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Ape Cognition and Why It Matters for the Field of Psychology

Essay Review of *Folk Physics for Apes: The Chimpanzee's Theory of How the World Works* by Daniel J. Povinelli[1]

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Perhaps few fields draw as colorfully on anecdotes as primatology. Here is one I like, among many. A chimpanzee researcher, Roger Fouts [1997], had just enlarged his laboratory to include a new grassy outdoor area, and the chimpanzees entered this area in the following way, after having spent many years inside:

> Dar squeezed by and exploded out the door and down the stairs to the ground. He raced across the grass field with such an ecstatic movement that he looked like he was skipping, quadrupedally. Then he turned toward us and let out a loud pant-hoot of happiness. Washoe was the next one out. She stood upright and surveyed the terraces, the garden and the familiar human faces at the observation window below. Stretching out her leg, she touched her toes to the first step and pulled them back quickly. Then she noticed Debbi [Fouts] standing at the fence near her. She walked over, reached through the fence, and kissed Debbi through the wire (pp. 335–336).

Such a passage reminds us of school children who race out onto grassy fields after a day cooped up inside; or of prisoners who are granted freedom from their cells and leave timidly, but thankfully. Thus, like many passages from the writings of Jane Goodall [2000] and Sue Savage-Rumbaugh [Savage-Rumbaugh & Lewin, 1994], Fouts' passage speaks not only to our common ancestry with apes, but our common psychology.

Yet are apes more different from us than such colorful stories convey? Daniel Povinelli answers 'yes' in an extraordinarily thoughtful, theoretically wide-ranging, and empirically focused book on the chimpanzee's theory of how the world works. In this commentary, I begin by sketching Povinelli's thesis. Then I discuss five ways that ape cognition matters for the field of psychology.

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Povinelli's Thesis

Povinelli begins with two moves. First, he in effect emphasizes that the plural of anecdote is anecdotes, not data. Second, he argues that similar behavior between apes and humans (e.g., on the dimension of simple tool use) does not necessarily establish similar cognition. Both moves then set into motion Povinelli's main agenda: 'to break down this general supposition of similarity into a series of specific, testable hypotheses concerning chimpanzees' understanding of concepts such as gravity, force, mass, shape, and physical connection (to name just a few), and then to subject these hypotheses to serious experimental scrutiny' (p. viii).

Before he turns to physics, however, Povinelli – over the course of 60 some pages – investigates whether chimpanzees, like us, reason about unobservable mental states (e.g., beliefs, desires, perceptions) as causes of behavior. Here is a flavor of how Povinelli goes about his business. Experiments in his lab and elsewhere have established that chimpanzees, like humans, are extremely interested in where others gaze, and will follow the whole head or even eye movement of another person or chimp. Indeed, if chimpanzees see that you are staring at something which is blocked from their own view, they will reposition themselves to look around the distracting object. Such evidence leads some people to believe that chimpanzees understand that you see things, and that they want to see what you see. But not so fast, says Povinelli. After all, it is possible that the chimpanzee is actually engaged in more reflexive action, and does not represent the other's internal attentional state.

To examine this latter hypothesis, Povinelli embarks on incremental, methodical, and clever experiments. For example, Povinelli had his chimpanzees encounter two familiar experimenters. One experimenter sat normally on a stool and looked directly at the chimp. Another experimenter sat in the same posture, but had a bucket over her head. Povinelli found that the chimpanzees were just as likely to gesture (to request treats) to the person who could *not* see them, as to the person who could. Moreover, he found the same results occurred whether a person was blindfolded or not, or had her hands over her eyes or not. The one exception occurred when one of the two researchers turned her back on the chimp. In this condition, chimpanzees gestured to the person in the frontward position. That might lead one to think, 'aha, that means the chimpanzees are thinking that they should gesture to the person who can see them'. But, maybe not, says Povinelli. So he conducts another experiment where two researchers sit side by side with their backs to the chimp. The only difference is that one researcher is twisting around so that she can see the chimp. The result? Chimpanzees did not prefer to gesture to the person who could see them. And so it goes. Every time the thoughtful reader comes up with a 'well, how about if it was the case that the chimpanzees were really doing …' or 'couldn't the results be interpreted to mean that …'. Povinelli comes forward with yet another experiment to test the segmented hypothesis. The upshot: Povinelli's results do not support what he calls the 'high-level model explanation' – that chimpanzees, like us, actually have a theory of mind.

Povinelli then brings this experimental approach to the domain of physics. For example, in one experiment (pp. 111–116) chimpanzees are trained to use a tool (similar to a stick) to push food through a clear horizontal tube. Then they are presented with a similar horizontal tube, but one that has a hollowed dip (like a cavity)

in the middle, such that food (placed to one side or other of the dip) will get trapped in the dip if it is pushed that direction. The tool is placed in a neutral position. Povinelli found that the chimpanzees could not figure out how to avoid the trap. Other experiments explored chimpanzees' understanding of transfer of force, size-shape interactions, physical connection, and object transformation. Based on the results of more than two dozen experiments (presented in depth over the course of 8 chapters), Povinelli concludes that 'although chimpanzees possess an excellent ability to reason explicitly about relations between objects and events that can be perceived, they appear to know very little (if anything) about phenomena that are, in principle, unobservable' (p. 298).

Against this backdrop of compelling empirical evidence, Povinelli's book raises many issues for those of us interested in human psychology (as opposed to ape psychology). In brief, here are five.

The Captive Subject Problem

Perhaps captive apes do not exhibit the same level of cognitive ability as apes in the wild. If so, Povinelli's research generalizes poorly to great apes as a species.

Povinelli attempts to shut down this critique in three ways, and is not altogether convincing. One, Povinelli says that it is virtually impossible to investigate ape cognition with any degree of precision in the wild. But such difficulty for investigations doesn't bear on the argument. Second, Povinelli says that 'the dichotomy between chimpanzees raised in the wild and in captivity is a false and misleading one to begin with' (p. 15). But that is more assertion than reason. Third, Povinelli says that 'chimpanzees raised appropriately in any setting grow up to display the very same set of social behaviors highlighted as particularly revealing by field researchers' (p. 15). This point has some merit. Yet as a counter-analogy, imagine that I find that humans in two different settings eat, walk, read, brush their teeth, talk with other humans about practical and philosophical ideas, argue with other humans, stare into space, frown, smile, sing songs, mutter under their breath, show embarrassment. This list could be very long. Then I tell you that one population lives in captivity (in prison). The other lives outside of captivity (in society at large). Are the behaviors of these two populations the same? Yes and no. It depends which behaviors one finds relevant, and the level at which the behavior is described. In other words, it is possible that Povinelli has selected behaviors of chimpanzees in the wild that all too easily map onto the behaviors of chimpanzees in captivity. Or another counter analogy. Slave traders can pull healthy adolescents from their families, ship them to another country, nourish them physically, and keep them in the company of their own kind, but it is not clear one has homo sapiens at their best, cognitively, emotionally, socially, or morally. I don't think of myself as a starry-eyed romantic. But I see as an open question the extent to which we miss essential qualities when investigating the life of any species outside of their natural setting.

The Problem of 'Just So' Stories

Anyone involved in comparative or evolutionary psychology has heard their share of just so stories, and probably told a few as well. These stories seek to explain how current day behaviors were selected in ancestral times on the basis that they increased the likelihood of individual and group survival. For example, E.O. Wilson [1984] and others [Heerwagen & Orians, 1993; Kahn, 1999; Kahn & Kellert, 2002] have argued that our attraction to certain forms of landscape emerged on the savannas of East Africa over a million years ago. To take just one example: Bodies of water not only provided a physical necessity to individuals, but drew forth other animals and plant life on which humans depended. Thus, it is not a mere cultural convention that people nowadays will travel long distances to walk along the sea shore, or that land prices are comparatively high for waterfront property. We are genetically predisposed to find such views and experiences pleasing. The problem here – the problem of just so stories – is that they offer post hoc evolutionary accounts without enough specificity to rule out competing if not more compelling explanations [Fischer, 1994]. They are, it is said, not so dissimilar to our childhood stories [Kipling, 1902/1996] that end 'and that's how the camel got its hump'.

A few of Povinelli's accounts are open to such criticism. For example, Povinelli seeks to explain why it is that similar social behaviors between chimpanzees and children are not accompanied by the same mental states. His explanation takes us back into the evolutionary history of primates, where 'in the thick of social interactions, reasoning about the *behavior* of other group members would work quite well (and probably better) than reasoning about their behavior *and* their mental states' (p. 59). Accordingly, Povinelli proposes that homo sapiens came to overlay a comparatively recent psychological ability to represent mental states onto the more ancestral behavioral system. That's a nice account for why apes might not have a theory of mind, and why humans do. But let us say that Povinelli's careful research showed us that apes actually did have a theory of mind. Then would not Povinelli's account readily change to something like 'it's obvious that in the thick of social interactions, reasoning about the behavior *and* mental states of other group members would be more advantageous than merely focusing on behavior'. In other words, this latter hypothesis not only competes with Povinelli's hypothesis, but on the surface seems even a little more compelling.

That said, Povinelli does better than most with his evolutionary accounts. On the whole, he is careful and thoughtful, and gives the reader lots to chew on. Perhaps most wonderful of all, Povinelli couples his evolutionary theorizing as closely as possible with experimental data.

What Makes Humans Uniquely Human?

The study of ape cognition helps to define what is unique to homo sapiens, and distinguishes us from other species. Povinelli weighs in on this issue. Part of his view, stated earlier, is that humans have a theory of mind, and apes don't. But for Povinelli the more general difference is this:

Unlike humans, the chimpanzee's reasoning about both physical objects and social beings appears restricted to concepts, ideas, and procedures that are linked to the world of tangible things. In both the social and the physical case, the chimpanzee learns about the observable properties of these entities, and the kinds of behaviors that these entities typically exhibit. The chimpanzee even takes the impressive leap of generalizing to new instances. But in neither case does the chimpanzee appear to generate additional concepts, related to perceptually non-obvious phenomena, concepts which could provide a unified account of why such regularities exist in the first place (pp. 338–339).

Povinelli considers a few resulting implications. For example, he says that this unique human capacity may be 'one of the critical "triggers" that unleashed human populations into nearly every ecogeographic zone on the planet approximately 200,000 years ago, while the species of great apes remained restricted to the tropics and neotropics' (p. 339). Other researchers, like Michael Tomasello [2000], have stretched further and suggested that this unique human capacity, that emerges in children between roughly 1–2 years of age, is the foundation for cumulative cultural learning – a 'ratchet effect' – that precipitates modern-day human achievements.

While there is something to this type of argument, I also suspect that too much work is being asked of too few constructs. Imagine, for example, if well-traveled extraterrestrials came to earth and found homo sapiens that had a theory of mind and the capacity 'to generate additional concepts, related to perceptually non-obvious phenomena' – but not much else in terms of sophisticated cognition. Would the extraterrestrials be surprised? Would they say 'oh gosh, how absolutely unusual to see a species with these capabilities and not a more advanced culture?' I don't think so. Rather, these early developmental achievements seem necessary but far from sufficient for human culture as we know it. If so, then in seeking an account of human uniqueness all the more reason for psychologists to focus on human development beyond the years of early childhood.

Differences *and* Commonalities: The Importance of the Conjunction

Here's a seemingly uncomplicated proposition. Children and adults are different. For example, compared to adults, children (generally speaking) are physically smaller, have a poorer vocabulary, less working memory, a poorer grasp of social conventions, and different forms of sexuality, friendship interests, and societal roles. Indeed, differences between children and adults cut across every category in developmental psychology, including physical growth and development, perceptual development, information processing, cognitive development, creativity, language, personality, social understanding, and moral development. Yet no matter how many differences we characterize between children and ourselves, we also know that children are, in important respects, similar to us. We're all humans, after all.

Povinelli sets up a similar comparison, but unfortunately gives the reader only two choices. We can accept anecdotes (and popular myths) and mistakenly believe that apes and humans share a common psychology. Or we can take science seriously and thereby be compelled, as he is, to recognize their differences. But other researchers have put forward compelling scientific evidence that establishes commonalities (and differences) between apes and humans [Aureli & Smueny, 2000;

Cheney & Seyfarth, 1990; Cords & Killen, 1998; Verbeek & de Waal, 2002; de Waal, 2002].

Frans de Waal [1996], for example, has investigated whether chimpanzees engage in reciprocal altruism: helping another with expectations of reciprocal help at a later point in time. In one study, de Waal recorded nearly five thousand interactions where a chimpanzee had the opportunity to share food with another chimpanzee. Analyzing all possible directions of transfer among individuals, he found that as

> predicted by the reciprocity hypothesis, the number of transfers in each direction was related to the number in the opposite direction; that is, if A shared a lot with B, B generally shared a lot with A, and if A shared little with C, C also shared little with A. The reciprocity hypothesis was further supported by the finding that grooming affected subsequent sharing: A's chances of getting food from B improved if A had groomed B earlier that day (p. 153).

De Waal goes on to suggest that individual chimpanzees 'with the mental capacity to keep track of given and received favors can apply this capacity to almost any situation ... Once a quid pro quo mindset has taken hold, the "currency" of exchange becomes secondary. Reciprocity begins to permeate all aspects of social life' (pp. 153–154). Thus chimpanzees baby-sit each other's offspring, and female bonobos 'are known to receive food from males immediately following, or even in the midst of, [sexual] intercourse' (p. 154).

De Waal's research does not commit us to the proposition that human morality can be reduced to reciprocal altruism. Or, if you believe that it can be, de Waal's research does not commit us to the proposition that ape reciprocal altruism is identical to human reciprocal altruism. But it does show substantive commonality in the lives of apes and humans. Thus Povinelli's theorizing would be stronger, and his argument more compelling, if he hadn't so much ignored this body of scientific literature. We're all primates, after all.

How Folksy is 'Folk Psychology'?

There is an emerging trend to talk about 'Folk' theories: *Folkbiology* [Coley, 2000; Medin & Atran, 1999], *Folk Psychology* [Davies & Stone, 1995; Greenwood, 1991; Horgan & Woodward, 1985], *Folk Religion* [Hiebert, Shaw, Tienou, & Shaw, 1999], *Folk History* [Botkin 1994], and so on. The overarching idea here is that researchers are seeking to articulate lay people's conceptions of a domain of knowledge. In the previous century, such social scientific investigations were often labeled more descriptively. Thus, Piaget, for example, titled books *The Child's Conception of the World* (1929/1960), *The Child's Conception of Number* (1952/1965), and *The Construction of Reality in the Child* (1954). Povinelli uses 'Folk' for the title of his book: *Folk Physics for Apes*. Then for the subtitle he comes in with the more traditional framing: *The Chimpanzee's Theory of How the World Works*. From the first pages of his book, Povinelli thoughtfully explains his choice. He argues, for example, that 'physics' is a good word to use, since this discipline concerns itself with, among other things, the interactions of energy, matter, and space – the very concepts he seeks to investigate. And he argues that 'folk' is a good word, too, for it lays no claim to the scientific veracity of the chimpanzees'

conceptions, but gives credence that these conceptions are 'to some extent or another, organized and coherent' (p. vii).

I would like to raise just one concern with the overall trend that invokes the term 'folk' for social scientific investigations, particularly as conducted by developmental psychologists. Namely, 'folk' (as in folklore) drives a wedge between children's conceptions of a domain and the way the world really works within that domain – a wedge between ontogeny and epistemology. And I question doing so. In the moral domain, for example, while it is generally recognized that what 'is' does not imply 'ought' (the naturalistic fallacy), it is also increasingly recognized that 'ought' implies 'can': that an adequate moral theory must take account of human capabilities and dispositions, and cannot stand apart from human lives [Scheffler, 1992; Williams, 1985]. So, too, in the social domain. Habermas [1979], for example, offers a theory of communicative action (ideal discourse) that involves three thematic validity claims: truth (with propositional content), rightness (embedded in social relations) and truthfulness (that depends on the speaker's intention). Habermas develops his theory, in part, by what he refers to as the 'rational reconstruction of generative structures' (p. 13) which recognizes 'a particular connection between formal and empirical analysis, rather than by their classical separation' (p. 25). Similarly, Piaget [1971] conceived of his cognitive-developmental research in terms of 'genetic epistemology,' which does not reduce the world (and validity claims) to human thought, as deconstruction postmodern theory does [Kahn & Lourenço, 1999], but recognizes that the genesis of human thought is in the thick of any account of valid knowledge. If in broad strokes this structural-interactional position has merit – and I think it does – then we may not be well served by the current proliferation of 'Folk' terminology.

Conclusion

Povinelli coauthored many of the chapters in *Folk Physics for Apes* with one or more of three collaborators: James E. Reaux, Laura A. Theall, and Steve Giambrone. Together they have written a scholarly and highly readable book. Even better, it's an important book. It provides hard-won experimental data and sophisticated theorizing to the field of primatology, while engaging deeply with foundational issues in the field of psychology.

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