

The Scientist: NewsBlog:

Nerves of sponge?

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The unassuming cells of a sea sponge may hold a clue to the origin of the nervous system, according to a paper published next Tuesday, August 5th, in [Current Biology](#). The detection of proneural pathways in the ancient organism suggests that genes for neurogenesis evolved earlier than previously believed.

Researchers have widely believed that nerve cells evolved after the divergence of sponges, which lack organs and nervous systems, from the rest of the animal kingdom (bilaterians). But [Bernard Degnan](#) of the University of Queensland in Australia and colleagues detected the expression of two key components of neuronal differentiation in bilaterians, Notch-Delta signaling and basic helix loop helix (bHLH) genes, in the surface cells of the sea sponge [Amphimedon queenslandica](#).

"Notch signaling is the most important pathway in neurogenesis," said [Hugo Bellen](#), a neuroscientist at Baylor College of Medicine, who was not involved in the study. "It's surprising that it [developed] so early in evolution."

The team scanned the genome of *Amphimedon*, the first sponge to have its full genome sequenced, for gene homologs to bHLH and Notch signaling pathway genes. After identifying them in the genome, the team carried out [in situ hybridizations](#) to prove that the genes are expressed in the outer layer of cells of a late *Amphimedon* embryo.

Then in a functional study, the scientists injected *Xenopus* and *Drosophila* embryos with transcribed mRNAs from one of the *Amphimedon* homologs, *AmqbHLH1*. [Neurogenin](#) is the most important gene for neuron differentiation in *Xenopus*, a vertebrate, while *Drosophila* relies primarily on another proneural gene, *atonal*. Although each species has both genes, swapping the primary gene expressed, *neurogenin* for *atonal* and vice versa, results in minimal neuron growth. However, expression of *AmqbHLH1* induced proneural activity in both species, mimicking the proneural gene of choice: *neurogenin* in *Xenopus* and *atonal* in *Drosophila*. It is "compelling evidence of the deep conservation of this system," wrote Degnan in an Email, indicating that the proneural pathways existed at the dawn of the Metazoa, some 50 million years earlier than previously thought.

[Degnan](#) describes the globular cells as a layer of sensory cells "akin to a disconnected nerve net." But [Bellen](#) said he hesitates to refer to them as sensory cells, as their function was not determined in the paper. "It'd be nice to know exactly what these cells do."

Degnan and his team are currently working to determine if the cells have sensory function, and their data suggest the cells are involved in sensing the environment, Degnan noted.