

Founding editor of the *Whole Earth Catalog*, contrarian champion of nuclear power, and driving force behind the Long Now Foundation, Brand has lately advocated for de-extinction and human life extension. One wonders if Sussman's art of longevity might unwittingly motivate technophilic oligarchs to fund bioengineering projects following Google's antiaging initiative, Calico.

Sussman has humbler, nobler designs: creating additional art and advocating for UNESCO recognition for all ancient organisms. God bless her. We need more artists, musicians, dancers, and poets to give humanistic expression to the pursuit of environmental knowledge. I wish major research institutions supported artist-in-residence programs alongside labs. Sussman believes that "[t]he best art and science projects enhance and extend each other, bringing something new to both; they are not about simply making the research pretty, or making artworks using novel scientific tools." By this measure, *The Oldest Living Things in the World* is a work for the ages.

#### References

1. E. Parker, A. Lewington, *Ancient Trees: Trees That Live for a Thousand Years* (Batsford, London, 2012).

10.1126/science.1254361

## COGNITIVE SCIENCE

# How Great a Separation?

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In *The Gap*, Thomas Suddendorf offers a cogent analysis of how the mental lives of humans differ from those of other animals. He claims that the gap lies in animals' inability to imagine the future or "read" the minds of others. Suddendorf (a psychologist at the University of Queensland) distills research that spans domains of memory, mental time travel, mind-reading, and morality. For each topic, he spells out psychological feats that most humans can perform and details explorations of the same traits in other animals. He supplements his summaries with research highlights: case studies of individuals who lack episodic memory, tests of self-awareness that expose animals with rouge on their noses to mirrors, arguments for mental

time travel in animals that store tools for later use, and inferring morality from apes' sign language.

Following a simple and predictable menu, Suddendorf's chapters simmer "what the science of the mind has taught us about the human faculties," serve up our knowledge of the "animal capacities in these domains that challenge claims of human uniqueness," and finally blend in a short discussion that melds these ingredients. He serves up a clear and unbiased account. More important, Suddendorf's conclusions are restrained and his analyses prudent.

Attempting to appease those with short attention spans, the author sprinkles *The Gap* with tidbits about current understanding and research methodology that range from mildly interesting to quite fascinating. Many of us assume, for example, that puberty marks the last major spurt in our growth and that any further cognitive advances trickle rather than flow. However, our brains do not fully reach maturity until young adulthood: When asked to simply look in the opposite direction of a light that appears on a screen, participants stumble as adolescents, then gradually get better as they grow up and learn to toe the line.

Suddendorf starts his quest to delineate the boundaries between human and animal brains with an assertion that some will find difficult to swallow: we are not that unique. We are "the last humans" simply because our nearest relatives have all died out. This perspective serves to map the rest of our journey: Because the forces of nature (or, as some argue, we) have killed off the hominids that would otherwise be most closely related to us, the best source of information about our ancestral conditions comes from apes and monkeys. Suddendorf vividly describes these creatures, including anecdotes of monkeys swinging off his arms. The book then walks us through humans' intellectual aspirations. Here readers encounter cats with rouge on their noses walking into mirrors, chimpanzees playing with paintbrushes, and orangutans trying to determine which cup (the noisy or quiet one) contains the nuts. In summarizing the results of these studies, Suddendorf discusses two contrasting perspectives: "rich" and "lean" explanations of animal behavior. For any set of findings, there can be rich interpretations that "ascribe complex, human-like abilities to animals" and lean explanations that defer



to simpler learning processes. For instance, Australian crows (*Corvus orru*) that have learned to eat poisonous crane toads (*Rhinella marina*) safely by flipping them over and pecking at their harmless belly demonstrate flexible problem-solving. But given the seemingly much greater intellectual flexibility of humans, what significance should we attribute to the crows' capability? The contrasting interpretations arise because the science is not objective. In our attempts to demarcate the gap between humans and other animals, our humanness confounds our understanding of nature—the romantics and skeptics among us reach rich and lean explanations, respectively. To his credit, Suddendorf gives equal voice to both.

Its foibles aside, the book provides a new lens through which to see the world. Read it, and you might never look at yourself or your household pets in the same light. One starts to realize how strange our own behaviors are as Suddendorf ratchets up our collective self-consciousness by offering snapshots of the insane world we seem to have created for ourselves. Referring to the abstract roles of "[r]eferees, idols, CEOs, officers, priests, [and] banks," he notes that "[a]nimals cannot perceive them. We merely imagine them together and act as if they are real. And so, for us, they are."

Ultimately, Suddendorf does not deliver a feel-good story. The book did not leave me feeling fuzzy inside, nor could I divine a moral or take-home message. The ideas presented are fascinating; the presentation, less so. *The Gap*, however, provides an honest account of an extremely interesting topic and a candid view of the research behind our understanding. The narrative is not always pretty, but why should science be?

#### The Gap

The Science of What Separates Us from Other Animals

By Thomas Suddendorf

Basic Books, New York, 2013.

366 pp. \$29.99, C\$34.50.

ISBN 9780465030149.

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10.1126/science.1254362