

# That jumping spider can hear you from across the room

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Jumping spider. Credit: Gil Menda and the Hoy lab

According to the standard textbooks, spiders are acutely sensitive to airborne vibrations from nearby sources. That is, they are supposed to respond to sounds and "hear," but only when the sound is coming from a

few centimeters or so away. Now, researchers reporting in *Current Biology* on October 13 have found that jumping spiders, and most likely other spiders too, can actually hear sounds over much greater distances.

The findings offer a new perspective on the auditory world of [spiders](#), the researchers say.

"The sensory world of the tiny jumping spider was thought to be dominated by sight and tactile touch," says Paul Shamble, who conducted the work along with colleagues in Ron Hoy's lab at Cornell University and has since moved to Harvard. "Surprisingly, we found that they also possess an acute sense of hearing. They can hear sounds at distances much farther away than previously thought, even though they lack ears with the eardrums typical of most animals with long-distance hearing."

Shamble says that their discovery was a lucky accident. He and colleagues including Gil Menda, also at Cornell, had previously devised a new method for making neural recordings from the brains of jumping spiders and were using the technique to explore how jumping spiders process visual information.

"One day, Gil was setting up one of these experiments and started recording from an area deeper in the brain than we usually focused on," Shamble recalls. "As he moved away from the spider, his chair squeaked across the floor of the lab. The way we do neural recordings, we set up a speaker so that you can hear when neurons fire—they make this really distinct 'pop' sound—and when Gil's chair squeaked, the neuron we were recording from started popping. He did it again, and the neuron fired again."

At the time, Shamble was in the main lab, just outside the recording room. Menda called him in and the two got to talking about how spiders

hear.



Jumping spider. Credit: Gil Menda and the Hoy lab

"We started discussing the details about how spiders can only hear things close by and, to demonstrate, Paul clapped his hands close to the spider and the neuron fired, as expected. He then backed up a bit and clapped again, and again the neuron fired."

Soon, Menda and Shamble were standing outside the recording room, three to five meters from the spider, amazed, as the spider's neuron continued to respond to their clapping. Based on everything they thought

they knew, it shouldn't have been possible.

Further study showed that the jumping spiders' hearing is most sensitive to frequencies that would enable them to hear the wingbeats of their parasitoid wasp enemies. Behavioral experiments showed that the jumping spider responds to such sounds by freezing—a common startle response.

The researchers also produced the first recordings of acoustically responsive neural units in the jumping spider brain to show that their brains respond to sounds over distances of more than three meters. They also found that direct mechanical stimulation of hairs on the spiders' forelegs was enough to generate a response in acoustically sensitive neurons.

"We found that when we shook single sensory hairs back and forth—these are the same hairs that are known to respond to sounds originating close to the animal—we also got responses," Shamble says. "This suggests that these hairs are how spiders are registering far-away sounds."

Shamble and Menda say that the new findings change scientists' view on the world that spiders live in. "In the movies, Spiderman has this strange, additional 'spidey sense' that helps him sense danger—it turns out the real-life spidey sense of spiders might actually be hearing!" Menda said.

The researchers are now recording from the brains of fishing spiders and [wolf spiders](#), among several other more interesting members of this large and diverse group of invertebrates, to test their hearing too.

**More information:** *Current Biology*, Shamble et al.: "Airborne Acoustic Perception by a Jumping Spider" [www.cell.com/current-biology/f ... 0960-9822\(16\)30985-X](http://www.cell.com/current-biology/f...0960-9822(16)30985-X) ,

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