

Profile of Michael Tomasello

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Michael Tomasello's insights, gleaned from nearly three decades of research on great apes and children, help answer a fundamental question: How do humans differ from other great apes in cognition and sociality? Tomasello, a professor of psychology and neuroscience at Duke University, has applied a comparative and developmental approach toward seeking answers. His studies on the psychological processes of social cognition, social learning, cooperation, and communication shed light on human uniqueness as well as on the cognitive abilities of our closest ape relatives. Tomasello, who is emeritus director of the Max Planck Institute for Evolutionary Anthropology, was elected to the National Academy of Sciences in 2017. His Inaugural Article (IA) explores why human infants and great apes are capable of passing some tests of social cognition, whereas only older children can pass others.

theory, appealed to Tomasello, who also admired the work of Soviet psychologist Lev Vygotsky. Both Vygotsky and Bruner emphasized the critical roles that social interactions and culture play in human cognitive development.

Guiding Tomasello's studies was his thesis advisor Ernst von Glasersfeld. "Von Glasersfeld was forced to leave the University of Vienna because of the Nazi threat, which resulted in his having no formal degrees, and yet he obtained a faculty position," Tomasello says. Von Glasersfeld, Piaget, Bruner, and Vygotsky were all constructivists who believed that human knowledge is constructed from social and other experiences.

Comparative Studies on Social Learning and Culture

Upon earning his doctoral degree in 1980, Tomasello became an assistant professor, and later, full professor of psychology at Emory University, where he also served as an adjunct professor of anthropology. His initial research was solely on children, but that would soon change. He accepted a position in 1982 as an affiliate scientist in psychobiology at the Yerkes Primate Center, where he stayed until 1998. "Yerkes is where it all came together for me," Tomasello says. "I had access to both chimps and kids, and therefore could conduct comparative experiments."

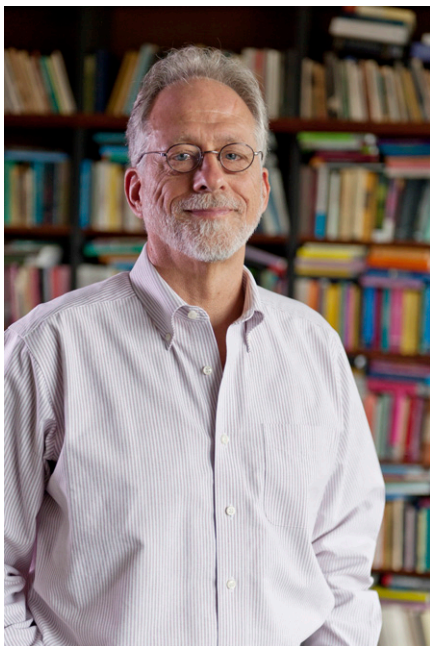
The first experiment concerned how chimpanzees and two-year-old children learn to use tools (1). The study concluded that chimpanzees emulate, while children imitate. Chimpanzee culture is tentative and fragile, as a result, according to Tomasello and his colleagues, who later showed that human culture accumulates modifications and ratchets up in complexity over time (2). The research was highlighted in two books focused on primate cognition (3) and the cultural origins of human cognition (4). In the latter, Tomasello argued that only one known biological mechanism could bring about the changes separating human beings from other great apes: "This biological mechanism is social or cultural transmission, which works on time scales many orders of magnitude faster than those of organic evolution."

Cultural Intelligence Hypothesis

From 1998 to 2018, Tomasello served as codirector of the Max Planck Institute for Evolutionary Anthropology.

Early Influences

Born in 1950 in Bartow, Florida, Tomasello recalls being first drawn to his field while he was an undergraduate at Duke University. He says, "I took a class on biological psychology that was fantastically interesting, and I realized this was something you could do for a living." After earning a bachelor's degree in psychology in 1972, he entered the University of Georgia's experimental psychology graduate program. His focus then was on the theoretical framework of Jean Piaget, a Swiss psychologist known for his research on child development. Tomasello also followed the research of Jerome Bruner, who was a pioneer in the field of cognitive psychology. Bruner's multidisciplinary approach, combining anthropology, psychology, linguistics, and literary



Michael Tomasello. Image courtesy of The Jacobs Foundation.

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During this period, he was also an honorary professor of psychology at the University of Leipzig and codirector of the Wolfgang Köhler Primate Center in Leipzig. In 2016 he became a professor of psychology and neuroscience at Duke University. Research at these and other institutions enabled Tomasello and coworkers (5) to develop the cultural intelligence hypothesis, which argues that humans possess a species-specific set of social-cognitive skills, emerging early in ontogeny, for participating and exchanging knowledge in cultural groups.

Tomasello and his colleagues tested the hypothesis by giving cognitive tests to children and nonhuman primates. "This was a huge study involving 106 chimpanzees, 32 orangutans, and 105 2.5-year-old children," Tomasello says. The researchers found that chimpanzees and children had similar physical world-related cognitive skills but that children possessed more sophisticated social abilities than nonhuman primates.

Shared Intentionality, Collaboration, Social Norms

As a specification of the cultural intelligence hypothesis, Tomasello proposes that a crucial difference between human cognition and that of other species is shared intentionality: the ability to participate with others in collaborative activities with shared goals and intentions. After attending a 2001 talk on collective intentionality presented by the philosopher Margaret Gilbert, Tomasello discussed the concept with his team. "And it occurred to us that accounts of shared intentionality—which are fundamentally about cooperating in everything from taking a walk together to creating a social institution—might provide a powerful theoretical framework for unifying the differences we were seeing between great apes and human children across many psychological domains," Tomasello later wrote (6).

Tomasello (7) determined that great apes and some children with autism understand the basics of intentional action but do not participate in shared intentionality. They found that the basics of shared intentionality develop gradually during the first 14 months of life by intertwining two distinct ontogenetic pathways. The first, applicable to all apes, allows for understanding others as animate, goal-directed, and intentional agents. The second is a human-specific motivation to share emotions, experiences, and activities with others.

In another study, Tomasello (8) showed that young children share resources with others more equitably in collaborative activities than they do in other situations. Collaboration had no such effect on chimpanzees. Humans' desire to distribute resources fairly may have its evolutionary roots in the sharing of the rewards of collaborative efforts. These roots might also explain the finding of Tomasello and coworkers (9) that toddlers object when people within their cultural group break rules, which often function as unifying social norms.

Functional Theory of Language Development

A study by Tomasello and Jody Todd (10) also touches upon early lexical development, a topic that Tomasello continues to study. In a 2003 book, he proposed a

functional theory of language development (11). The theory holds that language structure emerges from use and relies upon two basic skills: intention reading and pattern finding. He writes, "When human beings use symbols to communicate with one another, stringing them together into sequences, patterns of use emerge and become consolidated into grammatical constructions."

His extensive research on human and nonhuman primate communication was summarized in the 2008 book, *Origins of Human Communication* (12). It includes his team's findings on gestures, which chimpanzees also use for communication. Tomasello, however, concluded that chimpanzee gestures are not aimed at establishing joint attention, whereas both human gestures and language exhibit shared intentionality.

Evidence That Chimpanzees Possess Theory of Mind

A trio of studies conducted by Tomasello (13–15) demonstrate that chimpanzees possess at least some form of theory of mind, which is the ability to attribute mental states to oneself and to others. An innovative series of experiments provided the evidence. The researchers showed that when chimpanzees were in competition for food with a person, they chose to approach a contested food item via a route hidden from the competitor's view. Chimpanzees are therefore skillful at manipulating how others can see them.

In a 2008 article, Call and Tomasello (16) interpreted these findings as indicating that the key difference between chimpanzee and human cognition is that apes have a kind of perception–goal psychology, whereas humans have a full-blown belief–desire psychology, implying that nonhuman primates do not understand beliefs in the human-like way as mental representations that might or might not match reality.

How Children Understand False Beliefs

More recently, Tomasello and coworkers (17) applied an anticipatory looking test, originally developed for human infants, to a study involving three great ape species. The nonhuman primates looked in anticipation at an agent who was acting on a location where he falsely believed an object to be, even though the apes themselves knew that the object was no longer there. The results suggest that great apes operate with an understanding of false beliefs comparable to that of human infants. However, children aged four to five years begin to demonstrate a sophisticated understanding of both true and false beliefs (18).

Tomasello's IA presents a theory explaining why great apes and infants pass some false belief tests but only older children pass others (19). The hypothesis, based on several types of empirical evidence, holds that infants possess general primate skills of imagining the mental states of others. As children age, however, they develop shared intentionality, learn to communicate with people in linguistic discourse, and gain awareness that others may have different beliefs than they do about particular situations. Tomasello suggests that these abilities collectively underlie the observed

differences between how higher primates distinguish, or fail to distinguish, true from false beliefs.

Future Goals

Tomasello (20–22) further elucidates humanity's uniqueness in a trilogy of books addressing human thinking, morality, and ontogeny. In the third work, now in press and scheduled for publication in the fall of 2018, Tomasello uses his decades of experimental studies on nonhuman primates and children to identify eight pathways that differentiate *Homo sapiens* from great apes: social cognition, communication, cultural learning, cooperative thinking, collaboration, prosociality, social norms, and moral identity. He also notes how humans undergo key maturation steps at

around the ages of 9 months, 3 years, and 6–7 years, with the latter children becoming responsible for self-regulating their beliefs and actions so that they comport with the cultural norms of the group.

For his career achievements, Tomasello has received numerous honors, including the Royal Netherlands Academy of Arts and Sciences' Heineken Prize for Cognitive Science (2010), the British Academy's Wiley Prize in Psychology (2011), and the American Psychological Association's Distinguished Scientific Contribution Award (2015).

Tomasello says, "I'm presently settling into Duke, starting a small lab here, teaching, and pondering my next chapters."

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