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# Reasoning, Logic, and Development

## Essay Review of *The Enigma of Reason* by Hugo Mercier and Dan Sperber

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In 2011, Hugo Mercier and Dan Sperber published an influential article [Mercier & Sperber, 2011] arguing that human reasoning evolved for the purpose of argumentation and serves that purpose well. Additional publications followed and now, in *The Enigma of Reason*, Mercier and Sperber [2017] flesh out their theory. Individual reasoning is often fallacious, in their view, because it applies reasoning beyond the scope of its evolutionary purpose. Logic, rather than a basis for reasoning, is a formalized system developed by logicians that has little connection to actual human reasoning.

This is a rich and readable book that presents many intriguing studies from the literature of human reasoning and addresses diverse philosophical and theoretical conceptualizations of human rationality. In the end, however, I believe it has two serious, and closely related, flaws: it ignores development and, as a result, misunderstands the nature of logic and its role in reasoning.

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## Mercier and Sperber's Theory

*The Enigma of Reason* begins by noting the longstanding concern of philosophers with reason. It quickly turns to a scientific approach, by which it means an evolutionary perspective: "With Darwin came the realization that whatever traits humans share as a species are not gifts of the gods but outcomes of biological evolution. Reason, being such a trait, must have evolved" [Mercier & Sperber, 2017, p. 1].

And what is it that has evolved? Whereas dual processing theorists such as Kahneman [2011] posit "a contrast between intuition and reasoning as if these were two quite different forms of inference," the present theory maintains instead "that reasoning is itself a kind of intuitive inference" [Mercier & Sperber, 2017, p. 7]. Logicians, philosophers, and psychologists of reasoning have greatly overemphasized the role of reflection in human inference because they themselves "commonly resort to higher-order arguments as part of their trade," which is "hardly typical of the population at large." Such theorists "mistake their own professional twist of mind for a basic human trait" [Mercier & Sperber, 2017, p. 152].

Also in contrast to prevailing views, reasoning is seen as primarily social rather than individual, a matter of argumentation rather than logic:

Whereas reason is commonly viewed as a superior means to think better on one's own, we argue that it is mainly used in our interactions with others. We produce reasons in order to justify our thoughts and actions to others and to produce arguments to convince others to think and act as we suggest. We also use reason to evaluate not so much our own thought as the reasons others produce to justify themselves or to convince us.

Whereas reasoning is commonly viewed as the use of logic, or at least some system of rules to expand and improve our knowledge and our decisions, we argue that reason is much more opportunistic and eclectic and is not bound to formal norms. [Mercier & Sperber, 2017, p. 7]

The role of logic in reasoning continues to be discussed throughout the book. “Logic,” we are told repeatedly, “tells us neither how we reason nor how we should reason” [Mercier & Sperber, 2017, p. 174]. A section title firmly puts logic in its place: “In Reasoning, Logic Is a Heuristic Tool” [p. 158].

Central to the argument is a sharp distinction between logic and mathematics. Both logic and mathematics make use of ordinary language but they differ fundamentally, the authors argue, in their relation to language. Mathematics can be discussed in English, for example, using words such as “one,” “two,” “thousand,” “million,” “plus,” “minus,” and “times,” but underlying the use of these linguistic expressions are what they call “mathematical facts” (p. 153). Presumably such facts include, for example, the basic necessities of arithmetic: Three plus two always comes to exactly five, and subtracting two from five returns you to three. Two plus two plus two comes to six, and three times two must give the same result.

But logic, argue Mercier and Sperber, is different. Logic, they assume, derives from and relies entirely on language; unlike mathematics it has no deeper basis. Specifically, logic involves the use of words such as “if,” “then,” “and,” “or,” and “not,” which may reasonably be interpreted differently across different contexts. Thus logic, in their view, is pragmatic and contextual; it may sometimes contribute to reasoning but plays no special role.

### **Evolution without Development**

*The Enigma of Reason* is an important contribution to the psychological study of reasoning that challenges most prevailing views and will likely receive multiple critiques. One important basis for critique is that it does not take logic seriously enough. I argue here that the failure to take logic seriously is a failure to comprehend its nature, which is in turn due to a failure to take development seriously.

There is no denying the value of an evolutionary perspective on reasoning or any other psychological phenomenon. The human species is a product of evolution and can only be understood in light of its evolution. But it is no less true that a person is a product of development and can only be understood in light of that development. This makes

little difference if development is driven by evolutionary instructions encoded in our genes. But research over the past half-century has made it increasingly clear that development can only be understood as a constructive process that coordinates emerging structural relations across genetic, physiological, behavioral, environmental, social, and cultural levels. Development is not determined by, and cannot be reduced to, genes or evolution.

These matters have been discussed for decades by major developmental theorists including Richard Lerner, Willis Overton, Robert Lickliter, and David Witherington, all of whom remain understandably frustrated by the continuing use of simplistic evolutionary models [Lerner & Overton, 2017; Lickliter & Witherington, 2017]. The present book would upset them literally from page 1, where reason (see the quote above about Darwin) is presented as an evolved trait.

Oblivious to developmental considerations, Mercier and Sperber [2017] seem to construe people as collections of evolved traits. Each trait has evolved to serve some purpose and can be explained on the basis of that purpose. Reason is deemed a human trait that serves the social purpose of argumentation and is explained in those terms with no consideration of its development. I suggest here that extensive research on the development of logical reasoning, which is entirely ignored, is difficult to reconcile with the present theory.

### **The Development of Logical Reasoning**

*The Enigma of Reason* makes reasoning more enigmatic, rather than less, by ignoring nearly a century of developmental research. Contrary to any notion of logic as peripheral or exotic, research on the development of logical reasoning and metalogical understanding shows early logic and systematic progress over the course of childhood and often beyond [Moshman, 1990, 2011, 2015]. Logic is implicit in norms of biological self-regulation and can be seen, long before the emergence of language, in the increasingly coordinated sensorimotor cognition of infants [Langer, 1980, 1986; Piaget, 1971].

As children begin to talk, it becomes increasingly clear that they are routinely making inferences that can be recognized by logicians and psychologists as logical, though the children themselves do not initially comprehend the inferential nature of their cognition, much

less the logic of their inferences. Beginning about age six, children recognize inferences as a potential source of knowledge and show some understanding of logical necessity, consistency, and impossibility. Further development shows systematic progress as they go on to construct increasingly reflective understandings of the difference between logical knowledge of necessities and empirical knowledge of contingent matters about the world [Moshman, 1990, 2011, 2015; Smith, 1993].

Early mathematical development is in large part a matter of coming to understand the logic of number, counting, and simple arithmetic. Also beginning around age six, children treat mathematical truths like logical truths in distinguishing them from empirical facts and social conventions. There is no basis for the sharp distinction Mercier and Sperber make between mathematics and logic. Classifying these together, Piaget distinguished logicomathematical knowledge from empirical knowledge and showed that this is a distinction made not just by philosophers such as Kant, but by virtually everyone beyond the age of 6 or 7 years.

The development of logicomathematical knowledge appears to be an ongoing constructive process in which knowledge implicit in inference at any level becomes an object of reflection, which generates more explicit knowledge about logic, which guides higher levels of reasoning. Far from a “professional twist of mind,” research shows reflection to be a fundamental process of developmental change in the logicomathematical realm [Moshman, 1990, 2011, 2015; Piaget, 2001; Smith 1993].

The developmental literature does not contradict the rich literature showing that adults frequently and systematically fail to meet norms of logic and rationality [Kahneman, 2011]. But it does show that adolescents and adults, when reasoning at their best, show advanced forms of logical reasoning and metalogical understanding never seen among 8-year-olds, who in turn show logical competencies beyond those of 4-year-olds, who are already logical in important ways that can be traced back to the sensorimotor cognition of infancy and, further, to the normative self-regulation of biological systems. *The Enigma of Reason* is certainly correct that there is more to reasoning than logic, but there is much more to logic than the proposed theory acknowledges.

## **The Epistemic Basis of Reasoning**

Mercier and Sperber [2017] see reasoning as metacognitive in some ways, but they do not see it as epistemic. In their view, reasoning evolved as a pragmatic instrument to serve particular social purposes, not to determine the truth, so any truth that results is mostly incidental. Justification is crucial to argumentation, but justification, in the proposed theory, is neither based on logic nor aimed at truth.

This view is in sharp contrast to that of most philosophers, and especially epistemologists, who see truth as a necessary condition of knowledge. But Mercier and Sperber understand that they are challenging standard philosophical views. What they do not seem to realize is that they are also challenging the epistemic cognition of ordinary people [Moshman, 2015]. By the age of 4 years, children recognize that beliefs can be false; for many years after that they construct increasingly sophisticated conceptions of truth, justification, and knowledge. This epistemic development is reflected in increasingly sophisticated argumentation. It is not clear how the proposed theory can account for this. Why would evolution generate a universal course of individual development toward false and useless ideas about logic and truth?

But a moderate version of the proposed theory is much more plausible. Human beings develop in social contexts that encourage argumentation from very early ages and such argumentation plays a major role in the development of reasoning, which includes logic but also includes reasons that are not strictly deductive, such as appeals to evidence, principle, or precedent. There are epistemic domains of reasoning beyond the logicomathematical domain [Moshman, 2015].

No other species develops nearly as far as human beings in reasoning and rationality, presumably for evolutionary reasons, but evolution alone does not account for argumentation, reasoning, or any other aspect of rationality. Logical and epistemic development through childhood and beyond requires both individual agency and social transactions.

## **Conclusion**

The proposed theory, I have argued, is best viewed as complementary to standard views, rather than an alternative theory. It offers much of

value but cannot replace existing theoretical conceptions, in part because of evidence supporting those conceptions.

With regard to the emphasis on argumentation, reasoning is both social *and* individual, with reciprocal influences across multiple levels. Perhaps we have underestimated the social aspect of reasoning as a collaborative activity, a claim worth considering, but there is no need to disparage the epistemic agency and development of individuals and much evidence to remind us not to do so.

With regard to development, evolutionary accounts must acknowledge and explain developmental processes, sequences, and outcomes. People are not collections of evolved traits. The conceptualization of reason as a trait draws our attention away from its development and thus undermines our understanding of its nature, including its relation to logic.

Finally, reasoning is indeed much more than logic, and the present work helps us see better the many ways in which this is so. But reasoning sometimes properly relies on strict deduction and its associated possibilities, impossibilities, and necessities. Logic is crucial to much of our reasoning whether we know it or not, and we are better off if we know it.

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