used to test stroke patients who have lost the ability to speak and to rehabilitate those patients by showing them when their oral-communication muscles are moving correctly.

the extent of aphasia in patients, as well understanding the cognitive mechanisms underlying the language and movement disorders. Their research is also directed at treatments to help patients rehabilitate impaired communicative functions. In addition, McNeil studies the nature and treatment of motor speech disorders, focusing on the muscles involved in speech production and the "wiring" that enables the brain to communicate with those muscles.

Yang received a University Honors College Brackenridge Fellowship here last summer to work on a test to detect differences in how persons with aphasia process active versus passive auditory commands. The fellowships, named for Pitt founder Hugh Henry Brackenridge, annually award 60 Pitt undergraduates stipends of \$3,000 each, enabling them to do research rather than working summer jobs to make ends meet. More recently, Yang was awarded one of 10 Chancellor's Undergraduate Research Fellowships for 2007.

As part of her work with McNeil, Yang helped to develop a series of computerized "sub-tests" using a screen graphic that includes a series of red, green, blue, black, and white circles and squares. She has written a number of commands, both passive and active, that grow progressively more complex during the course of the test. For example, an active sentence might state,

"The red circle touched the green square." That may be followed by a passive sentence such as, "The left of the blue square was touched by the green square." Participants respond to commands by manipulating objects on a touch screen in order to measure their understanding of the statements.

The sentences were digitally recorded by McNeil to be played back first to a group of 25 elderly adults with no speech or language impairments, then to elderly adults with communication disorders.

"The reason I gave the project to Dorothy is that I wanted her to pick a project where she would learn a lot and do a lot, such as do speech acoustics analysis, work with clinical tools, and build new tests, while also getting experience with patients," McNeil explains. "She now has a pathway of research for years and years to come."

Yang also has contributed to a study of language performance differences between normal and aphasic adults, using a test developed by McNeil and Doyle called the Story Retell Procedure. Yang helped a graduate student conduct the test, which involves telling a story to test subjects and then asking them to retell the story as accurately as possible soon after hearing it. Yang later helped to transcribe each speech sample and then compiled the linguistic data into various charts and graphs for statistical analyses and for presentation to other

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The research findings were presented last year during both the International Aphasia Rehabilitation Conference, held in Sheffield, England, and the Clinical Aphasiology Conference; Yang traveled to Belgium last summer to participate in the latter conference.

An Honors College student, Yang is majoring in communication science and disorders, with minors in neuroscience and linguistics. She also is pursuing an intellectually rigorous Bachelor of Philosophy degree through the Honors College.

"I knew Pitt was a big research school, and I knew there were opportunities" for undergraduates here to participate in cutting-edge research, Yang says. Working as part of McNeil's team "has been incredible, and it definitely complements all of my classes," she adds. "Everything fits together really nicely and has really influenced my future."

Yang, whose father is a behavioral psychologist, says her original ambition was to be a clinician. "But in my freshman year, I jumped into research right away. I guess I was more interested in the brain and [investigating] what causes communication disorders. The best part of this research is the fact that there's still so much that needs to be discovered—the whole mystery. That's what attracts me to the area."

After she completes her undergraduate work next year, Yang says, she plans to pursue a Ph.D.—a goal that McNeil has encouraged.

Says McNeil, proudly: "She'll turn out to be a great academician if she wants to."