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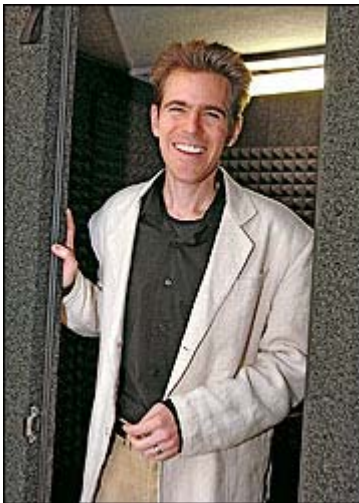
Investigating music and the mind

Psychologist looks at link between thought, action in production of music

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Peter Q. Pfordresher, a specialist in music cognition, aims to increase our understanding about how the human mind perceives and produces music.



Peter Pfordresher's work combines the two greatest interests in his life—psychology and music—into a single research topic.

PHOTO: NANCY J. PARISI

His work not only contributes to research on music and speech, but provides insight into other intriguing questions about the brain, such as the causes

behind tone deafness, vocal imitation and the organization of complex sequences of information.

"Music is a fascinating thing to me," says Pfordresher, assistant professor in the Department of Psychology, College of Arts and Sciences. "It is a great way to explore the human brain because it is highly complex, ubiquitous across cultures and an important part of people's lives."

"Yet," he points out, "in some ways music is easier to manipulate in an experimental sense than, for instance, language."

Although he once considered a career in music—"I was in a lot of bands and interested in rock music," he notes—Pfordresher chose to pursue a doctorate after receiving his bachelor's in psychology from Georgetown University in 1993.

"If people think peer review is bad," he laughs, "try getting an album produced."

In 1994, he traveled overseas to participate in a master's program at the Institute of Cognitive Neuroscience-University College London. During a class taught by the influential neuropsychologist Tim Shallice that addressed the complex framework used to understand language processing in the brain, Pfordresher had the sudden idea to combine the two greatest interests in his life into a single research topic.

"It occurred to me sitting in that seminar," he says, "that a similar, but not identical, kind of model could be constructed for how we process music."

Pfordresher wrote a master's thesis on the subject and, in December 2001, earned a doctorate in cognitive and experimental psychology from Ohio State University.

"I knew the prospect of getting jobs was tough in music cognition because it's sort of a fringe area," he says, "but I decided I might as well do something I really liked rather than compromise."

In September 2001, Pfordresher joined the University of Texas-San Antonio. He served five years as an assistant professor of psychology, but left after a promised doctoral program in his field failed to materialize. This is his first semester at UB.

Pfordresher continues work on a \$100,000 research project funded by the National Science Foundation entitled "Auditory Feedback in Sequence Production." The project, begun in 2004, aims to better understand the connection between thought and action in the production of music.

The research is conducted using volunteers—those with no musical training as well as trained musicians—who are asked to play an electronic keyboard connected to a computer. A sound recorder, pressure-sensitive keys and motion-capture camera collect a wealth of data on the performance. The lab, located in Park Hall, North Campus, also contains a sound-attenuated booth that is used in related vocal experiments.

The keyboard can be programmed to produce pitches that are silent, incorrect or out-of-order. For example, a subject might strike the first note in a sequence, but hear the second. Manipulating the order provides insight into how the brain organizes information to comprehend music since each pitch constitutes a building block in the melody. The same principle applies to the phonemes used to construct and understand words in language.

While turning off the sound or causing the keyboard to play random notes does not interfere with the performance, Pfordresher has found that shifting notes in the melody forward or backward to anticipate future actions or recall past actions does affect the performance.

The results seem to support an increasingly popular concept in cognitive science sometimes called a shared representation framework.

"You use the same mental representation to plan actions and to perceive the consequence of your actions," he explains. "The brain is trying to activate actions and not activate other actions, which are part of this same sequence, but auditory feedback is, in a sense, regenerating actions that are supposed to turn off."

In addition to the NSF-funded research, Pfordresher has been the principal investigator on a \$150,000 project funded by the San Antonio Life Sciences Institute. He remains a consultant on the initiative, which relates to singing and aims to understand "vocal pitch imitation."

His work on a related topic—tone deafness—continues in collaboration with colleagues at Simon Fraser University in Vancouver. He conducts behavioral research at UB, which is supplemented by data from brain scans collected in Canada. In 2005, the project received \$20,000 from the world-famous Grammy Foundation.

A strong tradition of research in auditory perception attracted Pfordresher to UB. He points to J. David Smith, associate professor of psychology, who has produced several noteworthy papers on the topic. In addition, other faculty members interested in speech and language at UB include Gail Mauner, associate professor; James Sawusch, professor; and Paul Luce, professor and chair, all in the Department of Psychology. He also notes the work of psychology faculty members Micheal Dent and Eduardo Mercado, both assistant professors who specialize in auditory process among animals.

"My research focuses quite a bit on commonalities between music and language," he says. "I like to talk to people with those sorts of interests."

"Another plus for the department," he adds, "is there is actually a 'Psychology of Music' course on the books." He is scheduled to teach that class during the spring semester, plus a course on statistics. This semester, he teaches a graduate seminar on auditory perception.

Pfordresher says moving to Western New York from Texas has turned out to be a good move—personally as well as professionally.

He and his wife, Lyn, a free-lance editor in educational publishing, reside in the Parkside neighborhood of North Buffalo near Delaware Park. Their first daughter, Emma, was born in July.

"I've been in love with Buffalo; more so than I thought I would," Pfordresher says. "We had a lot of fun going to the summer festivals downtown. I wanted to move here because of the department and university. I wasn't expecting Buffalo to be such an interesting and culturally rich place."
