

# Nerves found to exist in male spider genitalia

July 8 2015, by Bob Yirka

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*Araneus diadematus*. Credit: André Karwath/Wikipedia

(Phys.org)—A trio of researchers working in Germany has discovered that male spiders do indeed have nerves in their genitalia, overturning prior research that has suggested otherwise. In their paper published in *The Royal Society Biology Letters*, Elisabeth Lipke, Jörg Hammel and Peter Michalik describe the various techniques they used to discover

nerves in the arachnid palpal organ and their ideas on what purpose they serve.

For many years scientists have believed that the palpal organ in male spiders—the organ responsible for delivering sperm to the female [spider](#)—had no nerves in it. That would mean that the male would not be able to feel anything during intercourse, which some observers have likened to attempting sex with a fingernail in the dark. It appears prior researchers did not look hard enough, however, because the trio working on this new effort report that they have found evidence of nerves in the palpal organ.

To make their discovery, the team first cut up several of the organs (from a male Tasmanian cave spider) into extremely thin slices. They then looked at the samples using three different types of microscopes, one of which was a transmission electron microscope—and that allowed them to spot a tiny [nerve](#). More work revealed two clusters of nerves in the bulb. They also spotted two previously unknown glands also in the palpal bulb which appeared to be connected the nerves they found. Using data from the microscopes, the team built a 3D model of the palpal showing where the nerves are in the organ.

The researchers suggest that the nerves in the palpal bulb might serve to allow the male spider to feel stress on the organ during copulation, helping to improve placement and thus chances of successful fertilization. It is also possible, they note, that the nerves help with guiding the palpal to the female sex organ. They believe that it is unlikely that such nerves exist only in the species they studied, which means other spiders likely have them too. More research will be needed to find out. The team also plans to study the nerves they found to see if they can determine their true purpose.

**More information:** First evidence of neurons in the male copulatory

organ of a spider (Arachnida, Araneae) *The Royal Society Biology Letters*, Published 8 July 2015. [DOI: 10.1098/rsbl.2015.0465](https://doi.org/10.1098/rsbl.2015.0465)

### **Abstract**

Spider males have evolved a remarkable way of transferring sperm by using a modified part of their pedipalps, the so-called palpal organ. The palpal organ is ontogenetically derived from tarsal claws; however, no nerves, sensory organs or muscles have been detected in the palpal bulb so far, suggesting that the spider male copulatory organ is numb and sensorily blind. Here, we document the presence of neurons and a nerve inside the male palpal organ of a spider for the first time. Several neurons that are located in the embolus are attached to the surrounding cuticle where stresses and strains lead to a deformation (stretching) of the palpal cuticle on a local scale, suggesting a putative proprioceptive function. Consequently, the male copulatory organ of this species is not just a numb structure but likely able to directly perceive sensory input during sperm transfer. In addition, we identified two glands in the palpal organ, one of which is located in the embolus (embolus gland). The embolus gland appears to be directly innervated, which could allow for rapid modulation of secretory activity. Thus, we hypothesize that the transferred seminal fluid can be modulated to influence female processes.

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