BEHAVIOR

The Social Origin of Mind

Alison Jolly

He who understands baboon would do more towards metaphysics than Locke.
—Charles Darwin, Notebook M (1838).

Imagine as a life's work toting loudspeaker, tapes, batteries, and video camera around the Okavango Delta, occasionally being treed by lions or warned off by elephants. You skulk into long grass to conceal the speaker, then wait and wait until the supposed author of the playback call is safely out of sight and the intended hearer facing at least 90º away. It may take you a whole year to complete one series of experiments—all with the goal of confusing a baboon.

Baboon Metaphysics is the distillation of a big chunk of academic lives: the wife-and-husband team of Dorothy Cheney and Robert Seyfarth plus a flock of their students and friends. It is exactly what such a book should be—full of imaginative experiments, meticulous scholarship, limpid literary style, and above all, truly important questions. Baboon confusion turns out to be one of the strongest tools available for illuminating a primate's metaphysics as well as our own. What are the components of intelligence? How does intelligence evolve to meet the challenge of life in a social group? Is behavioral foresight possible without real empathy and without a "theory of mind"? How can factual information be communicated without language? Can we impute consciousness to another species? Philosophers argue in the abstract; Cheney and Seyfarth offer data.

Baboon Metaphysics
The Evolution of a Social Mind

by Dorothy L. Cheney and Robert M. Seyfarth

University of Chicago Press, Chicago, 2007. 358 pp. $27.50, £16. ISBN 9780226102436.

The "social intelligence hypothesis" proposes that the major influence in the evolution of primate intelligence has been the challenge of life in a social group. Of course an environment of fruit trees, floods, and lions has its own challenges, but dealing with the environment is always mediated by society. Primates may not be as unique as we would like to believe: dolphins, dogs, and pinyon jays have many of the capacities of a baboon. It becomes clear, though, that human minds are fundamentally those of a social primate. Baboons offer insight into how we arrived at our own kind of mind.

Cacma baboons (*Palio hamadryas ursinius*) in the Okavango Delta, Botswana.

First and simplest, every baboon knows the voices of everyone in the 80-strong troop. Each call is tagged with the individual's identity. If the playback calls sound like an ordinary social interaction, the hearer is little interested, but if calls violate expectations she will look toward the speaker for much longer. If she assumes that a call has something to do with herself, she changes her behavior toward the supposed caller. Long suites of logically constructed experiments make it clear that baboons categorize others by both rank and matriline: these are rule-governed classes on separate axes. Baboons foresee others' behavior with great sophistication. However, they seem to lack empathy toward others' emotions or awareness of others' knowledge. Cheney and Seyfarth write: "Baboons' theory of mind might best be described as a vague intuition about other animals' intentions.… There are hints that learned contingencies alone cannot explain all aspects of baboon behavior, but we cannot yet conclude that baboons regard other baboons—even tacitly—as intentional beings with goals, motives, likes, and dislikes."

Are baboons self-aware? Baboons distinguish clearly between "me" and "not-me" as the recipient of a playback call. They identify strongly with their own matriline. They join alliances with their own kin, but also they may approach and reconcile with animals their kin have threatened, apparently on behalf of the threatener. "In between-family fights, the baboon's 'I' expands to include all of her close kin; in within-family fights, it contracts to include only herself. This explanation serves for baboons as much as for the Montagues and Capulets." For a baboon to place herself within the group's social network, "she would seem to need some image of herself as a unique social being, distinct from all others and characterized by a unique set of social relationships with particular others."

Cheney and Seyfarth note several aspects of the "syntax of social knowledge." Knowledge conveyed by a vocalization is representational, that is, highly specific about a particular sort of predator or about a particular individual. Social knowledge has discrete values: a move grunt is not an infant grunt. It is hierarchically structured (I would rather say categorized) according to rank, matriline, and other attributes of the call-giver. It is rule-governed and open-ended, leading to "a cognitive system that allows animals to comprehend a huge number of messages from a finite number of signals. If a baboon understands that *Sylvia threat-grunts and Hannah screams* [life as usual] carries a different meaning from *Hannah threat-grunts and Sylvia screams* [Shock! Horror!], she can make the same judgement for all possible pairs of individuals in the group, including any new individuals who may join." Lastly, knowledge is propositional and independent of sensory modality. The knowledge obtained from playbacks alone is similar to actually seeing an interaction. This allows interpretation of sounds as a dramatic narrative: "Sylvia is threatening Hannah and causing her to scream."

The authors conclude that the syntactic properties of language originated in the structured knowledge necessary for a highly social primate. One widely quoted view of language origins is that proto-language, like pidgin dialects, lacked syntax (*1*). On the contrary, argue Cheney and Seyfarth, a propositional interpretation of calls in our own ancestors must have preceded the evolution of human language.

Humans, even very young children, are

The reviewer is at the Department of Biology and Environmental Science, Univiersity of Sussex, Falmer, Brighton BN1 9QG, UK. E-mail: ajolly@sussex.ac.uk

unlike all other primates in our urge to share knowledge and (except for autists) our huge empathy with others. Cheney and Seyfarth embed the evolution of language deeply into human "theory of mind" along with tool use and our eventual conquest (or disruption) of the environment. In this view, social intelligence was what got us to being as bright and complicated as baboons—and what has taken us still further, into becoming humanity.

I might suggest, though, that there is a brand new evolutionary pressure in the Okvango Delta: outwitting alien scientists. Watch out for Sylvia's Okavango Troop if they ever catch on to Cheney and Seyfarth!

Reference

1. D. Bickerton, *Language and Species* (Univ. of Chicago Press, Chicago, 1990).

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HISTORY OF SCIENCE

The Productivity of Prediction and Explanation

Matthew L. Jones

Isaac Newton famously eschewed "framing hypotheses" about the causes of gravity in favor of demonstrating a mathematical relation common to free fall on Earth and the motion of celestial bodies. Newton's refusal to explain the nature of gravity dismayed many contemporaries, who saw him as sacrificing the intelligibility of the world for mathematical prediction of effects. Newton's mathematical account of gravity became a model for a new kind of scientific intelligibility, one where empirically grounded and predictive mathematical accounts of the relations among things were preferred to causal, but empirically underdetermined, explanations. Accepting Newton meant appreciating how his mathematically framed and empirically justified generalizations might provide the best account of the world we can have—the best kind of sense we can make of the world.

Recent debates over the value of string theory underscore how central the contest among different ways of making the world intelligible remains in modern science. Such debates involve the very definition of science, the proper activities of its practitioners, and concrete questions about who ought to be funded and hired, and who not. Written for a nonspecialist audience, Peter Dear's *The Intelligibility of Science* argues that such prescriptive debates within science are integral to its development. The classic story of Newton provides the early turning point in Dear's concise and ambitious essay. Ranging from Aristotle and Lavoisier to Maxwell and Darwin and from Descartes to Einstein and Bohr, Dear portrays the development of modern science through the shifting accounts of what it means to make nature intelligible.

Dear (a historian of science at Cornell University) distinguishes science as natural philosophy, an account of what the world really is and how it works, from science as an instrumental tool, a collection of techniques useful for making predictions about the world and for changing it. This division draws upon perhaps the oldest chestnut of the philosophy of science, the debate between realism and instrumentalism. Dear illustrates that a productive, unresolved, ever-changing tension between realist and instrumental aims best characterizes the distinctiveness of modern science, its epistemic and instrumental efficacy, and its social and intellectual authority.

The Intelligibility of Nature
How Science Makes Sense of the World

by Peter Dear

University of Chicago Press, Chicago, 2006. 254 pp. $27.50, £17.50. ISBN 9780226139487. Science.Culture.

It is easy to recount the history of science after Newton as something like a long series of attempts to restrain the use of the imagination and the production of overly clever explanations. In such a view, science depends on the sober consideration of data, not the creation of speculative accounts that could conceivably explain that data. More true to the diversity of scientific effort, Dear's account tacks between advocates of great empirical restraint and advocates of greater imaginative flight in causal explanation. Dear shows the importance of a certain will not to know, or rather, a will not to attempt to know the real nature of things in the development of numerous scientific disciplines. He likewise shows the importance of resistance to such epistemic modesty. For every Lavoisier who counseled against speculation about causes in favor of a focused collection of the physical relationships revealed through painstaking experimentation, there was a Priestley who insisted on attempting to know about the things themselves; for every Newton eschewing hypotheses, a Cartesian insisting on their importance. Science benefited from, indeed was constituted by, this ever-unresolved contest over the intelligibility appropriate to learning about and manipulating the natural world. Just as much creative and productive 18th-century science came from abandoning a quest for causal, mechanical models, much creative and productive 19th-century science involved searching for sufficiently sophisticated models.

As Dear covers many fields in a few pages, historians and philosophers will have some qualms. The starting point of the narrative comes a bit late and too far to the west: the enormously fruitful debates over the status of the physical and predictive in Islamic astronomy, which found their way to Nicolaus Copernicus, deserve some discussion. The instrumental turn in 17th-century natural philosophy likewise had deeper roots in alchemy and chemical practice, with a particular Aristotelian sanction, than found in this account. A slightly more formal and detailed exposition about the sort of intelligibility offered by the new mathematical tools of Newton and Maxwell, designed to fit, capture, and illuminate the phenomena of natural world, would enhance Dear's case.

Dear's position rests on a historically informative blurring of the category of instrumentality. His instrumentality includes both a narrow sense, the predictive powers of a theory, and a broader one, the capacity of a scientific theory (and its associated experimental techniques and apparatus) to change the world. Dear well demonstrates that two aspects of instrumentality were and remain muddled in modern science. Studies developing his position should closely track the changing interactions of these two instrumentalities with the demands of intelligibility.

Dear weaves together a great deal of academic history of modern physics, chemistry, and biology into a concise, coherent, and original narrative that is introductory without ever being superficial. Readers will come away both with a narrative of some highlights of scientific development and an illuminating argument underlying that narrative, a potent way of thinking about modern science more generally. Philosophically minded readers will be inspired to seek a more formal account of intelligibility than appropriate here; historically minded ones a deeper inquiry into the contingencies and details necessarily omitted. All will be guided by the insightful and up-to-date bibliographic essay.

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The reviewer is at the Department of History, Columbia University, 1180 Amsterdam Avenue, MC 2527, New York, NY 10027, USA. E-mail: mj340@columbia.edu