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KEYNOTE SPEAKERS

Dr. Selmer Bringsjord

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"Inaugurating the Formal Science of Darwin's Mistake"

In their bold "Darwin's Mistake," Penn, Holyoak, & Povinelli (PHP; 2008) argue that Darwin profoundly erred in holding that there is no discontinuity between the cognitive capacities of nonhuman animals (e.g. dogs, the cognitive powers of which he repeatedly exalted, and also e.g. chimpanzees) versus those of *Homo sapiens*.[1] Predictably, many refuse to concede that PHP are right. This debate, which continues, is to this point in time a decidedly and thoroughly *informal* affair --- one based in part on evidence, yes; and indeed evidence that comes at least in part from science, but from *empirical* science (comparative psychology, mostly). I begin to recast the debate in the language of the *formal* sciences, which are based directly on formal logic and mathematics and are theorem-driven. The ultimate upshot expected from this recasting is the result that Darwin's continuity position, which is the very foundation of his *Descent of Man*, is *provably* wrong. My recasting, among other things, supplants PHP's reference to "physical symbol systems" with formalisms used in order to be precise about what computation is, and supplants helpful talk of various cognitive capacities (e.g., "relational reasoning") with precise forms of reasoning over rigorous defined formulas and equations.

[1] I have long maintained that Darwin's /Descent of Man/ is painfully illogical. See e.g. "How Logical is Darwin's /Descent of Man" (2009): http://kryten.mm.rpi.edu/PRES/DESCENT111909/SB_Darwin_Descent.pdf. And I have pointed out that Pinker's reply to Wallace's Paradox, on formal grounds, doesn't work: see (Bringsjord 2001).

- Bringsjord, S. (2001) "Are We Evolved Computers? A Critical Review of S Pinker's /How the Mind Works/" /Philosophical Psychology/ 2: 227—243. A preprint is available at http://kryten.mm.rpi.edu/selmer.wallaceparadox.pdf.
- Darwin, C. (1997/1871) /Descent of Man/ Amherst, NY: Prometheus.
- Penn, D., Holyoak, K. & Povinelli, D. (2008) "Darwin's Mistake: Explaining the Discontinuity Between Human and Nonhuman Minds" /Behavioral & Brain Sciences/ *31*: 109--178.

Dr. John E. Hummel

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Director of the Relational Reasoning Laboratory

"What Happened to the Human Brain?"

Humans are unique among the great apes in our capacity to reason explicitly about relations—an ability that underlies our capacity for mathematics, science, engineering and everything else that distinguishes us as a species. Reasoning about relations requires us to represent relations as entities in their own right, to bind arguments to those relations, to map systems of structures based on shared relations and to use the resulting mappings to constrain inference and learning. During human evolution something happened to our brains that makes it possible for us to do these things. I will discuss simulations of how the human brain accomplishes these tasks, and how the resulting algorithms account for aspects of human thinking, especially those that make us unique among the great apes.

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