Natural symmetry

Directional inference: scientific convention applies conclusions from animal studies to humans but not the reverse, contradicting current evidence.

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About face: new finds are forcing assumptions about our unique position in the animal kingdom to be revised.

Mickey Mouse, archie the cockroach, Snoopy, and Barney the purple dinosaur — just a few examples of creatures with minds and feelings like those of humans that richly populate the media. But in scientific circles, attributing human traits to animals is derisively dismissed as 'anthropomorphism'. Biomedical science only permits, and critically depends on, inference from animals to humans, in the form of 'animal models'. So in the direction of human–animal comparisons, popular culture seems to run contrary to science.

Are science and culture actually divergent here? No, not when you look more closely. Culture and science are based on the same simple model: an animal core painted with a veneer of human nature. Human ascendance, although only veneer-deep, is crucial to the model. Fanciful characters such as Barney and Snoopy, who sport a human psychic veneer on their respective dinosaur and canine effigies, are cultural heroes. In contrast, characters with the reverse attributes — Shakespeare's unfortunate Bottom or Jeff Goldblum as The Fly — are punished or possessed, not improved.

Similarly, scientists have had no problem seeing the lessons of Harry Harlow's experiments, in which monkeys were raised by artificial 'surrogate' mothers, for human orphanage practices. Neither have experiments using mice held dangling from their tails as models for human stress raised a scientific eyebrow, despite the tailless condition of *Homo sapiens*. But when it comes to applying conclusions about the human psyche to that of an animal, science draws a well-worn line.

The scientific reasoning behind this inferential line is now fading fast. Ideas about human–animal differences are being reshaped, and inference based on the veneer model of animal to human ascendance no longer fits current science. For years, most scientists with any biological training have discounted *scala naturae*, the idea of a progressive evolution from animals to the culmination of humans. We have long known that we share the same core but, more recently, our understanding of that core has been dramatically extended.

Today, continuity across species at a structural level is unquestioned in biomedical research, and the more we learn, the more apparent this continuity becomes. The same genes organize the body plan and fundamental structure-building and metabolic mechanisms across vertebrates and even invertebrates. Further, we have found that brain structures and organization develop in a highly coordinated fashion and that, across species, the principles of organization in the largest brains can be predicted from those in the smallest.

These structural similarities are echoed in behavioural patterns. Properties once thought uniquely human, such as culture, language, emotion, personality, are one by one being identified in species as varied as fish, sheep, rats, crows and even invertebrates. Not only can apes and birds design and use tools, but elephants can get post-traumatic stress, rodents can laugh, fish can suffer distress and, with a glance at its face, a sheep can assign another sheep to its correct position in the family tree and assess its emotional state.

Brain imaging has also played an important role in reshaping our views of the links between humans and animals, especially in relation to cognition, emotion and all 'private' mental states. This methodology has provided physical insight into mental states in humans, allowing direct comparison with mental states in animals. What was subjective has become objective, tractable and species-general. This implies that models of scientific inference are overdue for some serious rethinking to catch up and match scientific theory and data.

Science is not only composed of an ever-increasing number of facts; it also evolves through alterations in what are considered to be allowable methods and subjects of investigation, as the film *Kinsey* reminds us. Pioneering scientist Alfred Kinsey argued in the 1940s and 1950s that although sexual behaviour can be dissected and catalogued, love cannot. Fifty years later, contrary to his predictions, science is doing just that: studying love, from the hormonal effects of 'romantic disappointments' in cichlid fish, and long-term pair bonding in voles, to the imaging of brain correlates of the 'broken heart' in humans. The mutual expansion of method and subject has thoroughly confused traditionally held views of species differences and the nature of emotions. Ironically, in our efforts to determine why we are so unique, we have discovered that we are not so different after all.

Certainly, true species differences remain, but we need a better model than a layer of paint. And even though understanding species commonality and diversity together requires some perceptual adjustment (particularly because so much of biology and psychology has been defined by the veneer model), alternative models are readily available given the convergence of theory and data from diverse fields.

Bringing symmetry to our inference-making will have important benefits that override any short-term impediments. Legitimizing a thoughtful form of anthropomorphism frees hypothesis generation from antiquated assumptions of human ascendance and, paradoxically, provides a much more coherent picture of both human and non-human species. Hopefully, for the next generation of schoolchildren, Lassie, Flipper and Skippy the bush kangaroo will seem as impossibly quaint as will progressive evolution and unidirectional inference to future scientists. Like Tyger in William Blake's poem, symmetry may be fearful, but it is also fundamental. ■

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FURTHER READING

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