

## Elephant intellect: Genius in the largest brain on land

The African elephant is not only the largest animal on land, or even the animal with the largest brain — its brain is actually bigger even than would be expected for such a large creature. Scientists are trying now to figure out exactly how this brain gives rise to some of the most intelligent and socially sophisticated behavior in the animal kingdom.

Among the list of elephant's intellectual achievements, [according to Ferris Jabr's writing in \*Scientific American\*](#): the ability to grieve their fellow elephants, group decision-making and cooperation, tool use, console one another, communicate with a large vocabulary, and probably have a sense of self.

Despite behavioral evidence of intelligence, little work has been done on elephant brains to tease how, exactly, this organ — three times the size of a human brain — gives rise to such complex behavior. This is changing.

Paul Manger of the University of Witwatersrand, Suzana Herculano-Houzel of the Instituto de Ciências Biomédicas/Federal University of Rio de Janeiro, Brazil are the first scientists to present an accurate cell count of a whole elephant brain, and they did so via modern DNA-tagging techniques. Jabr's explanation:

Basically, [Herculano-Houzel] liquefies entire brains, preserving only the nuclei—sacs of DNA that serve as the command center of cells. Then she tags the DNA inside each nucleus with fluorescent proteins and measures the intensity of the fluorescence to get the total number of nuclei. Since each cell has only one nucleus, that number is the number of total brain cells.

The result? Elephant brains have three times more neurons than our own, though they are not spread the same way among the different areas of an elephant's brain. They have many more neurons devoted to motor function, enabling them to maneuver such a large body with precision and to wield their trunks with the dexterity of a human hand. They also have exceptionally developed regions for vocal communication and hearing, which helps explain the huge vocabulary of sounds from chirps to trumpets.

Given the problem-solving, self-awareness, and understanding of death on display in elephant behavior, there seems to be something missing from their brains:

Based on what we know about brains generally, [abstract] intellect arises from the cerebral cortex. Manger and Herculano-Houzel's recent investigations confirmed, however, that despite having a brain three times as large as our own, the elephant's cerebral cortex contains surprisingly few neurons and is nowhere near as dense as the human or chimpanzee cortex.

Where, then, does the elephant's abstract intelligence come from? Jabr leaves us with a tantalizing and highly speculative hypothesis:

Benjamin Hart of the University of California Davis has speculated that the elephant cortex derives its intellectual prowess not from local density but from widespread interconnectivity. He suspects that, whereas the human and chimpanzee brains have evolved many tight-knit networks of nearby neurons throughout the cortex—akin to states packed with highly populous cities—the elephant brain has favored lengthy connections between far-flung brain areas, building the equivalent of an extensive cross-country railroad system. For now, though, this is mostly hypothetical.

**Read the full, original article:** [Searching For The Elephant's Genius Inside the Largest Brain on Land](#)

**Additional Resources:**

- [The Science Is In: Elephants Are Even Smarter Than We Realized \[Video\]](#), Scientific American
- [Literal gene-ius: The search for a genetic basis of intelligence](#), Wired
- [Dolphin Genes Hold Clues to Animal Intelligence](#), LiveScience