Mice use vocalization patterning to determine whether to mate or not

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They are quiet as church mice ... or are they? It turns out there is a racy conversation going on in this biology lab at Washington State University in Vancouver, Washington; one that might make a preacher blush! But the conversation isn't between scientists, but rather three very sighted and excited mice.

"The patterning of these vocalizations could be very important in determining whether or not the female mouse wants to mate with the male that is making the vocalization," says Christine Portfors, a biologist and neuroscientist at the university.

She's able to dial down the ultra-high pitched conversations of mice to a frequency humans can hear via computer. Once processed, the pick-up lines of mice end up sounding like the pleasant chirping of birds on a spring day.

With help from the National Science Foundation (NSF), Portfors is doing a little eavesdropping, analyzing the high-pitched sounds and hoping to learn how mice brains distinguish between them.

"Humans can do this all the time where you can easily discriminate the difference between 'bad' and 'dad', and we don't know how the brain does it," she says.

Portfors starts by conducting an experiment that plays out a little like a cheesy reality show. Call it "The Mouse Bachelorette."

The drama unfolds as two females share a box with one male. "It's all about female choice. The males, when they're interested in mating, will emit these high-frequency vocalizations, a song, and if the female mouse likes that song, then she will allow that male to mate with her, and so we record their vocalizations," explains Portfors. Often one female is unreceptive to the male, which is why she gives him two options for possible mating.

Portfors demonstrates for us how she later replays those recorded male pick-up lines to a female mouse in a listening booth. A wired-up female hears the sounds as Portfors monitors the activity of her individual neurons.

She shows us on a computer screen the waveforms of active neurons. "You can see here that one particular neuron in the female mouse's auditory system responds to one particular vocalization, but when we present a different vocalization, the neuron doesn't respond. So each individual neuron has an ability to discriminate between different sounds that the male mouse is making in the presence of the female mouse," she explains.

Portfors' research is funded under the American Recovery and Reinvestment Act of 2009 (ARRA), which also allowed her to hire a small team of research assistants from the undergraduate to the postdoctoral level. Their goal is to determine which sounds stimulate which sets of neurons and, ultimately, to map the mouse brain. That could provide telling clues as to how humans detect and discriminate everyday sounds, such as speech.

"We have to try and come up with some ideas of how all the cells get put together and how their inputs create the big wiring pattern that we have in our brains," she says.

With the help of her research team, Portfors pursues her long-term goal: to help people who have lost their hearing. And along the way, "my research assistants also gain important technical and scientific skills that will help them continue to be productive and thinking members of our society," adds Portfors.

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