

## What Is Unique about Human Thinking?

**A Natural History of Human Thinking.** Michael Tomasello. Harvard University Press, 2014. 192 pp., illus. \$35.00 (ISBN 9780674724778 hardcover).

**M**ichael Tomasello heads a research group at the Max Planck Institute for Evolutionary Anthropology, in Leipzig. His work deals with how human thinking goes beyond that of other primates, qualitatively—how we think in ways that are not available to the great apes. His evidence consists of carefully controlled laboratory experiments with chimpanzees and young children. Tomasello and his associates convincingly show that there are three types of human cognition, only one of which—individual intentionality—is shared with the great apes.

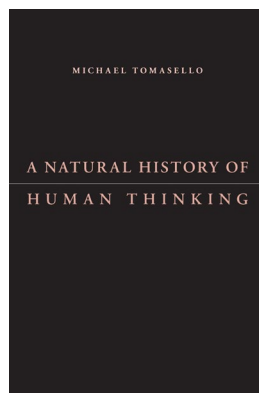
*Individual intentionality* is personal goal-oriented behavior, such as climbing a tree to pick a fruit or opening a box that contains a treat. Individual intentionality presumes a high level of cognitive functioning because it involves conceptualizing a final outcome (the goal) and devising a series of actions, each assessed for its effectiveness in contributing to the outcome. Individual intentionality can have a social component, such as when one individual enlists the aid of another in procuring a tool that is out of reach.

The second kind of cognition is what Tomasello calls *collective intentionality*. He writes: “Modern humans became cultural beings... by creating... conventions, norms, and institutions built not on personal but on cultural common ground. They thus became thoroughly group-minded individuals” (p. 80).

This form of cognition is *collective* because individuals must enter into complex social interactions with the goal of embracing specific social norms and conventions, and it is *intentional* because the resulting norms and conventions have the aim of promoting

some forms of social interaction and devaluing others. Tomasello argues that collective intentionality is absent in the great apes.

Tomasello’s unique and stunning contribution is his analysis of what he calls *joint intentionality*, which occurs when two or more individuals *collaborate* in accomplishing a common goal. Collaboration is a complex form of cooperation, the latter merely involving all participants in a task carrying out their part in a social process. For instance, eusocial insects, including termites, ants, and many species of social bees and wasps, construct elaborate and sophisticated colonial structures using purely instinctual behaviors. There is no evidence that these creatures conceptualize the final product and interact intentionally to produce it.



Collaboration goes beyond cooperation by linking the collaborators together in the form of networked minds with cognition distributed across the participants, with all participants morally committed to upholding their part in the process. Joint intentionality is *we-thinking*, a form of cognition that even young children understand but is generally unavailable to nonhuman animals. Tomasello’s analysis of we-thinking is, to my mind, completely convincing and an important contribution to our understanding of human cooperation.

It is worth reviewing some of the experimental evidence on which the notion of joint intentionality is based. Chimpanzees point the same way humans do, but they only point *imperatively*, never *declaratively*. That is, a chimp will point to a banana that is out of reach, requesting that a caretaker give her the banana. However, a chimp will never point to help a caretaker find something that a caretaker is looking for. Similarly, a chimp will not interpret a caretaker’s pointing as informationally relevant.

In one experiment, the chimp knows that a treat is hidden in one of two barrels, and she can choose either one of the barrels. The caretaker looks in both barrels, moves a bit away, and points to one of the barrels. The chimp then is found to choose each barrel with equal frequency, indicating that she could not interpret the caretaker’s pointing as a form of informational helping behavior. Even very young children, by contrast, invariably interpret the caretaker’s behavior as informational pointing, and the child always chooses the correct barrel.

Joint intentionality requires that collaborators recognize that each has a certain special perspective on the task, with unshared knowledge that must be supplied to the other collaborators for successful task completion. Therefore, joint intentionality requires that individuals understand that others not only have beliefs but that others may have *false beliefs*.

The standard test for understanding false beliefs has the following form. The subject and the experimenter sit on opposite sides of a table on which lie three opaque, upside-down cups. The experimenter places an object under one of the three cups and then goes away. A puppet then takes her place at the table and moves the toy from under one cup to under another. The puppet then goes away, and after a short time the experimenter returns.

The subject is asked where the experimenter will look for the object. A child under the age of 12 months—or a chimp of any age—will predict that the experimenter will turn over the cup to which the puppet moved the object, thus failing to comprehend that the experimenter, who did not witness the puppet's behavior, will have a *false belief* concerning the location of the toy. A human child older than 12 months will correctly predict that the experimenter will look under the wrong cup.

Tomasello concludes from this and related experiments that human thinking is fundamentally cooperative and based on joint intentionality, whereas other primates' thinking is primarily competitive and based on individual intentionality. He calls this the *shared intentionality hypothesis*.

Having developed the concepts of individual, joint and collective intentionality, Tomasello explains how the latter two, present in humans and absent in apes, might have evolved. He argues that our hunter-gatherer forebears first distinguished themselves from other primates by developing small-scale, basically dyadic collaborations in hunting and scavenging. Participants in collaboration on this scale created socially shared joint goals and joint attention, laying the basis for cooperative social interaction.

According to this account, individuals with an enhanced capacity to collaborate would be valuable partners in foraging. They would therefore be more successful hunters, would be attractive mates, and would have more offspring. These offspring would inherit the capacity for joint intentionality and the predisposition to commit to collaborating with others, leading to the evolutionary success of their collaborative powers. Tomasello judges that this collaborative step began soon after the emergence of the first hominins some 2 million years ago.

Tomasello suggests that collaboration in this period can be modeled as a *stag hunt game*. In the stag hunt game, two players can each go it alone and expect to capture a rabbit worth 1, or

they can collaborate and expect to capture a stag, worth 4, for instance. But if one goes for the stag and the other opts for the rabbit, the stag hunter gets 0. It is easy to see that this is a pure coordination game in which hunting the stag is better for both players, but they still may fail to cooperate because each suspects that the other may not cooperate. The noncooperative solution is basically what nonhuman primates do, whereas the cooperative solution is what humans evolved to do through a commitment to joint intentionality.

Tomasello offers a straightforward set of conditions leading from joint to collective intentionality. As human populations began growing in size and competing with one another, Tomasello argues, group life as a whole became one big collaborative activity, creating a much larger and more permanent *shared world*—that is to say, a culture. The resulting group mindedness among all members of the cultural group was based on a new ability to construct common cultural ground through collectively known cultural conventions, norms, and institutions.

It was also in this period that language developed. For dyadic collaboration, simple gestures and pointing will do, but when collaboration involves many individuals, some of whom are strangers, a broader set of communication tools is needed, and language fills this need.

Despite the elegance of this evolutionary story, its accuracy is doubtful. There is no evidence in the paleoanthropological record of a hominin ancestor whose social organization was based on, in Tomasello's words, "collaboration... between *ad hoc* pairs of individuals." Early hominins, in the transition from the Pliocene to the Pleistocene, were scavengers (Binford 1985, Blumenshine et al. 1994, Dominguez-Rodrigo and Barba 2006, McPherron et al. 2010), whose coordinated collective action was sufficient to drive off the predators who had attacked and killed the prey. Before the advent of poisoned stone-tipped spears and arrows, which was comparatively recent, the active pursuit of

large prey by a few hunters was likely impossible (Sahle et al. 2013). Both scavenging and hunting in the woodlands and forests of the Pleistocene involved most of the able-bodied men in a band acting collectively by spreading out over a large area in search of prey. When one member of the band located a prey object, the others would be called to chase away predators with stones and spears. They would then carry the prey, which could be quite large, back to the home base, where the meat could be cooked and shared.

The notion that very small groups of hunters could form coalitions and hunt apart from other small groups of hunters is certainly possible, but it has no support in the paleoanthropological data. Also, contemporary hunter-gatherer groups, of which there are more than 1000 around the world, almost always hunt collectively and have sophisticated social norms for the egalitarian sharing of the meat from large animals. The main reason for collective hunting appears to be that capturing large prey is an infrequent and unpredictable event, so collective participation in the hunt reduces the stochasticity of returns to an acceptable level (Lewis et al. 2014)

If these observations are accurate, it is most likely that an early hominin species developed a crude but effective collectively intentional society with norms, conventions, and sophisticated communication forms that gave this species an evolutionary advantage over the many hominin species of the time that were competing for control of the hunter-gather niche in woodland and forest. Tomasello hypothesizes that the transition from joint intentionality to collective intentionality had to wait until there were high levels of human population and interband competition. However, hunter-gather societies with collective hunting appear in the fossil record long before human population growth took off in the modern era, and interband warfare was probably never unimportant in our hominin ancestors (Bowles and Gintis 2011). There was therefore no "joint intentionality" society at all.

Similarly, the notion that human language is a modern adaptation to high population density and warfare is not plausible. Human language originated in all likelihood more than 700,000 years ago (Dediu and Levinson 2013), although it may have taken its modern form much later, between 100,000 and 50,000 years ago (Lieberman and McCarthy 2007). However, human population growth began only 10,000 years ago.

An important casualty of these facts is Tomasello's assertion that early hominin collaboration can be insightfully modeled as a stag hunt game. The essence of the stag hunt game is that each agent has an incentive to collaborate, provided all the others do. If there are  $nb$  to the total group payoff at a cost  $c < b$  to himself, and assuming the group payoff is shared equally among the players, a player will collaborate provided that  $b \div n > c$ . This may be true for  $n = 2$  or  $n = 3$ , but it is unlikely that the payoff from cooperating is more than three times the cost. For a typical group of hunters, which may have included 8 to 16 individuals, each individual has an incentive to shirk. Therefore, the proper game describing collaborative hunting is much more likely to be a *public goods* game than a stag hunt game. In fact, we know that contemporary humans have genetic predispositions that allow them to develop social institutions that foster cooperation in such public goods games (Fehr and Gintis 2007, Bowles and Gintis 2011).

Tomasello refers to Skyrms (2004) for support in claiming that the stag hunt is the proper tool for analyzing human cooperation. However, Skyrms's argument is not plausible for games with more than two players, and it is questionable even for  $n = 2$ . In the latter case, if the task requires two people to complete a job successfully, one can generally shirk to some extent, with the hope that the other will pick up the slack. This violates the conditions of the stag hunt game. Once we add

several players and variable effort to the mix, the stag hunt game falls apart.

Moreover, this reliance on the stag hunt game has led Tomasello astray in assessing the importance of altruism, which is replaced by mutualism in the stag hunt game, in fostering human cooperation. This belief is a nonstarter. For one thing, joint intentionality includes a joint commitment to the group of collaborators, and commitment means precisely each member honoring the group's goals even when his best self-regarding interest would be to abandon the collaboration—or at least reduce his contribution to the group effort—in order to attain other personal goals. For another, the idea that most human cooperation is either joint or collective intentionality is simply not the case. Altruism-based helping and punishing occur in many crucial situations in which there is no collaboration at all. If a stranger gives me directions, or if passengers on an air flight are considerate to one another, these forms of prosociality are altruistic in the most rigorous sense. But no collaboration is involved. Moreover, human morality includes such character virtues as honesty and courage, for which people sacrifice personal gain to honor even when they have no feelings for those who benefit from their virtue and when they cannot gain materially from their rectitude. This is altruism without collaboration.

The story of human social evolution remains largely to be written (Gintis et al. 2015), and Tomasello's shared intentionality hypothesis is probably an important part of the story. But his assertion that intentional collaboration is "primarily responsible" for human cooperation is not plausible, if only because it is unlikely that any one factor is primarily responsible for anything in human evolution. We are the product of a complex, multifaceted evolutionary dynamic, and the deeper we probe into our origins as a species, the more wondrous facets we unearth.

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HERBERT GINTIS

*Herbert Gintis (hgintis@comcast.net)  
is an external professor with the  
Santa Fe Institute.*

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