PRESIDENT'S LECTURE SERIES

Todd F. Roberts, Ph.D.

What's in a Song? How Songbirds Teach Us About Learning and Vocal Communication

Thursday, Sept. 19, 2024
4 p.m. Lecture, Reception to Follow
Tom and Lula Gooch Auditorium
utsouthwestern.edu/pls

UTSouthwestern
Medical Center

ABOUT THE PRESIDENT'S LECTURE SERIES

The President's Lecture Series was established to recognize the importance of UT Southwestern staff in enabling the Medical Center to achieve its mission and goals. The faculty excels in education, research, and patient care only with the contributions of staff, whose work, directly and indirectly, supports faculty endeavors.

The lectures selected for this series provide an opportunity for the employees of UT Southwestern to learn more about the research discoveries, clinical advances, and other contributions of the Medical Center's most accomplished scientists, physicians, and senior leaders. Three times each academic year, leading experts present a President's Lecture, discussing in nontechnical terms the basics of their research and clinical programs and their implications for good health and medical care.

The President's Lecture Series is offered in appreciation and respect for the work and dedication of UT Southwestern staff.

Daniel K. Podolsky, M.D.
President
UT Southwestern Medical Center

ABOUT THE LECTURE

About half of the estimated 10,000 known bird species learn their vocalizations through imitation – a type of learning that shares many behavioral and genetic features with how humans learn to talk. Studying these birds can shed light on the process behind how language acquisition takes place, as well as conditions in which it sometimes goes awry, such as with autism spectrum disorder (ASD).

Todd Roberts, Ph.D., Associate Professor of Neuroscience, has made vocal learning in birds the focus of his career. His work centers on zebra finches, a songbird species commonly kept as pets in the U.S.

Dr. Roberts' initial interest in this topic was sparked by his own childhood experiences. His family moved from Houston, Texas, to Brazil when he was about 6 months old to support his scientist father's research on malaria and other mosquito-borne diseases. There, he simultaneously learned Brazilian Portuguese and English, becoming the most fluent bilingual speaker in his household. But soon after Dr. Roberts returned to the U.S. at age 7, he stopped speaking Portuguese and lost the ability to speak or understand the language.

This experience ignited a lifelong curiosity to understand vocal learning that eventually brought him to UT Southwestern in 2013. In his lab, ongoing research with collaborator Genevieve Konopka, Ph.D., Professor of Neuroscience, aims to decipher the evolutionary roots of neural circuits involved in social behaviors necessary for vocal learning, some of which overlap with neural circuits implicated in ASD. In new research, he and his lab are trying to understand the neural underpinnings of male birds' ability to sing and motivations to teach songs to their sons.

"By studying this special form of learning in birds," Dr. Roberts said, "we are unlocking new knowledge on what makes us human."

ABOUT THE SPEAKER

Todd F. Roberts, Ph.D., Associate Professor of Neuroscience and an Investigator in the Peter O'Donnell Jr. Brain Institute at UT Southwestern, is recognized for his work studying how auditory memories are encoded and used to guide vocal imitation in songbirds and for discovering how motor circuits control production of learned vocalizations. This research has implications for neurodevelopmental disorders, such as ASD, that affect speech and language learning in humans.

Work from Dr. Roberts' lab, published in *Science Advances*, found that inactivating the ASD-linked *FoxP1* gene in young songbirds prevented the birds from forming memories necessary to reproduce their fathers' songs accurately. The findings could help explain the deficits in speech and language that often accompany ASD and eventually lead to new treatments specifically targeting this aspect of the disorder.

Dr. Roberts has also led several songbird studies investigating how the brain works during vocal learning, including through implanting memories in the brain to teach vocalizations and manipulating circuits to directly guide changes in previously learned vocalizations. More recent research from Dr. Roberts' lab, published in *Nature*, used artificial intelligence to analyze the song that male zebra finches learn to sing, identifying qualities that signal their sexual attractiveness to females.

Dr. Roberts, who joined the UT Southwestern faculty in 2013, is a Thomas O. Hicks Scholar in Medical Research. He is a recipient of a National Institutes of Health Director's Transformative Research Award, the Klingenstein-Simons Neuroscience Fellowship Award, and a National Alliance for Research on Schizophrenia and Depression Young Investigator Award from the Brain & Behavior Research Foundation. Dr. Roberts earned his undergraduate degree in psychology and Ph.D. in neuroscience from the University of Maryland. He worked with Richard Mooney, Ph.D., as a postdoctoral fellow at Duke University Medical Center in Durham, North Carolina.

ABOUT THE NEXT SPEAKER

Thursday,

February 13, 2025

Daniel J. Siegwart, Ph.D., a Professor in the Department of Biomedical Engineering, Department of Biochemistry, and the Harold C. Simmons Comprehensive Cancer Center, is recognized for developing lipid nanoparticles that serve as carriers for genetic medicines. He and his colleagues have shown in animal models that this approach can deliver genetic instructions that prompt cells to produce therapeutic proteins, turning them into living drug factories. This approach can also be used to deliver therapies that fix the genomes of cells, correcting the root cause of genetic diseases.

In a series of recent papers, Dr. Siegwart and his colleagues reported that adjusting the lipid composition of these synthetic nanocarriers influences where they end up in the body. Using this system, which they named Selective Organ Targeting (SORT), the researchers steered lipid nanocarriers to the spleen, where their genetic medicine payload trained immune cells to fight cancer. In another study, the team directed lipid nanocarriers to the lungs, where gene editing tools corrected the causative genetic mutation in an animal model of cystic fibrosis.

Dr. Siegwart, who joined the UT Southwestern faculty in 2012, holds the W. Ray Wallace Distinguished Chair in Molecular Oncology Research and serves as the Director of the Program in Genetic Drug Engineering, Director of the Drug Delivery Program in Biomedical Engineering, and Co-leader of the Chemistry and Cancer Program in the Simmons Cancer Center.

In July 2024 he was selected as an Emerging Leader in Health and Medicine Scholar by the National Academy of Medicine.

He majored in biochemistry at Lehigh University and studied as a research fellow at the University of Tokyo. After earning his Ph.D. in chemistry from Carnegie Mellon University, he completed a postdoctoral fellowship at the Massachusetts Institute of Technology in the laboratory of Robert Langer, Sc.D.