Abstractions

FIRST AUTHOR

Vocal communication is a dynamic process that involves both speaking and hearing. The auditory system must continuously distinguish between external sounds and feedback from one's own voice. Steven Eliades, a recent MD–PhD graduate of Johns Hopkins University School of Medicine in Baltimore, Maryland, and his advisor Xiaoqin Wang monitored marmoset vocalizations, and report that suppression of some neurons in the auditory cortex during vocalization enhances the neurons' sensitivity to self-generated sounds (see page 1102). Eliades explains the potential link between auditory processing and speech-related disorders.

How did this work evolve?

This whole project came about by accident. Several years ago, we were monitoring neurons in marmosets as part of a simple auditory experiment. We noticed that when we heard a monkey vocalize, the neuron we were monitoring stopped firing. We created conditions that altered what the animal heard while vocalizing in real time. We show that auditory cortex neurons that are suppressed — that is, fire less often — during vocalization are most sensitive to one's own vocal feedback. This suggests that these neurons are responsible for self-monitoring.

What were the biggest challenges of working with marmosets?

They aren't very vocal when alone under typical experimental conditions. Through trial and error, we created a way to get high-quality sound recordings of the vocalizations of free-roaming marmosets. Other major challenges were adapting an implantable electrode for use in small monkeys such as marmosets, and making sure the monkeys didn't climb on or chew through the implant wires.

What insight did you gain from this work?

I realized how little we understand of how hearing and speech interact. Disruptions in this process may be more of a clinical problem than is currently appreciated.

What types of disorder might this shed light on?

Some 50-year-old theories suggest that a malfunction in auditory processing may underlie stuttering. This work suggests that some stutterers might be unable to self-monitor because their auditory system does not process feedback information correctly. Initial data also suggest that a difficulty faced by patients with Parkinson's disease — who tend to speak too softly, limiting their ability to carry on conversations — may be a self-monitoring problem. ■

MAKING THE PAPER

Keivan Stassun

Astronomers find that identical twin stars are not always the same.

'Identical twin' stars are about as rare as their human counterparts. As the name suggests, these stars are thought to have been born at the same time and been made from the same materials. They are also equal in mass. It was previously assumed that identical twin stars orbiting one another as part of a binary star system were formed under such conditions. But a team led by Keivan Stassun, an astronomer at Vanderbilt University in Nashville, Tennessee, has discovered a pair of 'newborn' twin stars that aren't all that identical. The finding indicates that the 'twins' may have been born several hundred thousand years apart.

"Our discovery shows that you can't necessarily assume that two stars in a binary star system are identical in age," says Stassun. He and his co-workers set out to find a young eclipsing binary star system in order to learn more about early stellar evolution. Such systems are hard to find, because they comprise roughly one in every thousand stars. Taking their measurements is also tricky: astronomers can measure properties such as mass, surface temperature, brightness and size only when one of the stars passes directly in front of the other as they swirl in orbit. "You have to stare at thousands of stars and wait for just a couple of them to wink as they eclipse one another," says Stassun.

The team collected spectra and snapped images of two sibling stars, dubbed Par 1802, within the Orion Nebula, a giant stellar 'nursery'. The stars within the nebula are about a million years old — mere infants for stars, which have a lifetime of tens of billions of years. Although the two stars are almost identical in mass, which qualifies them as identical twins, one is significantly warmer and brighter than the other, and also potentially larger in diameter (see page 1079).

The physical differences between the stars seem to stem from their birth order, says Stassun, who attributes the stars' dissimilarities to a nature-versus-nurture influence similar to that involved in human development. "Nature dictated their birth order — although we have no idea how — and then the physical differences that we see all followed directly from that," he says. However, the interstellar cloud of gas and dust in which stars form may have fed — or nurtured — these stars equally so that they were born with the same birth weight.

On the basis of models used to predict stellar growth curves, the physical differences between the siblings indicate that the brighter, warmer star is a few hundred thousand years behind its companion in terms of development. Stassun likens this to a half-day difference in age in day-old human twins. When the stars reach maturity in about a hundred million years, the difference in their ages will become almost impossible to detect, he says. "It's only because we caught this pair so early in their lives that we're able to see the manifestations of one being slightly further along than the other."

But how the twin stars could be born at different times remains largely speculative at this point. "Our theoretical understanding of how binary systems like this one form has a lot of gaps in it," says Stassun, who is nurturing the careers of some young scientists from minority backgrounds, enlisting them to help collect data from telescopes in Chile for this work. He is optimistic that a closer look at these young sibling stars might reveal how early star systems evolved. ■

FROM THE BLOGOSPHERE

"How does one become a reviewer for Nature journals?" asks Wen Jiang of Canada's University of Toronto in *Nature Nanotechnology*'s Nature Network forum (http://tinyurl.com/58vxeq). Most graduate students and postdocs help their supervisors to review papers, he notes, but how can they jump from 'subcontracted' to 'designated' reviewer?

Associate editor Ai Lin Chun replies that she is looking for referees with a good publication track record, and that the journal often selects new and younger faculty members. In a recent example, an eminent professor was too busy to review, but recommended his talented graduate student. The student provided a fine, detailed and thoughtful report. "When this happens," Chun writes, "it is not so easy to forget!"

She enjoys thoughtful, well-balanced reports that suggest improvements to the authors, all in a timely manner. "We do have a chasing system," she says, "but it is certainly not my favourite thing to do!" Chun adds that sometimes even established professors provide terrible reports. "We feel less enthusiastic in asking them to review again." ■

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