Limits of neuroscience

Commentary on **Cook et al.** on *Dog Jealousy*

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Abstract: Examining the relationship between jealous behaviour and the amygdala may be quite informative about the function of the amygdala, but the amygdala may be less helpful in informing us about jealous behaviour. Claims about the potential practical relevance of the results also require that the magnitude of the effects inform the relevant discussion. The dogs used in the study probably share some very important personality characteristics; this too limits the practical implications of Cook et al.'s findings for dogs in general. It is nevertheless a testament to the skill of the experimenters, and the amazing bond between dogs and humans, that such research could be conducted at all.

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It is a remarkable feat to have trained 13 dogs to tolerate an fMRI scanner, let alone get them to cooperate in an experiment in such a context. One cannot help but be deeply impressed by the experimental virtuosity of the researchers (Cook et al., 2018). However, I am certainly not the first to be uneasy about the real utility of much neuroscience research: There is something of a backlash against many of the claims of neuroscience (Satel & Lilienfeld, 2013), a backlash so well established that there is a backlash against the backlash (Marcus, 2013). At a broad philosophical level, my concern with the target article is that it is implicit in the title that we can take jealousy in dogs more seriously because of evidence from neuroscience. However, it is an uncomfortable truth for some scientists studying emotion that the primary data for our knowledge about emotions are subjective experience and human judgement. The plural of anecdote in this case is data. Our knowledge of the localisation of affect is ultimately derived from human experience and judgement. We think a particular area of the brain may be associated with a particular emotion because we have induced a particular emotion and then observed what the brain gets up to. We know what emotions are because we are emotional beings. We began investigating jealousy in dogs because our experience with dogs suggested that dogs were jealous. We did not start to investigate jealousy in dogs because of what was going on in their amygdala. Studying brain/behaviour relationships provides a rich source of information concerning brain function, but much less so concerning behaviour.

There are several more technical issues that I would like to mention. I am not at all sure that amygdala function can provide really useful information. The amygdala is implicated in just about everything from emotion, to fundamental cognitive processes such as long-term memory, working memory and visual attention (Schaefer & Gray, 2007). The statistical analysis is also problematic, as interpreting the magnitude of effects from a mixed-effects model is by

no means straightforward. In the discussion, the authors make no mention of the magnitude of the effects, but simply state that there was a positive correlation between aggressive temperament and amygdala activation. The magnitude of any such relationship is crucial to any claims that the information from the study could inform behavioural interventions.

My final comment is that regardless of the C-BARQ scores, given what the dogs were required to do, I cannot think that these dogs were anything but highly social, unaggressive and co-operative. These may be special dogs. In any study of individual differences, it is crucial to have sampled the range of the trait of interest. The findings of a study of individual differences using 13 very carefully trained and selected participants must be treated with great caution.

My overwhelming feeling having written this commentary is social guilt (which I believe is thought to be localised to the anterior middle cingulate cortex) because being a critic is easy, and I remain amazed that the researchers managed to conduct this study at all.

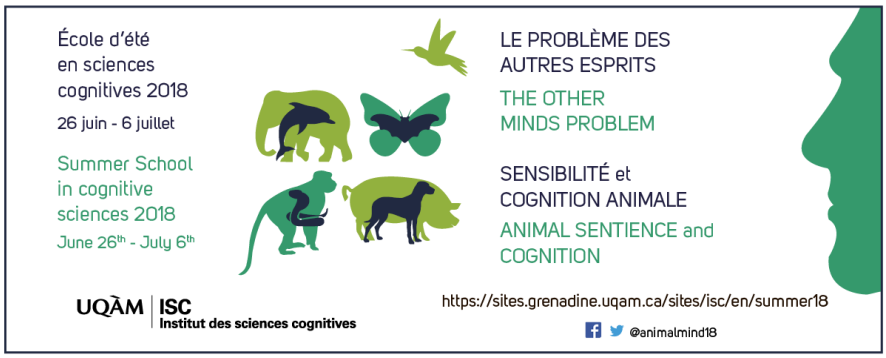
References

Cook, P., Prichard, A., Spivak, M., & Berns, G. S. (2018). Jealousy in dogs? Evidence from brain imaging. *Animal Sentience* 22(1)

Marcus, G. (May 27, 2018). The problem with the neuroscience backlash. *The New Yorker*.

Satel, S., & Lilienfeld, S. O. (2013). *Brainwashed, the seductive appeal of mindless neuroscience*. New York: Basic Books.

Schaefer, A., & Gray, J. R. (2007). A role for the human amygdala in higher cognition. *Reviews in the Neurosciences, 18,* 355-382.



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The Other Minds Problem: Animal Sentience and Cognition

Overview. Since Descartes, philosophers know there is no way to know for sure what — or whether — others feel (not even if they tell you). Science, however, is not about certainty but about probability and evidence. The 7.5 billion individual members of the human species can tell us what they are feeling. But there are 9 million other species on the planet (20 quintillion individuals), from elephants to jellyfish, with which humans share biological and cognitive ancestry, but not one other species can speak: Which of them can feel — and what do they feel? Their human spokespersons — the comparative psychologists, ethologists, evolutionists, and cognitive neurobiologists who are the world's leading experts in "mind-reading" other species — will provide a sweeping panorama of what it feels like to be an elephant, ape, whale, cow, pig, dog, chicken, bat, fish, lizard, lobster, snail: This growing body of facts about nonhuman sentience has profound implications not only for our understanding of human cognition, but for our treatment of other sentient species.

Gregory Berns: **Decoding the Dog's Mind with Awake Neuroimaging**
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Jon Sakata: Audience Effects on Communication Signals
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Michael Hendricks: Integrating Action and Perception in a Small Nervous System
PANEL 2: Primates, Voles and Worms
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Malcolm MacIver: How Sentience Changed After Fish Invaded Land 385 Million Years Ago
Sarah Woolley: Neural Mechanisms of Preference in Female Songbird
Simon Reader: Animal Social Learning: Implications for Understanding Others
PANEL 3: Sea to Land to Air
WORKSHOP 3: Steven M. Wise: Nonhuman Personhood
Tomoko Ohyama: Action Selection in a Small Brain (Drosophila Maggot)
Mike Ryan: "Crazy Love": Nonlinearity and Irrationality in Mate Choice
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Colin Chapman: Why Do We Want to Think People Are Different?
Vladimir Pradosudov: Chickadee Spatial Cognition
Jonathan Balcombe: The Sentient World of Fishes
PANEL 5: Similarities and Differences
WORKSHOP 5 (part 1): Gary Comstock: A Cow's Concept of Her Future
WORKSHOP 5 (part 2): Jean-Jacques Kona-Boun: Physical and Mental Risks to Cattle and Horses in Rodeos

Joshua Plotnik: Thoughtful Trunks: Application of Elephant Cognition for Elephant Conservation
Lori Marino: Who Are Dolphins?
Larry Young: The Neurobiology of Social Bonding, Empathy and Social Loss in Monogamous Voles
Panel 6: Mammals All, Great and Small
WORKSHOP 6: Lori Marino: The Inconvenient Truth About Thinking Chickens
Andrew Adamatzky: Slime Mould: Cognition Through Computation
Frantisek Baluska & Stefano Mancuso: What a Plant Knows and Perceives
Arthur Reber: A Novel Theory of the Origin of Mind: Conversations With a Caterpillar and a Bacterium
PANEL 7: Microbes, Molds and Plants
WORKSHOP 7: Suzanne Held & Michael Mendl: Pig Cognition and Why It Matters
James Simmons: What Is It Like To Be A Bat?
Debbie Kelly: Spatial Cognition in Food-Storing
Steve Phelps: Social Cognition Across Species
PANEL 8: Social Space
WORKSHOP 8: *To be announced*
Lars Chittka: The Mind of the Bee
Reuven Dukas: Insect Emotions: Mechanisms and Evolutionary Biology
Adam Shriver: Do Human Lesion Studies Tell Us the Cortex is Required for Pain Experiences?
PANEL 9: The Invertebrate Mind
WORKSHOP 9: Delcianna Winders: Nonhuman Animals in Sport and Entertainment
Carel ten Cate: Avian Capacity for Categorization and Abstraction
Jennifer Mather: Do Squid Have a Sense of Self?
Steve Chang: Neurobiology of Monkeys Thinking About Other Monkeys
PANEL 10: Others in Mind
WORKSHOP 10: The Legal Status of Sentient Nonhuman Species