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PRESS RELEASE
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SONGBIRDS AND SINGING RODENTS HELP REVEAL THE SECRETS OF SPEECH

The critically acclaimed film 'The Diving Bell and the Butterfly' tells the tale of the journalist Jean-Dominique Bauby who was left unable to speak following a massive stroke. Using one of his only remaining movements (the voluntary blinking of his left eye) he communicated with his partner to direct the creation of this heart-rending memoir describing his experiences.

This film illustrates the importance and complexity of our ability to communicate with the outside world, and in work presented at the FENS Forum of Neuroscience in Berlin today (10 July**), Associate Professor Michael Long** of the New York University Langone Medical Center explained how he is helping to understand new ways to help people who, like Bauby, have lost the ability to speak.

"My team's work focuses on understanding how our brains plan and execute the movements needed to form our words and other complex behaviours. We use a variety of approaches to study the brain processes underlying activities such as speech, which need to be interactive and adaptable to circumstance, by contrast to highly reproducible well-defined muscle movements such as hitting a golf ball or playing the violin, where consistency is key," he explained.

Professor Long and colleagues thus use bird, mouse and human subjects to identify brain centres involved in producing motor sequences both during natural behaviour and when artificially manipulated.

Their work centres on a comparative approach to understanding the brain circuits underlying a range of complex vocal behaviours. Professor Long said, "We study the cellular and circuit mechanisms that enable the zebrafinch to sing, a highly stable behaviour that is executed with a high degree of precision."

These birds learn to sing from a tutor (usually their father) with striking parallels to human speech, and the motor memory of the song is stored in a single location in the bird's brain. By investigating activity of this circuit during song, Professor Long has been able to visualise the activity of tens of thousands of interacting brain cells that create each note.

From studying the songbird's brain in this way, Professor Long better understands the function of the human brain during both speaking and singing. Together with clinical colleagues he has examined the brain mechanisms underlying vocal production and perception.

In one example of this work, Professor Long and colleagues cooled specific regions of the human brain during speech production and found changes in vocal timing and quality, helping to further define the function of these regions. In a related case study, they used the same cooling approach to examine a song production region on the right hemisphere of a trained singer to identify circuits involved in regulating vocal pitch.

Professor Long and colleagues recently examined vocal interactions in a newly characterised neotropical rodent – known as Alton's singing mouse - which can flexibly coordinate the timing of its vocalisations to interact with sensory input in a process known as counter-singing. In these studies, a small region of the mouse cortex was found to be critical in enabling them to sing duets with each other.

From this work – ranging from birds to rodents to humans – Professor Long is starting to unlock the mysteries of human speech. And from these studies, he hopes to develop new ways of treating patients with speech disorders, bringing together biological observations and innovative technology to help the voiceless regain their words.

END

Plenary Lecture P06 Stability and flexibility in motor networks

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NOTES TO EDITORS
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The 11th FENS Forum of Neuroscience, the largest basic neuroscience meeting in Europe, organised by FENS and hosted by the German Neuroscience Society will attract more than 7,000 international delegates. The Federation of European Neuroscience Societies (FENS) was founded in 1998. With 43 neuroscience member societies across 33 European countries, FENS as an organisation represents 24,000 European neuroscientists with a mission to advance European neuroscience education and research. https://forum2018.fens.org/

Further reading
Functional Segregation of Cortical Regions Underlying Speech Timing and Articulation
M Long, K Katlowitz, M Svirsky, R Clary, T McAllister Byun, N Majaj, H Oya, M Howard III, J Greenlee *Neuron* Volume 89, Issue 6, p1187–1193, 16 March 2016
DOI https://doi.org/10.1016/j.neuron.2016.01.032