

How Whale Brains are Wired for Emotions

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Anyone who doubts the intelligence of cetaceans need only see the 1977 movie *Orca: The Killer Whale*. Although it might seem like a cheesy rip-off of *Jaws*, it does a pretty good job of depicting the vengefulness of a grief-stricken whale. The recent findings of scientists Patrick Hof and Estel Van Der Gucht of the New York Consortium in Evolutionary Primatology in the United States, provided fresh evidence of the intelligence, self-awareness, and social complexity of these sentient beings.

After spending 15 years studying whale brains, Hof and Van Der Gucht discovered the presence of spindle cells in the anterior cingulate cortex and frontoinsular cortex, the same areas of the brain that regulate emotional functions such as empathy, speech, intuition, rapid gut reactions, and social organization in human beings. The cells were also found in other areas of the whales' brains although Hof was not certain about the significance of the cells in those areas. Even more interesting, whales have these cells in greater numbers than humans do and have had them twice as long as humans have.

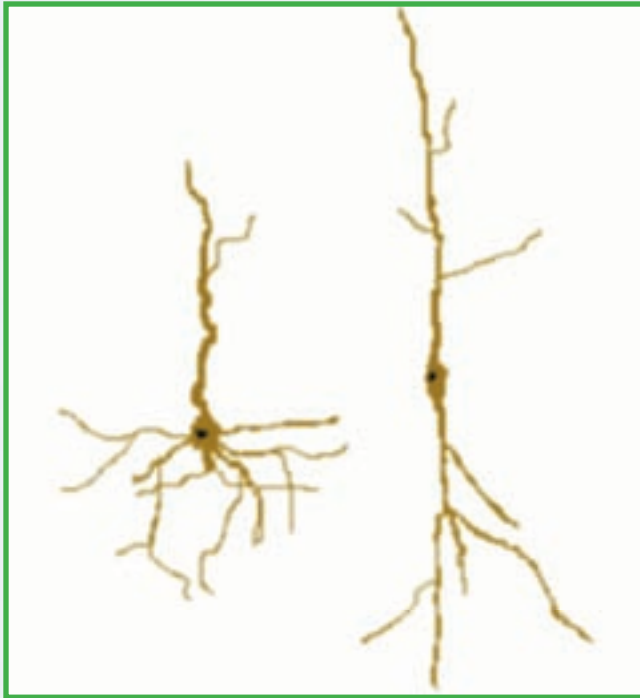
Special Cells

Spindle cells are believed to be the cells that make us human. These brain cells allow us to feel love, suffering, the whole range of human emotions, in fact. For the longest time, scientists thought spindle cells were found only in humans and our closest evolutionary relatives, apes and monkeys.

However, Hof clarified that this does not necessarily mean that whales and other cetaceans



Cetaceans are descendants of terrestrial mammals of the order Artiodactyl. Today, cetaceans and artiodactyls are classified under Cetartiodactyla, a super-order that includes whales and hippos.



Spindle cells can be found in the brains of the humpback whales, fin whales, killer whales, and sperm whales.

feel love and other emotions in exactly the same way that humans do. He believes that more work is needed to know for sure whether love is the same for humans and whales. He said, "I don't know the nature of such feelings in these animals. Whales are isolated and we cannot just apply what we see in great apes or ourselves in that type of animal."

While the exact function of spindle cells in whale brains is still under study, Hof believes that they act as some sort of "high-speed connections that fast-track information to and from other parts of the cortex." He compared them to express trains that bypass unnecessary connections, enabling us to instantly process and act on emotional cues during complex social interactions.

Evolutionary Convergence

The discovery of spindle neurons in cetaceans is an example of "neuro-anatomical convergence" between cetaceans and primates, according to Dr. Lori Marino, a senior lecturer in neuroscience and behavioral biology at Emory University in the US.

Evolutionary convergence occurs when two different species evolve to have similar features although they are usually unconnected to each other in any way. In this case, such a highly specific structural similarity such as spindle cells evolved in the two species due to evolutionary convergence and not because of shared ancestry because the last common probable ancestor of cetaceans and primates lived more than 95 million years ago.

This finding is consistent with the growing body of evidence for similarities between cetaceans and primates in terms of cognitive abilities, behavior and social ecology.

Sources

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- ▶ Knight, Renee. *Whales in love: Like humans, their brains are wired for romance.* 10 December 2006. <http://environment.independent.co.uk/wildlife/article2062504.ece>
- ▶ Marino, Lori. *Convergence of Complex Cognitive Abilities in Cetaceans and Primates.* 2002. www.emory.edu/LIVING_LINKS/pdf_attachments/Marino_convergence.pdf

Gentle Giants

The following words were mentioned in the article you just read. Using the clues provided, unscramble each and write the correct word in the space provided.

1) acsnetaec

Large ocean mammals, including whales and dolphins

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2) nidleps

_____ cells – brain cells that enable us to feel emotions

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3) tocrex

Outer layer of the brain where the spindle cells are found

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4) septiam

Mammals with large brains and complex hands and feet; includes monkeys and apes

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5) aitrn

What Hof compared spindle cells to

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6) vncgnerceoe

Evolutionary _____ happens when similar structures or traits evolve in two distinct organisms

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Answers:
 1. Cetaceans
 2. Spindle
 3. Cortex
 4. Primates
 5. Train
 6. Convergence