BECOMING HUMAN

A THEORY *of* ONTOGENY

MICHAEL TOMASELLO

Becoming Human

Becoming Human

A THEORY OF ONTOGENY

Michael Tomasello

The Belknap Press of
Harvard University Press
Cambridge, Massachusetts
London, England
2019

Copyright © 2019 by the President and Fellows of Harvard College
All rights reserved
Printed in the United States of America
First printing

Art: *Yellow Journey* (oil on canvas) © Charlie Millar, courtesy of Bridgeman Fine Art
Design: Tim Jones

9780674988637 (EPUB)
9780674988644 (MOBI)
9780674988651 (PDF)

The Library of Congress has cataloged the printed edition as follows:
Names: Tomasello, Michael, author.
Title: Becoming human : a theory of ontogeny / Michael Tomasello.
Description: Cambridge, Massachusetts : The Belknap Press of Harvard University Press, 2019. | Includes bibliographical references and index.
Identifiers: LCCN 2018014212 | ISBN 9780674980853 (hardcover : alk. paper)
Subjects: LCSH: Developmental psychology. | Ontogeny. | Socialization. | Evolutionary psychology. | Behavior evolution.
Classification: LCC BF713 .T655 2019 | DDC 155—dc23
LC record available at https://lccn.loc.gov/2018014212

For the Leipzig Team

Contents

Preface

In this book I propose a theoretical framework for organizing and explaining the research that my colleagues and I did from 1998 to 2017 in the Department of Developmental and Comparative Psychology of the Max Planck Institute of Evolutionary Anthropology in Leipzig, Germany. It is presented as a more or less coherent story, but the story line was not there from the beginning. It emerged only through the work. The theoretical framework owes much to my colleagues, although, needless to say, they do not all agree with all of it.

My main acknowledgment is thus to the Leipzig team as a whole for their exceptional work and dedication to the scientific enterprise. Many of their studies are cited here. Of my numerous colleagues over the years, I would like to single out my senior partners who were there for the duration. Elena Lieven was my one age-mate throughout, serving as a constant reminder that nothing says human uniqueness like language (and often serving as my social conscience as well). Josep Call *was* the ape house, from designing its testing rooms to designing brilliant experiments, and the ape work simply could not have been done without him. Malinda Carpenter was my main partner in crime when we first began thinking at our almost daily lunches for several years about human uniqueness in terms of shared intentionality (although we still disagree about some points). Crucial to the enterprise as well were Katharina Haberl, who created and supervised our incomparable child laboratory, and Henriette Zeidler, who was the organizational hub through whom, and because of whom, everything worked.

I also would like to express my deepest gratitude to the Max Planck Society, without doubt the best scientific organization in the world, and to my colleagues in the other four departments of the Max Planck Institute for Evolutionary Anthropology, without doubt the best institute of its kind in the world. The working atmosphere for those nineteen years was, in a word, inspirational. It was a privilege to work in the society and at the institute.

In terms of this book in particular, I would like to thank first and foremost my wife, Rita Svetlova, for providing numerous helpful comments on many ideas and phrasings in various parts of the book. In addition, I thank Jan Engelmann, who read the entire manuscript and gave helpful feedback, particularly on the second chapter. And finally, I thank Andrew Kinney at Harvard University Press as well as HUP's three anonymous reviewers for helpful feedback on the penultimate draft.

> Note that many of the studies cited in this book have videos of the children or the apes performing in (usually) one condition in the task. They can be viewed by scientists and educators (for scientific and educational purposes) at:
>
> http://www.becoming-human.org/
> Username: developmental
> Password: psychology

Becoming Human

I

Background

> It is the epigenetic rules, the hereditary regularities of mental development, that . . . connect the genes to culture. . . . The search for human nature can be viewed as the archaeology of the epigenetic rules.
>
> E. O. Wilson, *Consilience* (1998)

~ 1 ~

In Search of Human Uniqueness

In his 1871 book *The Descent of Man* Charles Darwin proposed, in effect, that humans were just another branch on the evolutionary tree. Victorian Englanders, many with significant scientific training, were incredulous. Humans' closest living relatives, the great apes, still lived in forests and jungles "red in tooth and claw," but humans lived in a world of telescopes and steam engines, symphony orchestras and the British Parliament, and morning prayer followed by afternoon tea. It was a puzzle, to say the least, how just another branch on the evolutionary tree could live a life so utterly different from that of other animals.

Today this puzzle is essentially solved. At some point in human history a new evolutionary process arose. A telltale sign of this new process is that not all humans live amid telescopes, symphony orchestras, and the British Parliament but instead live among their own distinctive artifacts, symbols, and institutions. And because children, whatever their genetics, adopt the particular artifacts, symbols, and institutions into which they are born, it is clear that this societal variation cannot be coming from the genes but rather is socially created. The full puzzle is thus that humans are not only a species of unprecedented cognitive and social achievements but also, at the same time, one that displays a novel kind of socially created, group-level diversity.

The solution to the puzzle—the new evolutionary process—is of course human culture. But the traditional notion of culture as something apart from biology and evolution will not do. Human culture is the form of social organization that arose in the human lineage in response to specific adaptive challenges. Its most distinctive characteristic is its high degree (and new forms) of cooperation. Synchronically, the members of a cultural group coordinate with one another in the context of self-created cooperative structures such as conventions (including linguistic conventions), norms, and institutions, and they relate to one another based on cooperative motives such as trust, commitment, and fairness. Call this the coordinative dimension of culture. Diachronically, the members of a cultural group pass along skills and knowledge to succeeding generations via cooperative processes of cultural learning, such as active instruction and conformist learning, resulting in a kind of "ratchet effect" in which cultural practices and products (including conventions, norms, and institutions) evolve, perhaps "improve," over historical time. Call this the transmitive dimension of culture. The outcome is that virtually all of humans' most remarkable achievements—from steam engines to higher mathematics—are based on the unique ways in which individuals are able to coordinate with one another cooperatively, both in the moment and over cultural-historical time.

But this explanation of human uniqueness in terms of cultural processes creates another puzzle, and this one is not yet solved. In this case the focus is not on the level of the species and its achievements, but rather on the level of the individual and its psychology: how do human individuals come to the species-unique cognitive and social abilities necessary for participating in cultural coordination and transmission? To answer this question the obvious first step is to establish exactly how human psychology differs from that of other primates—precisely how humans as individuals are unique. The difficulty is that over the past few decades empirical research has established that humans' nearest living relatives, the great apes, possess cognitive and social skills highly similar to those of humans, including many that are seemingly relevant to cultural processes. For example, there is recent research demonstrating that at least some great apes (1) make and use tools, (2) communicate intentionally (or even "linguistically"), (3) have a kind of "theory of mind," (4) acquire some behaviors via social learning (leading to "culture"), (5) hunt together in groups, (6) have "friends" with whom they preferentially groom and form alliances, (7) actively help others, and (8) evaluate and reciprocate one another's social actions.

But do apes do these things in the same way as humans? To make this determination in particular cases we must look beneath the sweeping claims that both apes and humans "have *x*" or "do *y*," even though such claims may be true on a general level. To penetrate beneath such generalities, we need to make more fine-grained comparisons by performing comparative experiments in which humans and great apes (especially chimpanzees and bonobos, as humans' nearest living relatives) are observed in as-similar-as-possible circumstances. Such controlled experimental comparisons make it possible to detect subtle differences of behavior and, ideally, the cognitive and motivational processes underlying them. In this way we seek to identify the differences on the individual psychological level that ultimately lead to humans' unique forms of cultural coordination and transmission (and so to telescopes and parliaments).

Given a description of the key differences between humans and their nearest great ape relatives, the next task is to explain those differences. In an evolutionary framework, the axiomatic explanation is, of course, natural selection: the human individuals alive today have been naturally selected to meet certain species-unique ecological or socioecological challenges. For example, one proposal is that humans evolved many of their unique cognitive and social capacities in response to ecological challenges that first forced them to collaborate with one another in acquiring food, and then later prompted them to form larger cultural groups to defend their resources from other groups (Tomasello 2014, 2016). Under these conditions, individuals who could best cooperate with others—individuals who were both capable and motivated to put their heads together with others to collaborate or form a culture—were at an adaptive advantage and so proliferated.

But natural selection creates nothing. Natural selection is only a sieve that sorts, after the fact, viable from nonviable organisms. Evolutionary novelties originate not from natural selection but rather from the other main dimension of the evolutionary process: inherited variation. Classically, inherited variation in evolution emanates from genetic mutation or recombination, which produce, via ontogenetic processes, novel traits. But recent advances in evolutionary developmental biology (so-called Evo-Devo) suggest that the constructive role of these ontogenetic processes has not been fully recognized. Not only do new traits always come into existence via ontogenetic processes—which direct and constrain genetic expression—but by far the most frequent source of new traits is changes in the timing and manner in which already existing genes are expressed and transact with the environment. Thus, even relatively modest changes in the way that regulatory genes orchestrate ontogenetic timing and plasticity can have enormous and cascading phenotypic effects—not encoded directly in the genes—as developing systems interact with one another and with the environment in unexpected ways. The implication is that if we wish to explain how uniquely human psychology is created, we must focus our attention on ontogeny, and especially on how great ape ontogeny in general has been transformed into human ontogeny in particular.

And that is my goal here. I wish to describe and explain the ontogeny of uniquely human psychology, using as a starting point great ape ontogeny. Great apes engage in basic processes of perception, memory, and categorization, as well as more complex processes of intentional communication, prosocial behavior, and social learning. From this starting point, we may then attempt to identify the unique aspects of human psychology as they emerge ontogenetically over the first years of life. A natural end point for this investigation is children of six to seven years of age. In the eyes of many cultural institutions and traditions, across many centuries and societies, children's sixth or seventh birthday heralds their entry into the "age of reason." In British common law, this is the first age at which a child may commit a crime. In the Catholic Church, this is the age at which a child may first take communion. In cultures requiring formal education, this is the age at which a child is ready for serious instruction in literacy and numeracy. And in traditional societies, this is the age at which a child is first given important independent tasks such as tending a flock, gathering firewood, or delivering a message (Rogoff et al. 1975). Overall, children of this age have become, from a cognitive point of view, mostly *reasonable*—beings with whom one may reason, and expect a reasonable response in return—and they have become, from a social point of view, mostly *responsible*—beings whom one may hold accountable, and expect to hold themselves accountable, for their beliefs and actions. The result is nascent "persons," who have taken a giant first step toward internalizing the culture's norms of rationality and morality, making them for the first time capable of and indeed responsible for normatively self-regulating their own beliefs and actions.

Our working hypothesis to explain the ontogeny of uniquely human psychology is Vygotskian: uniquely human forms of cognition and sociality emerge in human ontogeny through, and only through, species-unique forms of sociocultural activity. But the theory we develop updates and modifies Vygotsky—it is *Neo*-Vygotskian—in placing human sociocultural activity within the framework of modern evolutionary theory. This means that we begin by seeking to identify the ways in which humans are biologically prepared for engaging in their unique forms of sociocultural activity; indeed, we may argue that it is precisely this biological preparation—in the form of maturationally expressed capacities—that makes uniquely human sociocultural activities and experiences possible in the first place. This does not contradict Vygotsky's argument for the key role of sociocultural context in human psychological development. Modern evolutionary theory emphasizes that organisms inherit their environments as much as they inherit their genes: a fish inherits not only fins but also water. Human children inherit a sociocultural context replete with cultural artifacts, symbols, and institutions, and their unique maturational capacities would be inert without a sociocultural context within which to develop (Richerson and Boyd 2005). Normal human ontogeny thus requires *both* the maturation of species-unique cognitive and social capacities and also individual experience in such things as collaborative and communicative interactions with others, structured by cultural artifacts such as linguistic conventions and social norms.

The account of human evolution on which we rely is that of Tomasello et al. (2012; see also Tomasello 2014, 2016), which focused on the evolution of human cooperation and how it enables species-unique processes of cultural coordination and transmission. For precision, the account borrows theoretical tools from philosophical accounts of shared intentionality (Bratman 1992, 2014; Searle 1995, 2010; Gilbert 1989, 2014). In this view, humans' abilities to cooperate with one another take unique forms because individuals are able to create with one another a shared agent "we," operating with shared intentions, shared knowledge, and shared sociomoral values. The claim is that these abilities emerged first in human evolution between collaborative partners operating dyadically in acts of joint intentionality, and then later among individuals as members of a cultural group in acts of collective intentionality. In contrast to Vygotsky's almost exclusive focus on the transmitive dimension of culture—how the culture's practices with symbols and other artifacts are passed along across generations and thereby restructure human psychological functioning—we focus more on the coordinative dimension of culture: how humans, including children, collaborate and communicate in the moment (how they *co*-operate) as they engage with others in sociocultural activities. Indeed, the argument will be that it is the coordinative dimension of uniquely human cognition and sociality—including its motivational aspects and the new social relationships that these engender—that makes possible the cooperative cultural practices of teaching and conformist learning, which play the key roles in uniquely human cultural transmission.

In the context of this evolutionary account, our ontogenetic account invokes three sets of processes that together construct particular developmental pathways. The first are processes of maturation as more or less direct reflections of humans' evolutionary history. Our specific proposal is that the ontogeny of human cognitive and social uniqueness is structured by the maturation of children's capacities for shared intentionality. Mirroring the phylogenetic sequence, this maturational process unfolds in two basic steps: first is the emergence of joint intentionality at around nine months of age, and second is the emergence of collective intentionality at around three years of age. These two transitions affect children's cognitive and social psychology across the board, albeit with different particulars for different developmental pathways.

The second set of processes is children's individual experiences, especially their sociocultural experiences. Uniquely human cognitive and social ontogeny depends crucially on transactions between the individual and a rich cultural ecology, which is both necessary for normal human development and also responsible for many cultural and individual variations. (A child maturing by itself on a desert island would not end up in adulthood as anything vaguely resembling a culturally competent "person.") Once again, age three is a crucial transition point. For most of human evolutionary history, this is the age of weaning, when children start taking their first independent baby steps into the wider world. It is thus at this age that they begin having independent and meaningful interactions with peers, inaugurating what some scholars have dubbed "the two social worlds of childhood": (1) interactions with knowledgeable and authoritative adults, who provide key experiences relevant to the transmitive dimension of culture; and (2) interactions with coequal peers, who constitute especially challenging partners for social and mental coordination in collaboration and communication, thus providing key experiences relevant to the coordinative dimension of culture. The claim is thus that children before the age of three are mainly adapted for eliciting care and attention from adults, whereas after age three they are prepared for both culturally learning from adult pedagogy as such and developing new skills through coordinative interactions with peers.

The third set of processes are humans' various forms of executive self-regulation. The proposal, following Vygotsky (1930 / 1978), is that many aspects of human cognitive and social uniqueness result from the special ways in which children attempt to executively self-regulate their thoughts and actions not just individually, as do many primates, but also socially through their constant monitoring of the perspectives and evaluations of social partners on the self. Again age three is key. Before age three, children's executive regulation is mostly individual, as other primates', although it often works on uniquely human cognitive and social content. After age three, children begin to socially self-monitor their communicative attempts to see if they are comprehensible and rational to others, and they begin to socially self-monitor the impression they are making on others so as to maintain their cooperative identity in the group. In addition, from age three children also *collaboratively* self-regulate their cooperative interactions with others. Thus, they make joint commitments with others in which "we" make sure that "you" and "I" each behave ourselves, as well as (implicit) collective commitments to the group's social norms to which "we" make sure that both self and others conform. By engaging in such social and cultural self-regulation from three to six years of age, young children come to create the many and various kinds of self-reflective, normatively structured, and reason-based forms of thought and action that make them for the first time reasonable and responsible persons.

My attempt in what follows is to use this neo-Vygotskian framework to explain the origin and development of children's species-unique forms of psychological functioning during the first six years of life. I do this separately for each of the eight ontogenetic pathways—four cognitive and four sociomoral—that most clearly distinguish humans from their nearest great ape relatives (as determined by comparative experiments). The overall aim is thus a complete and coherent account of the process of becoming human—uniquely human.

2

Evolutionary Foundations

The most basic cognitive and social processes that can be observed in developing children today all have evolutionary histories. Understanding these histories is important because it tells us what these psychological processes are, in the sense of what they are "designed" to do (Tooby and Cosmides 2005).*

In general, great apes have evolved cognitive and social skills for doing such individual things as foraging for food and competing with groupmates for dominance status. Humans in addition have evolved a suite of species-unique cognitive and social skills for coordinating with others in various novel forms of cooperative interaction. These uniquely human adaptations for cooperation evolved in two key steps (Tomasello et al. 2012). The first step comprised adaptations enabling early human individuals to cooperate with one another dyadically in obligate collaborative foraging (with partner choice); these are the skills and motivations of joint intentionality. The second step comprised adaptations enabling modern human individuals to cooperate with one another in the larger collaborative enterprise known as culture; these are the skills and motivations of collective intentionality. These two steps constitute the evolutionary foundations of uniquely human cognitive and social ontogeny.

The emergence of early humans' collaborative and cultural ways of life also instigated important changes in the general course and context

* "If creatures from outer space came across a complex human artifact such as a traffic light, idling, they could dissect it and analyze its structure forever and not understand why it behaves in the way that it does. The wires and lights by themselves could never reveal (not even with the help of an fMRI) why the red light on one side activates only when the green light on the other side activates. To understand these actions we must first understand traffic, and how the traffic light was designed to solve the specific problems created by traffic" (Tomasello 2014, 151).

of human ontogeny. Of special importance, as humans became ever more cooperative they began investing more time and resources into the development of their children, and this effort included adults other than the mother (in the so-called cooperative breeding pattern). Adults provisioning children with food and information well into adolescence slowed down ontogeny, freeing up time and resources that enabled children to appropriate more efficiently the massive amounts of cultural information required to become proficient in the ways of the group.

In this chapter, then, we set the stage for the specific ontogenetic analyses in the main body of the book. We do this, first, by explicating the evolutionary foundations of uniquely human psychology, and, second, by specifying how this uniquely human psychology led to several novel features of human ontogeny as a whole. We conclude with some methodological considerations that, in the chapters that follow, will structure how we go about describing and explaining uniquely human ontogenetic pathways.

Human Evolution

Our story begins with humans' last common ancestor (LCA) with other apes, about 6 million years ago. By all accounts this LCA was much more similar to contemporary chimpanzees and bonobos than to contemporary humans, so we use modern-day chimpanzees and bonobos as models for its psychology. From there we posit two new "environments of evolutionary adaptedness" that selected for humans' ultra-cooperativeness: one focused on face-to-face collaboration in early humans from around 400,000 years ago, and the other focused on culture in modern humans from around 100,000 years ago. Contemporary human psychological ontogeny comprises adaptations shared with the LCA as well as uniquely human adaptations grounded in these two subsequent evolutionary periods.

Great Ape Individual Intentionality

Obviously, we have no direct evidence for the nature of the LCA's psychology. But we know quite a bit about the psychology of chimpanzees and bonobos, as models. Because our goals here are general, our account of their cognition and sociality is general as well. For more detailed accounts with fuller citations of the relevant research, see Tomasello and Call (1997), Call and Tomasello (2008), and Tomasello (2014, 2016). In addition, in the eight chapters that follow this one we discuss in detail many studies in which chimpanzees and / or bonobos are directly compared with human children.

Cognition Chimpanzees and bonobos spend the better part of their day foraging for food. In this context, they have evolved cognitive skills for understanding the workings of the physical world (Tomasello and Call 1997). They understand (1) space, for finding food; (2) object categories, for identifying food; and (3) quantities, for maximizing food intake. In other words, chimpanzees and bonobos possess the same "core knowledge" of the physical world that human infants begin to display early in ontogeny (Spelke 2009). In addition, in procuring and extracting food—especially when tools are involved—these apes make causal inferences in ways that can only be called thinking. For example, if an ape sees a cognitive problem in one location, then goes to a different location to examine a row of tools, she can, just by looking, choose the tool that fits the problem's causal structure (though the problem is out of sight at the moment). The ape can do this because she has the ability to cognitively represent the problem and mentally simulate using the available tools within that represented problem. In all, based on studies of modern-day great apes, we may say that the LCA had very sophisticated skills of cognition and thinking about the physical world.

A somewhat similar story may be told about social cognition. Great apes, and therefore the LCA, possess and possessed an understanding of others as intentional agents. It is likely that apes' understanding of intentional agency also evolved in the context of foraging—that is, competitive foraging—because identifying others' goals and perceptions is crucial for predicting their behavior when in competition with them. For example, if a subordinate chimpanzee sees two pieces of food and sees a dominant chimpanzee looking in the direction of one of them, she will then choose to pursue the piece that the dominant cannot see. She does this based on an understanding that the dominant has the goal of food and that he can pursue that goal only if he can perceive it. Thus, based on studies with great apes we may hypothesize that the LCA had an understanding of others as intentional agents (another piece of core knowledge) and that they used this understanding in mental simulations to predict what others would do in various novel competitive situations. Based on other studies with apes, we may infer that the LCA's skills of communication and social learning were likewise sophisticated because they too were underlain by the basic social-cognitive skill of understanding others as intentional agents.

Overall, in comparing the cognitive skills of chimpanzees and bonobos to those of human children, I have characterized our nearest great ape relatives as operating with skills of individual intentionality (Tomasello 2014). They possess complex skills of cognition and social cognition for understanding, predicting, and manipulating their physical and social worlds. What they do not possess is humanlike skills of shared intentionality, such as the ability to participate in the thinking of others through joint attention, conventional communication, and pedagogy. Chimpanzees and bonobos—and thus the LCA—are and were very clever, but mainly or only as individuals.

Sociality Like most primates, the LCA had more or less long-lasting social relationships with selected groupmates. In addition to kinship, their relationships were based mainly on (1) competition and dominance, and (2) cooperation and "friendship." Like many mammals, they combined these two types of relationships as they cooperated with a partner to fight for dominance with a competitor. To cultivate good partners for these conflicts, they did various things to make friends (such as grooming and sharing food). They also helped one another do such things as retrieving an object or obtaining food when they themselves were not competing for it. In general, the LCAs very likely had a special sympathy for kin and friends—especially those who supported them in competitive interactions—and thus cooperated with them in various ways. Their cooperation was grounded in competition.

The one apparent exception is no exception at all. Chimpanzees (and perhaps bonobos) hunt in small groups for monkeys and other small mammals, and so presumably did the LCA. In terms of coordination, in some cases the hunt resembles a kind of helter-skelter chase; but in other cases individuals surround a small prey in order to capture it. Based on experimental studies, we may infer that it is a kind of individualistic coordination in that each hunter is attempting to capture the monkey for itself (because the captor gets the most meat) and they take account of the actions and intentions of others in order to do so. The participants are not working together so much as they are using one another as "social tools" to maximize their own gains. This is also evident in the fact that the captor will steal away with the carcass whenever he can. But typically he cannot, so all the participants (and many bystanders) get at least some of the meat by begging and harassing the captor. We may thus infer that the LCA had some basic skills of collaboration, but these did not include working together toward a shared goal or voluntarily sharing the spoils at the end.

Overall, as paradoxical as it may sound, our best guess is that LCA individuals had rich social lives with long-lasting relationships, but—as compared with humans—their sociality was still somewhat individualistic. When hunting, they could not put their heads together with others to form the shared goal of working together, and they had no tendency to share resources fairly among all relevant parties. Chimpanzees and bonobos, and so the LCA, are and were very social, but only in a kind of instrumental way.

Executive Regulation In both the physical and social domains, individuals of the LCA also likely had the ability to self-monitor their own actions and thinking. Thus, based on studies with great apes, we may infer that they could make decisions based on an assessment of what they did and did not know; for example, if they were uncertain about the location of something (or whether they could win a fight), they could opt out and pursue another goal rather than risk high-cost failure. This suggests that when they were thinking about a problem they in some sense knew what they were doing.

Furthermore, one large-scale study of chimpanzees (and orangutans) suggested that if the occasion called for it the LCA could self-regulate its behavior in various adaptive ways. For example, it could (1) delay in taking a smaller reward now so as to get a larger reward later, (2) inhibit a previously successful response in favor of a new one demanded by a changed situation, and (3) make itself do something unpleasant for a desired reward at the end (Herrmann et al. 2015). In short, LCAs had a variety of skills of cognitive self-monitoring and motivational self-regulation. What they did not do, that even human children do, is to monitor their actions and thinking based on the perspectives and evaluations of others in their social group.

Early Human Collaboration and Joint Intentionality

Humans diverged from other great apes around 6 million years ago. For the next 4 million years they were basically bipedal apes with ape-sized brains. Then, around 2 million years ago, there emerged the genus *Homo,* with larger brains and new skills in making stone tools. Soon after, a global cooling and drying period led to a radiation of terrestrial monkeys (for example, baboons), who outcompeted *Homo* for many resources. New options were needed. A transitional option was scavenging carcasses killed by other animals, but then some early humans (the best guess is *Homo heidelbergensis* some 400,000 years ago) began obtaining the majority of their food through more active collaboration; indeed, the collaboration became obligate. This meant that individuals were interdependent with one another in much more urgent ways than before.

An essential part of the process of obligate collaborative foraging was partner choice. Individuals who were cognitively or otherwise incompetent at collaboration—for example, those incapable of forming a joint goal with others—were not chosen repeatedly as partners, and this meant no food. Likewise, individuals who were socially or morally uncooperative in their collaborative interactions with others—for example, those who tried to hog all the spoils—were also avoided as regular partners and so were doomed. The upshot was that there was strong and active social selection (West-Eberhard 1979) for cooperatively competent and motivated individuals.

The radically new psychological process that emerged at this time was what we may call joint intentionality based on joint agency. A joint agent comprises two individuals who have a joint goal, structured by joint attention, each of whom has at the same time her own individual role and perspective. This may be called the dual-level structure: simultaneous sharedness and individuality. The partners in joint agency relate to one another dyadically, second-personally, in face-to-face interaction; over time they create with one another shared experiences, the common ground on which their collaborative efforts may rely. The creation of a joint agent—while each partner maintains her own individual role and perspective at the same time—created a completely new human psychology, spawning new forms of both cognition and sociality.

Cognition It is possible to characterize what happened with these early humans as just the emergence of some new skills, and that is certainly true. But these were not just any skills. These were skills that created a new kind of agent, one in which two distinct individuals, in a sense, perceived and understood the world together while still not losing their own individual perspectives. This created for early humans what we may call perspectival cognitive representations. Whereas great apes could abstract common features across exemplars and form an abstract representation of a set of entities, early humans could not only do this but also see the same entity from different perspectives, under different descriptions (for example, as stick and as tool), both at the same time. This form of cognitive representation is responsible for much of the remarkable flexibility and power of human conceptual activity.

A joint intentional activity constituted a shared conceptual world, encompassing the partners' distinct perspectives, and it created the pragmatic infrastructure upon which early humans' new skills of cooperative communication could be built (Tomasello 2008). These skills were initially manifest in the new and uniquely human gestures of pointing and pantomiming, used by partners to coordinate their individual roles and perspectives toward a collaborative end. These gestures relied on some new forms of cognitive inferencing. Thus, for example, one individual might point for another to a dead branch in a tree. With no common ground, such a gesture would be meaningless. But if they were hunting together for antelope, and from previous experience together they had common ground in knowing that the recipient needed a spear but had broken his yesterday (and that this dead branch was of the appropriate size and structure), then the simple pointing gesture might communicate something like "There's a potential new spear for you." It would communicate this, that is, if the recipient could engage in an evolutionarily new form of inference: a socially recursive inference. Specifically, following the pointing gesture to the stick, the recipient had to ask himself why the communicator *intended* that he *attend* to that stick (whereupon his consultation of their common ground would provide the answer). Being able to recursively embed one intentional or mental state (*attend*) inside another (*intend*) was another new ability with enormous cognitive consequences.

Early humans' new skills of cooperative communication thus enabled not only new forms of social coordination but also new forms of thinking, especially the ability to coordinate different perspectives in various ways, including recursively with a partner. Socially recursive inferences—in which the individual conceptually embeds one intentional or mental state within another—enable individuals in addition to reflect on their own mental states: to think about their own thinking. The cognitive outcome of early humans' adaptations for obligate collaborative foraging was skills of joint intentionality: skills for putting one's head together with a partner to form a joint goal with joint attention, creating the possibility of thinking about things in terms of perspectival cognitive representations and socially recursive inferences.

Sociality Early human individuals who were socially selected for collaborative foraging related to others in some new ways. Most important, they had strong cooperative motives, both to work together with others toward cooperative goals and to feel sympathy for and to help others who were, or might be, their partners. If an individual depended on a partner for foraging success, then it made good evolutionary sense to help him whenever necessary to make sure he was in good shape for future outings.

Moreover, early human individuals who were socially selected for collaborative foraging also developed a new kind of cooperative rationality that led them to treat others as equally deserving partners—that is, not just with a sense of sympathy but also with a sense of fairness. Partners understood that either of them could, in principle, play either role in a collaboration and that both of them were necessary for joint success. Moreover, as two individuals collaborated repeatedly with one another in a particular foraging context, they developed a common-ground understanding of the way that each role needed to be played for joint success, what we may call role-specific ideals (for example, in hunting antelopes the chaser must do *x*, and the spearer must do *y*). These ideals were impartial in the sense that they specified what either of us must do to fulfill the role "properly," in a way that ensured our joint success. All of these things together led to a collaborative attitude: because we both are needed for success, and we are interchangeable in our roles (each of which have mutually known and impartial standards of performance), we are equally deserving of the spoils. This is in contrast to cheats or free riders, who are not deserving of the spoils.

In choosing a partner for a collaborative effort, early human individuals wanted to choose someone who would live up to role-specific ideals and who would divide the spoils fairly. To reduce the risk inherent in partner choice, individuals who were about to become partners could use their newfound skills of cooperative communication to make a joint commitment, pledging to one another to live up to their role ideals, including a fair division of the spoils. As part of this joint commitment, the would-be partners also could pledge, implicitly, that whichever of them might renege on the commitment would be deserving of censure; so the deviant, if she wanted to stay in good cooperative standing, would actually join with the partner in condemning herself (internalized into a sense of guilt), in a kind of we > me morality.

Thus, the social outcome of early humans' adaptations for obligate collaborative foraging was a second-personal morality: the tendency to relate to others, face to face, with a heightened sense of sympathy for (potential) partners and a sense of fairness based on a genuine assessment of both self and other as equally deserving partners in the collaborative enterprise (self–other equivalence).

Executive Regulation Based on studies comparing apes and human children, we may infer that early humans not only engaged in individual self-regulation (as did the LCA), but also a kind of social self-regulation. Cognitively they were able to executively regulate their own thinking by anticipating how others would understand and evaluate this thinking—typically as it was expressed in some overt act of cooperative communication. This constitutes a kind of social self-monitoring of their individual thinking (to later become self-regulation via norms of rationality). Socially, especially in the context of partner choice, they could simulate how others were evaluating their cooperativeness, and they cared about this enormously (to become, later and in combination with their we > me morality, self-regulation via norms of morality).

Modern Human Culture and Collective Intentionality

The small-scale collaborative foraging characteristic of early humans was eventually destabilized by two demographic factors that ushered in modern humans (*Homo sapiens sapiens*) some 150,000 years ago. First was competition with other human groups. Competition with other groups meant that a loosely structured population of collaborators had to turn into a more tightly knit social group to protect its way of life from invaders. The result was the sense that our entire social group was one big collaborative activity aimed at group success. Second was increasing population size. As human populations grew, they tended to split into smaller groups, leading to so-called tribal organization in which a number of different social groups were still a single super-group or "culture." This meant that recognizing others from one's cultural group became essential; in the context of sometimes hostile group competition, one also needed to be recognized by others in one's group oneself. Such recognition in both directions was important because only members of one's cultural group could be counted on to share one's skills and values and so be good and trustworthy collaborative partners, including for group defense. The dependence of individuals on the group thus led to a sense of group identity and loyalty, and a failure to display this group identity and loyalty could be lethal.

Contemporary humans have many diverse ways of marking group identity, but the original ways were mainly behavioral: people who talk like me, prepare food like me, and otherwise share my cultural practices are likely members of my cultural group. And so emerged modern humans' tendency toward active conformity to the group and its conventional cultural practices. Teaching one's children to do things in the conventional way thus became mandatory for their survival. Teaching and conformity generated cumulative cultural evolution characterized by the "ratchet effect"—and thus cultural organization in the form of the group's specific set of conventions, norms, and institutions. Individuals were born into these supraindividual social structures and had no choice but to conform to them. The key characteristic of individuals adapted for cultural life was thus a kind of group-mindedness, both in taking the perspective of the group cognitively and in caring about the group's welfare.

Cognition The cognitive skills needed for functioning in a cultural group were not just skills of joint intentionality but skills of collective intentionality. Individuals had not just personal common ground with other individuals but also cultural common ground—even with individuals they had never before met—because they knew together that they had all had many of the same experiences as a result of growing up in the same cultural group. The individual also had to take the perspective of the group in many situations, especially with respect to the culture's conventions, norms, and institutions. There were right and wrong ways to perform the roles in them: this is the way we do things. This new kind of perspective was thus a kind of "objective" perspective, independent of any individual. Institutions further fortified this sense of objectivity because essential parts of the cultural world were institutional realities such as chiefs, marriages, and shells-as-money, which were in actuality regular people and things that attained a new status—with new deontic powers—because and only because everyone recognized in their cultural common ground that they did in fact have this status.

In many ways the most important conventions in a cultural group are its linguistic conventions used to coordinate social activities. In addition, language is key to the way that humans think in many different ways, perhaps especially in the way that it conventionalizes perspectives (for example, *dog* versus *pet*) and enables individuals to jointly attend to one another's ideas as they exchange them via their shared linguistic conventions. Language additionally contributes to the sense of an objective perspective on things, as it enables one to express generic propositions about the world in general. Thus, to teach their children, modern human individuals began using generic forms of language in which it is not just that a particular leopard is dangerous, but "Leopards are dangerous" represents an objective fact about the world. The teacher is not communicating her personal opinion to the child but rather representing the culture's objective view of things.

Moreover, modern humans used their linguistic skills to argue with one another cooperatively about some belief or action. In doing so, they provided reasons for why others should agree with them (for example, we should go this way, not that way, because there are antelope tracks down this path, not that path). The individuals who could participate meaningfully in this process were those who behaved cooperatively by subordinating themselves to "good" reasons: my personal preference does not matter, but I will agree and go along with whatever decision is supported by the most and best reasons, using criteria on which we all agree. By engaging in this process individuals' thinking became organized in a much wider and more reason-based "web of beliefs," structured by the group's normative standards of rationality.

Sociality Living in a modern human cultural group meant, above everything else, conforming. One had to conform to coordinate with others in conventional cultural practices, to advertise one's identity with the cultural group's way of doing things, and to be in line with the group's social norms. Some social norms were only about conformity and group identity, but others touched on humans' senses of sympathy and fairness (inherited from early humans), and these became moral norms. And so just as conventional norms codified the right and wrong way of doing things in instrumental activities, moral norms codified the right and wrong way of treating other people morally. Because the collective intentionality and cultural common ground of modern humans created a kind of "objective" perspective on things, modern human morality came to be characterized as objective right and wrong.

Of course one could act against moral norms. But when called to task by other group members, the options were limited: one could ignore their criticism and censure, and so place oneself outside the norms and values shared by the cultural group (perhaps leading to exclusion from the group), or one could accept it as legitimate and deserved. And indeed modern humans did think of the cultural norms into which they were born as a legitimate means by which "we" regulate "us," and it was part of their group identity to think in this way. This meant that when one deviated from the group's social norms, it was important to justify this deviation to others in terms of the shared values of the group (for example, I neglected my duties because I needed to save a child in trouble). In this way, modern humans internalized not only moral actions but moral justifications, and so created a reason-based moral identity within the moral community.

Executive Regulation And so modern humans self-regulated their thoughts and actions not just based on what they imagined other individuals to be thinking about them, as did early humans, but also based on the normative standards of the group. They began self-regulating their thoughts via the group's publicly accepted norms of rationality, and their actions via the group's publicly accepted norms of morality: they observed not just social self-regulation but normative self-governance. They asked themselves, What ought I to think? And what ought I to do?

Summary and Implications for Ontogeny

Figure 2.1 presents a schematic summary of the three steps in human evolution just explicated. Our ontogenetic hypothesis is that these three sets of adaptations—great ape individual intentionality, early human joint intentionality, and modern human collective intentionality—form the maturational bases for human psychological development, the latter two accounting for its species-unique aspects. Our working hypothesis is that the skills and motivations of joint intentionality (for example, joint attention

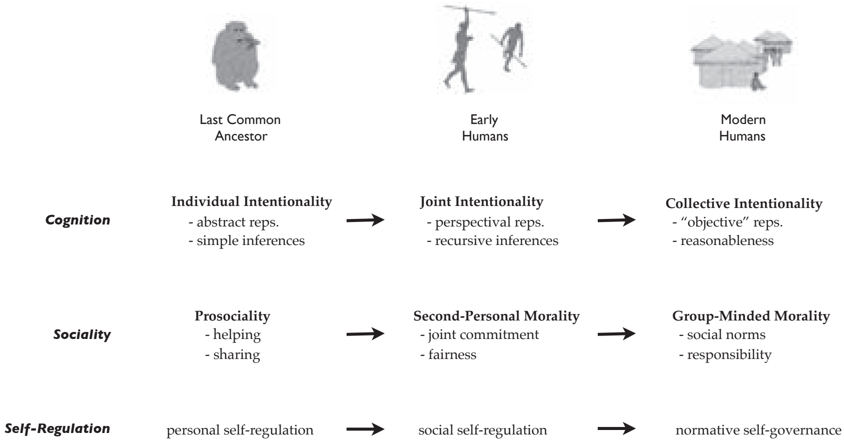

Figure 2.1 General summary of the evolutionary roots of uniquely human cognition and sociality. Abbreviation: reps. = cognitive representations.

and dual-level collaboration) first emerge at around nine months of age. Then, after additional maturation and experience, the skills and motivations of collective intentionality (such as an understanding of conventions and an impartial sense of fairness) begin to emerge at around three years of age. We expect to see something like this developmental sequence in each of the ontogenetic pathways we examine.

Human Ontogeny

Ontogeny constructs individuals. It does this by constructing a complex and interrelated set of ontogenetic pathways. Indeed, in modern evolutionary developmental biology (Evo-Devo), the target of natural selection is not adult "traits," as in classical accounts, but rather ontogenetic pathways. That is, there is natural selection not just for adult end points but also for the construction process that brings them into existence (Gould 1977; West-Eberhard 2003). Over evolutionary time, an ontogenetic pathway may change in content (for example, the presence or absence of some psychological competency), in timing (when the competency first emerges and how long it takes to develop), and in plasticity (the degree to which the competency is open or closed to environmental influences). The result is that different species, living in different ecological conditions, evolve different patterns of ontogenetic construction (that is, life history strategies).

Most species have at least some so-called ontogenetic adaptations—everything from tadpole fins to human infants' rooting reflex during nursing—that are adaptive only at a particular developmental period and then disappear. Deferred adaptations, by contrast, are those that are important for the success of reproducing adults, with their emergence during childhood being a simple consequence of the time needed for creating the mature form. Crucially, the evolutionary requirement in all cases is that the organism as a whole must be viable at each and every ontogenetic step or it will not survive to reproduce. An evolutionarily informed approach to ontogeny—a life history approach—must therefore specify the ecological challenges and resulting adaptations for the organism at each developmental period on its own terms.

A given pathway develops under the developmental constraints created by many others: none can occur before its component parts are ready, and none can be too disruptive to the others or to the overall process. On the other hand, interactions among developmental pathways—as one or the other of them changes—can be the source of major and unexpected evolutionary novelties. For example, imagine an evolutionary time at which only adult humans could run bipedally (adapted, say, for chasing game). In later generations, those individuals who by chance began running earlier in ontogeny had various advantages relative to others (for example, in escaping predators), resulting in a species-wide tendency for children also to be capable of running. Such changes in timing can have momentous effects on phenotypes by creating novel interactions among pathways, with cascading effects as ontogeny proceeds. For instance, one can imagine that children being able to run at younger ages might have the side effect that adults would now give them more freedom earlier, which might then affect the nature of their interactions with peers. The key point is that these side effects on adult and peer interactions were not a part of the original process of natural selection for children who run; they were only "emergent" phenotypic outcomes, which then became subject, as everything else, to natural selection.

This Evo-Devo perspective on ontogeny is thus an epigenetic perspective: focused not on genes but on gene expression as it manifests in ontogenetic processes transacting with environments and with one another to create phenotypes. When the focus is on behavior and psychology, this way of looking at things is often referred to as developmental systems theory (for example, Gottlieb 1997). When the focus is on human behavior and psychology in particular, it is often referred to as evolutionary developmental psychology (for example, Bjorklund 2015; Barrett 2015). This epigenetic approach to human psychological development contrasts sharply with many so-called nativist approaches, which invoke evolution simply to claim "It's innate!" and be done with it (what I have previously called "simplistic nativism"; Tomasello 1999). A more thoroughgoing evolutionary approach to human psychological development will describe and explain the dynamic processes that construct particular ontogenetic pathways.

The Human Ontogenetic Niche

The individuals of all great ape species go through relatively protracted ontogenies, spending a large portion of their lives in immature form. This long period of immaturity is dangerous for the fledgling because it depends on others for food and protection from predation. Providing all this care is also costly and risky for adult caregivers in a variety of ways. The large costs and risks of this "extended immaturity" life history pattern—for both offspring and caregivers—suggest that it must have at least some adaptive advantages. Most basically, a long period of immaturity means that many cognitive and social competencies, and their associated skills of learning, will develop gradually as the organism interacts with its environment. This extra time, as it were, gives the individual the opportunity to construct its own flexible and cognitively controlled ways of dealing with its own individual adaptive challenges (Bruner 1972).

The human version of this extended immaturity life history pattern has some special characteristics adapted to humans' ultra-cooperative lifeways. Most importantly, human ontogeny unfolds within a highly cooperative social group (a culture), whose members collaborate and help one another in myriad ways, including in raising the young. In this cooperative ontogenetic niche, children depend on many more adults in many more ways and for a much longer period of time than do other apes.

The most basic way is in obtaining food. Great ape mothers wean their youngsters at around four to five years of age, and from then on they are on their own in obtaining food. Great ape mothers allow their offspring to scavenge the detritus of their feeding behavior—the peels, husks, and shells—but they do not actively provision them (see Ueno and Matsuzawa

2004, for an experimental demonstration). In sharp contrast, after human children wean at around three years of age, they are provisioned with food by mothers and other adults until well into adolescence. In a study of hunter-gatherers, Hill et al. (2009) found that children typically do not provide their own food at a level sufficient for survival until mid-adolescence. This same pattern would seem to hold, perhaps even more strongly, for the children in modern industrialized societies.

In a similar fashion, great ape youngsters are pretty much on their own for gathering information about the world around them. They may learn things from others, but adults do not actively provision them with needed information via teaching or instruction (Thornton and Raihani 2008). Once again in sharp contrast, human children gain much information from intentional adult instruction, and this is true in societies of all types, including in hunter-gatherer groups where adults instruct children in less verbal ways (Kruger and Tomasello 1986; Hewlett and Roulette 2016). Indeed, for human children to acquire the local cultural skills on which their survival depends—and to develop normally in all kinds of other ways cognitively and socially—adult instruction is absolutely essential.

All this cooperative provisioning of food and information is done not just by mothers but by a plethora of other adults. For all four nonhuman ape species, basically 100 percent of the care of offspring is provided by the mother, and youngsters stay in close proximity to their mothers for some time, typically in bodily contact. In sharp contrast, human adults form pair bonds, so children are raised in nuclear families with childcare also provided by other relatives and friends. The outcome is that in human societies of all kinds, from hunter-gatherer groups to modern industrialized nations, after early infancy only about 50 percent of the care of offspring is provided by mothers, with the other half provided by fathers, grandmothers, and friends (Hrdy 2006). This pattern of so-called cooperative breeding enables mothers to forage and engage in a variety of other tasks without distraction, and so to have offspring at more closely spaced intervals than other apes. Another important outcome of this pattern of cooperative childcare—which will figure prominently in our account of infancy—is that securing care and attention from an array of different adults presents unique cognitive and social challenges for the infants themselves, perhaps contributing to the development of some of their precocious social and cognitive abilities (Hrdy 2016; Hawkes 2014).

The main point is that this especially cooperative ontogenetic niche makes possible an especially protracted ontogeny. Adults provisioning youngsters with food and information frees them from the costs and risks of sustaining themselves energetically and informationally so that they may take their time developing their cognitive and social skills. The most concrete way to see the overall pattern is to look at brain growth over age in humans and chimpanzees. The adult human brain is roughly three times larger than that of other apes. But even if this enormous size difference at maturity were neutralized, the relative rates at which chimpanzee and human brains reach their respective adult sizes are very different. As can be seen in Figure 2.2, already at birth the brains of chimpanzees are about half of their adult size; they reach 90 percent of their adult size by two years of age. In stark contrast, the brains of humans are only 20 percent of their adult size at birth and do not reach 90 percent of their adult size until eight years of age.

The fact that the human brain is three times larger than that of chimpanzees suggests more complex cognitive functioning in adulthood, and its much slower rate of development suggests that human children need more time to learn and develop their skills in their especially complex cultural environments. Thus, despite some variability in particular developmental pathways, a common pattern for humans is the early emergence of basic skills followed by a long period of development to get to

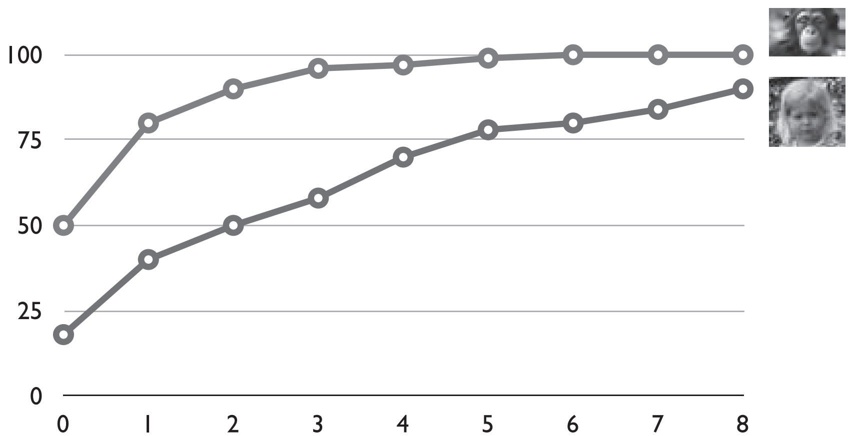

Figure 2.2 Percentage of adult brain size as a function of age (in years) in humans and chimpanzees (based on data from Coqueugniot et al. 2004).

the final, highly complex adult end point—as we shall soon see in much detail.

Human Psychological Life History

It is widely accepted among virtually all students of human evolution that this pattern of a relatively slow ontogeny, including slow brain growth, is at least partly an adaptation to humans' cultural way of life, in which developing children have much to learn and many skills to develop before they can become competent members of their cultural group. And these competencies are not just cultural fads and fashions; early human individuals could not have survived for long on their own without mastering a variety of culturally transmitted subsistence practices and social conventions, including the appropriate use of basic artifacts and symbols. This might lead us to expect that human children should have early emerging skills for becoming competent members of a cultural group.

Evidence for this proposal is provided by Herrmann et al. (2007). They administered a comprehensive battery of cognitive tests to large numbers of chimpanzees ($n = 106$), orangutans ($n = 32$), and two-and-a-half-year-old human children ($n = 105$). The test battery consisted of sixteen different nonverbal tasks assessing all kinds of cognitive abilities involving both physical and social problems relevant to primates in their natural environments. The tests relating to the physical world consisted of problems concerning space, quantities, and tools and causality. The tests relating to the social world consisted of problems requiring the subjects to imitate another's solution to a problem, communicate nonverbally with others, and read the intentions of others from their behavior. If the difference between human and ape cognition is a difference in something like "general intelligence," then the children should have differed from the apes uniformly across all the different tasks. But this was not the case. The finding was that the children and apes had similar cognitive skills for dealing with the physical world; however, the children—old enough to use some language but still years away from reading, counting, or going to school—already had more sophisticated cognitive skills than either ape species for dealing with the social world (see Figure 2.3).

When the correlational structure of individual differences in these cognitive tasks is examined, neither the children nor the chimpanzees revealed a factor of general intelligence (Herrmann et al. 2010). What both species had was a similar factor centered on spatial cognition (likely to be

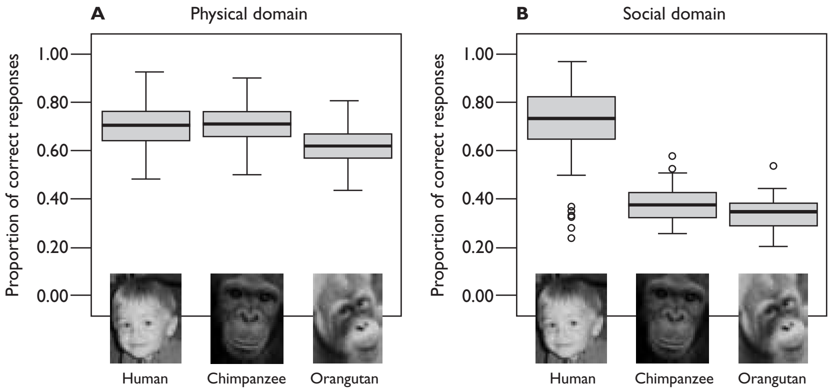

Figure 2.3 Results of tests of cognitive abilities in human children, chimpanzees, and orangutans illustrating their differing rates of development (overall results from Herrmann et al. 2007).

mammalian-wide). The main difference between species was that for the chimpanzees there was only one additional factor comprising various physical and social-cognitive tasks, whereas the children showed distinct, separate factors for physical cognition and social cognition. This species-unique social factor—in combination with children's greater social-cognitive skills on this test battery—suggests that early in ontogeny humans already employ unique adaptations for social cognition, which enable them to master, in a way that other apes cannot, the cultural skills of communication, cooperation, and social learning. What Herrmann et al. called the cultural intelligence hypothesis is that these unique, early developing social-cognitive skills empower human children to culturally learn from others in ways that "bootstrap" their understanding of the physical world through language, instruction, and other cultural and educational interactions so that as adults they will have especially sophisticated cognitive skills across the board.

A key point for current purposes is that humans' specialized social-cognitive skills are not things added onto the end of ontogeny in adulthood, but rather they emerge relatively early—sometime before two-and-a-half years of age, at the least. So all other aspects of human cognitive and social development are built on this unique foundation, leading to unique outcomes. A dramatic demonstration of this proposal comes from the most comprehensive study to date of great ape cognitive ontogeny. Wobber et al. (2013) administered the same basic test battery as Herrmann et al. (2007) to completely new groups of human children ($n=48$), chimpanzees, and bonobos at two, three, and four years of age (some data were collected longitudinally, and some were collected cross-sectionally). Figure 2.4 shows the overall pattern of results (combining the two species of nonhuman great ape into *Pan;* $n=44$).

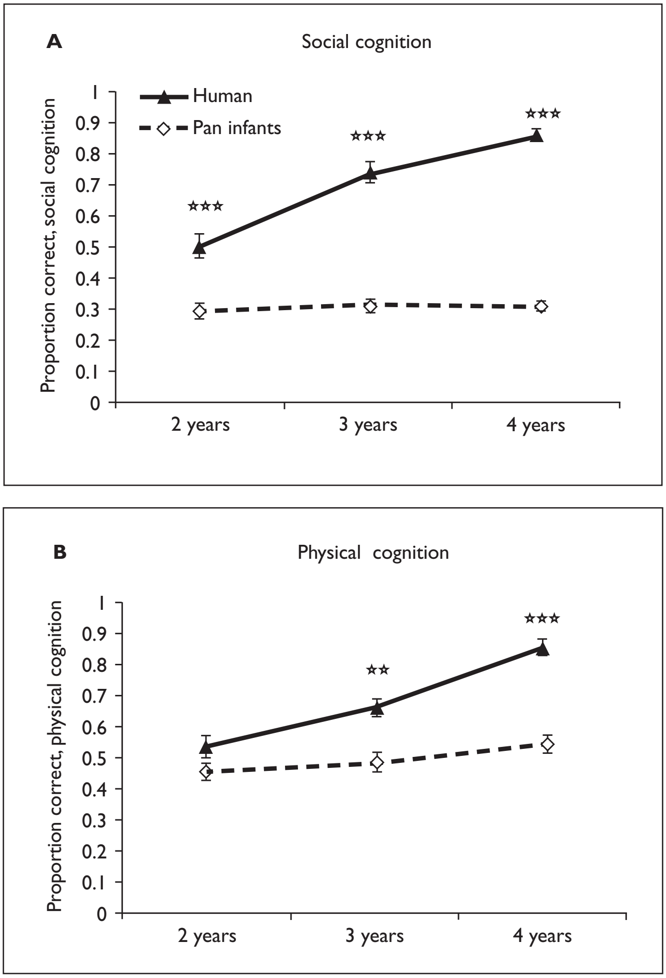

Figure 2.4 Social (A) and physical (B) cognitive development of human children compared with chimpanzees and bonobos (*Pan* group) at two, three, and four years of age (overall results from Wobber et al. 2013). Asterisks indicate a statistically significant species difference.

The first thing to note is that the results at age two-and-a-half replicate—with new samples of comparably aged apes and children—the most basic finding of Herrmann et al.: children and the two species of *Pan* are indistinguishable in their skills with space, quantities, and causality (physical cognition), but the children are already advanced in their skills with imitation, communication, and intention reading (social cognition). The pattern after that earliest age provides strong support for the cultural intelligence hypothesis. In the period from two to three years of age, children's skills of social cognition continue to increase in a dramatic fashion whereas those of apes do not develop further at all. Children's social-cognitive skills go from being roughly 65 percent higher than those of *Pan* at age 2 to being 130 percent higher at age three, to being more than 200 percent higher at age four (Figure 2.4A). Consistent with the idea that these rapidly developing social skills are leading the way to human adults' overall more sophisticated cognitive skills, in the physical domain children go from being indistinguishable from apes at age two to having significantly better skills at ages three and four (by approximately 25 percent and 60 percent, respectively; Figure 2.4B). Interestingly, this pattern of behavioral findings parallels rather closely the patterns of brain growth depicted in Figure 2.2: chimpanzees' skills in both social and physical cognition are basically mature already at two years of age (by which point their brains are 90 percent of adult size), whereas young children's skills in these domains increase significantly from ages two to four as their brains go from roughly 50 percent to 75 percent of adult size.

Young children's remarkable skills in social cognition, as compared with those of other apes, are almost certainly adaptations for life in a cooperative cultural group—a life in which individuals must coordinate, communicate, and learn from one another in myriad ways. But one might ask, Why do these special skills emerge so early in ontogeny, even before weaning? In the context of her theory of human cooperative breeding and childcare, Hrdy (2009, 2016) proposed that human infants' remarkable skills of communication, social cognition, and social learning—shared intentionality—are ontogenetic adaptations for the infancy period itself, in the context of a childcare regime in which mothers have more babies at more closely spaced intervals, and infants have multiple caregivers. Far more than other primates, human infants must compete with siblings and other children for the attention and care of not only their mother but also less familiar caregivers. In such a context, infant strategies to promote mother–infant attachment as characteristic of all primates (for example, crying when in need) are no longer sufficient. Instead, according to Hawkes (2014), in this context the infants who do best are those who can discern the thoughts and moods of caregivers and solicit help and care from them via various kinds of interaction and communication. Tomasello and Gonzalez-Cabrera (2017) offer a modified version of this hypothesis, emphasizing that such things as infants' emotion sharing, attention sharing (aka joint attention), and attitude sharing in cooperative communication with adults all tend to align the psychological states of infant and adult; many studies in social psychology show that aligning psychological states—and even behavior in imitation—promotes social bonding (for example, Wolf et al. 2016). Social bonding via the sharing of emotions, attention, actions, and attitudes is an evolutionarily novel phenomenon: individuals feel closer to others as they share experiences with them. This is foundational to virtually all forms of uniquely human cooperation and shared intentionality.

After infancy, early childhood (from three to six years of age) inaugurates what has been called "the two social worlds of childhood." The first world is that of adults, especially with regard to issues of cultural transmission. Thus, although adults in some cultures attempt to teach children from early in ontogeny, it is not until around three years of age that children begin to understand adult pedagogy as, essentially, the "objective" voice of the culture informing them of how "we" do things (see Chapter 5). The second world is that of peers, especially with regard to issues of social and cultural coordination. Again, young children will interact with peers from well before three years of age, but infants' and toddlers' interactions with peers are so thin they are often described as "parallel play" (and their conversations are mostly talking at, not with, one another; see Chapter 4). But after age three, young children begin to interact with peers in ways that evidence a growing competence at social and mental coordination, including an understanding of the culture's conventions and norms, and a growing respect for peers as coequal collaborative and communicative partners. The slow pace of human ontogeny gives young children sufficient time to master both these social worlds.

The developmental capstone of the current account is children at six or seven years of age. As noted above, across all of the world's cultures, children of this age are seen as having reached a new level of functioning that enables them for the first time to perform simple but important cultural tasks independently and reliably (Rogoff et al. 1975). To an important extent, adults begin to see children of six or seven years as mostly *reasonable:* thinking and acting in ways that they are capable of justifying to others in the culture based on reasons and values we all share. And they have become, from a social point of view, mostly *responsible:* recognizing that others in the culture depend on them to act in accordance with these shared reasons and values—and doing so. Children of this age have thus become, at least to some degree, beings who can normatively self-regulate by asking themselves, What ought I to think? And what ought I to do? They are now ready to begin mastering in earnest the many adult-like skills, practices, and knowledge necessary to become fully fledged members of their cultural group.

Explanation in Developmental Psychology

Our overall goal is to provide a scientific explanation for the main ontogenetic pathways constituting uniquely human psychology. This goal places us squarely in the field of developmental psychology. Explanation in developmental psychology classically comprises two steps: (1) an age-anchored description of some developmental pathway and (2) identification of the factors that affect that pathway's trajectory at various steps along the way, especially in terms of the processes of maturation, experience, and executive self-regulation.

Description does not mean naïve observation. Much of the research in developmental psychology consists of experiments designed to reveal what children are really doing when their naturally occurring behavior could be interpreted in multiple ways. When they use a word do they understand it as a social convention used only by in-group members? When they divide things equally between people are they doing so with a sense of fairness? Describing a developmental pathway means establishing its nature, including its underlying cognitive and socioemotional processes, at each of its steps.

Identifying the factors that affect a developmental pathway calls on correlational research, cross-cultural research, research with special populations, and experiments. In our analyses here, we begin with the developmental pathways already in motion, as it were: we start with the ontogeny of great ape psychology, which has its own trajectory. For current purposes, that existing great ape trajectory is a given, which we do not attempt to explain. What we attempt to explain is how humans have deviated from that relatively ancient trajectory.

Maturation and Experience

There is no doubt that maturation—as the direct expression of human evolution by means of natural selection—plays a key role in structuring human ontogeny, including its unique aspects. However, in complex human competencies, maturation never supplies anything like a finished product, as it can do (to a first approximation) in very basic behavioral skills such as breathing and swallowing. In all of the cases that concern us here, then, what matures is a *capacity,* a readiness to go forward under certain conditions. Actually going forward requires exercising that capacity and experiencing the results.

Given that the ontogeny of complex human competencies is almost never due to maturation alone, we will speak here of the "maturational component" of a developmental pathway—that is, those aspects of a pathway that have been naturally selected at the level of the species as a whole (typically with some plasticity). Importantly, even the aspects of a pathway that are invariant across individuals may still involve much learning if the opportunities for such learning are invariantly available to all individuals. A good example, on the level of sensory-motor development, is walking. The human body has evolved in myriad unique ways for walking bipedally, from the structure of the skeleton, to the structure of the limb muscles, to specialized feet, to specialized mechanisms of balance, and on and on. And all typically developing children in all cultures begin walking within a quite predictable developmental period between about nine and eighteen months of age. Clearly, the developmental course of walking has a large maturational component. But at the same time, children *learn* to walk, and they do so with the support of such generic things as gravity that are invariantly available in all normal human environments. Biological adaptations arise in response to environmental challenges, and the developing organism's actual interactions with those environmental challenges are often a crucial part of their ontogeny.

The nature of children's experience depends on their cognitive and social abilities at a particular developmental level. A great ape, no matter its developmental level or experiences, cannot learn about scoring a goal in soccer because it does not have the capacity to understand the rules that constitute the game. It has no ability to understand culturally constituted realities that depend on conventional agreements. Children can only understand scoring a goal in soccer (beyond the spatial event of a ball entering a net) when they have the skills for understanding rule games, which depend on cognitive skills of collective intentionality that only develop after age three. One may attempt to teach a two-year-old the rules of soccer and what constitutes a goal, but they will not learn because they are not maturationally ready to have the requisite experiences. On the other hand, two-year-olds can learn many things from their joint attentional and collaborative interactions with others—in ways that great apes cannot—because they have capacities for engaging with others in those ways. We thus advocate a "transactional" causality: maturational capacities create the possibility of new kinds of experiences and learning, and then those learning experiences are the proximate causes of development.

In contrast to such maturationally structured learning, there are, of course, many human skills and much human knowledge for which the individual cannot be biologically prepared in any direct way because they vary across human societies—such things as riding a bicycle, making a bow and arrow, or reading a book. Learning such culturally specific skills depends on a social environment full of other individuals who engage in and even teach the particular cultural practice. We could thus call this culturally structured experience. Of course, it also depends on evolved skills of cultural learning that are universal in the species. Indeed, our focus here is not on culturally specific skills but rather on the ontogeny of children's general skills and motivations of shared intentionality, including cultural learning, that make the acquisition of culturally specific skills possible at all.

Following Vygotsky (1930 / 1978), our basic distinction will be between skills that develop "naturally" through maturationally structured individual learning, and those that develop "culturally" via imitative learning from others in the culture or via adult instruction. It is also possible for children to develop new skills in a process of social co-construction, in which, for example, they learn to view a situation from multiple perspectives simultaneously by assimilating the differing perspectives of peer partners. The result is a typology of four types of learning and experience that play key roles—at different ages in diverse domains—in human cognitive and social ontogeny: (1) *individual learning,* (2) *observational learning* (imitation and so forth), (3) *pedagogical or instructed learning,* and (4) *social co-construction* (prototypically in peer collaboration).

Who young children are learning from often matters as well. Infants and toddlers before the traditional weaning age (up to three years old) have their most meaningful social interactions and experiences with adults. Adults not only nurture and protect them, but they also engage with them in uniquely human forms of social interaction such as joint attention, cooperative communication, and social imitation. This suggests the possibility, as noted previously, that human infants' early emerging skills of joint intentionality evolved to elicit care and attention from parents and other adults by forming meaningful social relationships with them. In contrast, infants and toddlers do not have an abundance of meaningful social interactions with peers. Of course, they sometimes interact with other infants and toddlers, but their respective actions are often described as "parallel"; they almost never engage with one another in uniquely human forms of social interaction such as joint attention, cooperative communication, and social imitation.

Also as noted previously, beginning at around three years of age, young children enter into what has been called the two social worlds of childhood: adults versus peers. On the one hand, children of this age interact with knowledgeable and authoritative adults, who typically tell them what to do and teach them things, and they typically conform and learn because adults are respected authorities. On the other hand, children of this age interact with peers, who are no more knowledgeable or powerful than they are, which engenders perspective-taking, dialogic thinking, and reciprocity. Of course, there are exceptions to this pattern, when young children engage coordinatively with adults in some situations—perhaps especially in Western, middle-class cultures where it is normal for adults to play with their children as if they were peers. Also young children sometimes are instructed in things by more expert peers. But still there is a huge difference in the nature and the effects of these two different types of social interaction, rooted in the simple fact that adults are adults, and peers are peers.

Our causal model is thus, to repeat, "transactional." Maturational capacities are inert until they are used in transactions with an environment. It is what children experience and learn during these maturationally structured transactions—and, in many cases, how they learn and who they learn from—that actually propels human ontogeny forward.

Executive Regulation

Although different in kind from maturation and experience, the third causal factor in human psychological development is children's budding abilities of *executive self-regulation*. In many modern theories, what we are calling executive self-regulation—including everything from executive function to emotion regulation—is often considered as a separate competency or skill, and in many cases that is appropriate. Thus, there is a great deal of research showing how young children self-regulate their own actions and cognition through inhibition, attention switching, risk-conscious decision making, effortful control, and delay of gratification (for reviews, see Carlson et al. 2013, on executive function; and Eisenberg et al. 2006, on emotion regulation).

But a number of classic theorists have also invoked executive self-regulation (in one form or another) in a much broader context, as a causal factor in human ontogeny separate from both maturation and learning. For example, Piaget (1977) explained many of humans' developmental achievements by what he termed equilibration, a set of self-regulatory processes that he thought applied widely in the biological world. Most importantly, equilibration regulated human children toward coherence and consistency in their cognitive functioning, often precipitating cognitive development without any direct external stimulus. For example, if a child was initially confused by hearing the same creature called a *dog* and an *animal,* further experiences might then induce the understanding of the hierarchical relation between these two words. But then if the child heard other such pairs, the result might be a reorganization in her linguistic concepts across the board, that is, a hierarchical organization across all words. In such cases neither maturation nor experience can provide a complete explanation—although both are involved—but rather, we must invoke a process of cognitive reorganization that goes beyond either of these. Cognitive reorganizations of this type presumably require an executive level at which the specific items or components from the perception-action-cognition level are assembled and coordinated. Karmiloff-Smith (1992) articulated a very detailed account of such processes, what she called representational redescription, referring again to children's attempts to find coherence and consistency in understanding how things work by redescribing them on ever more abstract executive levels.

We are concerned here with two basic types of uniquely human executive self-regulation. The first is executive self-regulation when the content is uniquely human forms of cognition or sociality, what we may call the *individual self-regulation of unique content*. For example, when children are confronted with conflicting perspectives on the "same" thing—a problem not faced by other primates because they do not understand such different perspectives—the solution to this disequilibrium is a reconceptualization that coordinates these perspectives. So, for example, the solution to the apparent problem that the same creature is called *dog* and *animal* is the construction of a hierarchical relationship between the two. Another example would be when the child faces conflicting desires or values, such as in a situation in which the considerations of sympathy for a friend and selfishness pull in different directions. In this case, a possible resolution is constructing some notion of fairness to all concerned. Importantly, in all such cases we will talk not about learning but about construction, because development occurs as already existing psychological elements are reorganized.

The second type of uniquely human executive regulation is what we may call *social self-regulation*. In this case, the individual appropriates the perspectives or values of others to use as a standard in the self-regulatory process. Here it is not just the content being regulated that is social, but the executive process itself that is social. Social self-regulation takes several different forms. For the moment, we can point to a few examples that illustrate the basics. First, when young children are faced with the prospect of doing something either cooperative or uncooperative, they behave differently if they are being watched by a peer—for example, they share more and steal less—whereas chimpanzees do not care (Engelmann et al. 2012, 2016a). Presumably, children are imagining or simulating the value judgment that the peer will make and executively self-regulating their behavior accordingly (so-called impression management). Second, sometimes young children executively self-regulate their communicative acts by carefully choosing a formulation that facilitates listener comprehension. Presumably in this case they are imagining or simulating the listener attempting to comprehend their communicative act, and they are adjusting their formulation accordingly (see Tomasello 2008, for a review). Third, the prototypical Vygotskian example is that of an adult verbally instructing or guiding the child in solving a problem. Eventually the child internalizes this instruction to voluntarily direct her own attention and action strategically (for example, Vygotsky 1930; Winsler 2009).

The general process is thus that the young child imagines how some social interactant is comprehending or evaluating her, and then she uses this to socially self-regulate. Scaling up the sociality involved, children from about three years of age (but, needless to say, not apes) socially self-regulate on the basis of cultural structures—such as, prototypically, conventional and moral norms—that are based in cognitive processes of collective intentionality, what we may call *normative self-governance.* This process operates in much the same way as social self-regulation in a dyadic context, but the social other in this case is more generalized and authoritative. Thus, from sometime during the late preschool period, young children self-regulate both their thinking and actions not just by how efficacious they will be in the current context (as do apes), and not just by how they will affect a particular person's thoughts or evaluations (as do younger children), but also by the perspective of how these will fit with the normative expectations of the social group. This process essentially constitutes the construction of a normative point of view as a self-regulating mechanism, arguably the capstone of the ontogeny of uniquely human cognition (normative rationality) and sociality (normative morality). And, again, engaging in social self-regulation or normative self-governance can lead to developmental change without any additional inputs from either maturation or learning.

All these kinds of executive self-regulation—individual self-regulation (of uniquely human processes), social self-regulation, and normative self-governance—play important roles in leading children to reconfigure things in ways that resolve conflicts between perspectives or values. By internalizing social experiences structured by shared intentionality and using them to executively self-regulate their own thoughts and actions, young children, by the time they are six years of age, will have taken a first big step on the road to becoming normatively reasonable and responsible members of their cultural group.

Methods

We will be attempting in what follows to describe and explain developmental pathways. Obviously, before charting a developmental pathway one must decide what constitutes that pathway. This can be done in different ways depending on one's purposes, including the degree of detail needed. In general, a developmental pathway may be defined or characterized by the end point one wishes to explain. If one wishes to explain walking, then the pathway includes all of the relevant skills and competencies leading to that end point. However, if one wishes to explain running, then walking is only one step along the way. In most cases, a developmental pathway, as defined by a particular end point, will comprise a number of other, perhaps smaller pathways with their own developmental histories.

In deciding how to describe and explain a developmental pathway we must make some methodological choices. Most basically, an evolutionary perspective on human ontogeny leads to a focus on action as the primary level of analysis. Natural selection can operate directly only on the way organisms interact with the environment overtly. The ability to perceive something, or feel something, or think something can only be "seen" by natural selection if it influences the way the organism acts, in which case these internal processes become, indirectly, targets of natural selection. This is not to say that the underlying psychological processes are somehow unimportant or problematic; to the contrary, they structure everything. But in an ontogenetic analysis, we must view perceptual, cognitive, and emotional processes in their context as components in a developing pathway whose evolutionary *telos* is adaptive action.

To identify the underlying psychological processes involved, experimental methods are needed. In the contemporary field of developmental psychology, there are three main sets of methods (leaving aside the neuroscientific methods, as they are mainly correlational and concerned with a different level of analysis). The first is various kinds of looking measures, which are used most prominently in studies with infants, whose skills of adaptive action are limited. Studies using these methods have uncovered a host of surprising competencies in infants, which have transformed the way that developmentalists view the earliest phases of human ontogeny. But in most cases the competencies revealed are perceptual competencies and represent only a first step toward a fully developed system of adaptive action. The second set of methods, at the other end of the continuum, involve language-based interviews, used mostly with children from about four to five years of age, as younger children are notoriously poor at expressing their knowledge and competencies in language. Third, in contrast to both of those approaches, our focus here is on methods that target children's skills of decision making and adaptive action: how children interact with and adapt to various behavioral contingencies and problems. This focus is appropriate because most of the developing pathways with which we are concerned unfold during the period of one to five years of age, when children have some significant behavioral competencies but little ability to reflect on them linguistically. For each of the developmental pathways whose course we chart, we will look briefly at any perceptual or motivational competencies that emerge early in the pathway and serve as precursors, but we will not consider our job complete until we have charted the way the child uses these competencies in facing behavioral challenges.

In the next two parts of the book, we describe and explain how human children become reason-based rational and moral creatures over ontogenetic time in particular domains. In Part II the four chapters focus on uniquely human cognition, and in Part III the four chapters focus on uniquely human sociality. The basic procedure for each of the chapters is as follows.

- We begin by recounting what is known about great apes in this domain, and in particular anything known about great ape ontogeny.
- We then describe and explain the species-typical ontogenetic pathway for humans (based mainly on behavioral experiments). In most cases this comprises two interrelated and ordered pathways reflecting, in turn, the capacities of joint intentionality (evolved for early human collaborative foraging) and collective intentionality (evolved for modern human cultural life). For example, the pathway for uniquely human cultural learning has a first phase of imitative learning followed by a second phase of instructed (pedagogical) learning. The explanation is in terms of what we know about the key factors affecting the course of the pathway, as established by developmental studies of biological syndromes (especially autism), individual differences, and cultural differences.
- Finally, we spell out how developments in this domain contribute to the overall structure and ontogeny of children's reason-based rationality and morality.

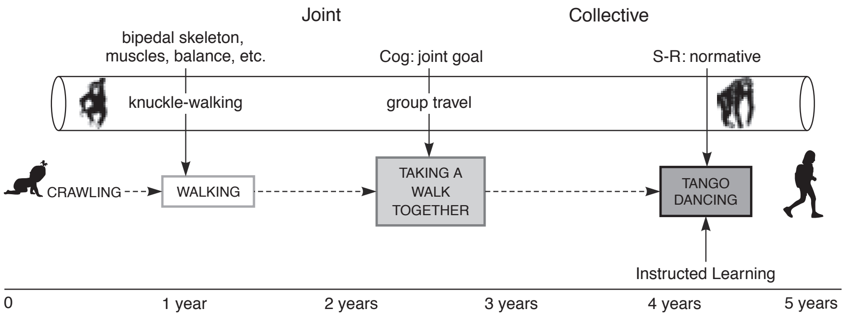

Figure 2.5 Illustration of a developmental diagram: the ontogenetic pathway for learning to dance the tango. Abbreviations: Cog = cognitive capacity; S-R = executive self-regulation.

To help us to describe a particular developmental pathway and to identify the factors that affect its course, we will use what we may call developmental diagrams. The function of these diagrams is to graphically depict a particular developmental pathway across age, including the most important component processes and causal factors involved. As a playful example (intended only as an illustration of the method), in Figure 2.5 we depict the ontogenetic pathway for learning to dance the tango.

Such developmental diagrams comprise four essential components. First, our starting point is great ape ontogeny (in the tube occupied by an infant and juvenile chimpanzee at either end). The key competencies here are knuckle-walking, which emerges in apes at one year, and active participation in group travel, which emerges between two and three years. Second, the focus of our explanatory attention is the middle row of rectangular boxes, flanked by an infant and young child at either end. These depict a path from crawling to walking to taking a walk together to tango dancing, at the ages indicated. Third, in the top lines above the great ape tube are uniquely human maturational capacities of (1) joint intentionality (here: the cognitive capacity for forming a joint goal) and (2) collective intentionality (here: the executive capacity to normatively self-regulate or, in this case, to "follow the rules") that mature at, respectively, about nine months and three years. (Included in this example only are also uniquely human capacities for bipedality.) Fourth, the shading around each box depicts something of the nature of the experiences needed for the individual to bring together these different sources into the designated developmental outcome, with darker shading indicating that more of particular kinds of experience are needed. In addition, the skills listed below the boxes indicate experiential inputs from other skills with their own complex developmental histories—in this case, the ability to learn from instruction. So, in this example, walking requires experience of a very generic kind, whereas tango dancing requires specific instruction. (In each of the particular accounts that follow, the relevant experiences will be specified more precisely, of course.)

The animating image is thus great ape ontogeny moving forward; then, as uniquely human capacities of shared intentionality mature, they enable new forms of sociocultural experience, which transform great ape psychology into human psychology over developmental time. In general, my explanation for the developmental emergence of the ability labeled by a particular box in a particular diagram always includes (1) great ape ontogeny (in the tube) as the foundation; (2) preceding abilities (to the left), with an arrow to the box as precursors; (3) maturational capacities (above the tube), with arrows to the box as enabling causes (including executive regulation); and (4) relevant experiences (shading around the box) as proximate causes. Thus, "taking a walk together" emerges from individual walking and ape group travel, as the capacity for forming a joint goal with a partner matures and enables new kinds of coordinative social experiences with others. We will be using such developmental diagrams as a way of summarizing both the trajectory of the developmental pathway and the factors that affect it for each of the pathways in each of the eight chapters that follow.

II

The Ontogeny of Uniquely Human Cognition

> In the process of development the child not only masters the items of cultural experience but the habits and forms of cultural behavior, the cultural methods of reasoning.
>
> Lev Vygotsky
>
> "The Problem of the Cultural Development of the Child" (1929)

Human cognition is unique in multifarious ways. But at the root of all of these, we would argue, are the ontogenetic processes by which young children come to put their heads together with others in acts of shared intentionality. Although great apes' "core knowledge" of the spatial-temporal-causal-quantitative structure of the physical world and their basic understanding of agency and social interaction are foundational for uniquely human cognition, they are not sufficient. We need, in addition, cognitive processes evolved for social and mental coordination with social partners.

The issue is not just "mind-reading"—apes turn out to be pretty good at that. But they do it mostly in competition. Social and mental coordination with others for purposes of cooperation is something different. In mind-reading aimed at competition, I do not want you to know what I am thinking. In mental coordination aimed at cooperation, I do. Many of humans' everyday acts are thus designed to actually help others read their minds. And so an element of recursion enters the picture as I *intend* that you *know* what I *think*.

Adaptations for mental coordination with others restructure human cognition in a variety of ways over developmental time. First, from around nine months of age, infants engage with others in acts of joint attention, which creates the possibility of conceptualizing entities and situations simultaneously from differing perspectives; then, later, they can even view things from an "objective" perspective. From early on as well, infants communicate with others referentially, inviting them to jointly attend to something, and this requires recursive inferences about mental states embedded in mental states; later they communicate with shared linguistic conventions. Again, from early on infants imitatively learn things through others' perspectives, and later they come to understand pedagogy as an attempt by a representative of the cultural group to convey objective cultural knowledge. Finally, by the time they reach school age, children are capable of using all these skills of social cognition, referential communication, and cultural learning to engage intersubjectively with a peer in the kind of cooperative thinking and reasoning that are the source of all kinds of novel cultural achievements.

These are the social-cognitive skills of shared intentionality that enable humans, but not other great apes, to work together to create such things as steam engines, poetry, and governmental institutions. But these skills do not come into being full-blown. They come into being in individuals through a developmental process, extended over time, in which maturation, experience, and executive self-regulation all play constitutive roles.

3

Social Cognition

Mature human thinking is structured by the basic distinction, recognized since the ancient Greeks, between subjective and objective (or appearance and reality, belief and truth, opinion and fact). The distinction derives from the insight that a single individual's subjective perspective on a situation at any given moment may or may not match with the objective situation as it exists independent of this or any other particular perspective.

Great apes and other animal species do not bifurcate experience in this way. They take the world as it appears to them, without contrasting it to anything else (objective or otherwise). They are also able to imagine what another individual is experiencing or has experienced, but they do not contrast this with what they or anyone else is experiencing or has experienced either, much less with an objective perspective. Their understanding of the world and their understanding of others' experiencing of the world are simply not integrated in a way that leads to the distinction between subjective and objective.

Great apes do not distinguish subjective and objective, in my view, because this is not an insight that individuals can come to on their own. An individual cannot come to it either by inventing a clever theory or by simulating another's experience, and they cannot come to it by comparing their past to their current experience. To understand the distinction between subjective and objective, an individual must triangulate (to use the term of Davidson 2001) on a shared situation with another individual at the same moment: we both see *X*, but you see it this way, and I see it that way. That is, the participants must come to understand that the two of us are sharing attention to one and the same thing, but at the same time we each have our own perspective on it. This is the basic cognitive organization of the so-called dual-level structure of shared intentionality (Tomasello 2014).

Human infants begin engaging others in this dual-level manner from around nine months of age. They are able to do this because they have inherited this way of engaging others from their early human forebears, for whom it enabled novel and unique forms of social and mental coordination. Initially, infants engage with adults in joint attention, within which they learn about their individual perspectives. In communicating, child and adult attempt to align their perspectives, and later in ontogeny to exchange and coordinate perspectives in conversation about a common topic. It is through the exchange of perspectives in linguistically mediated discourse—in which partners jointly attend to one another's thinking—that children are forced to coordinate discrepant perspectives (which they do through the use of their developing skills of executive regulation). During the period from three to six years, using their emerging skills of collective intentionality, children construct from this admixture of sharedness and individuality an "objective" world independent of their own or anyone else's way of construing it, but about which, nonetheless, individuals may have various subjective perspectives, attitudes, and beliefs, including false beliefs.

In this chapter we focus on the ontogeny of uniquely human social cognition. We begin with the ontogeny of great ape social cognition, especially their ability to imagine (nonperspectivally) what others perceive and know. We then look in turn at young children's skills of joint attention and at their ability to coordinate multiple perspectives on the same entity. These unique skills set the stage for three- to four-year-old children's ability to coordinate conflicting perspectives on the executive level—for example, two contrasting beliefs or an object's appearance as compared with reality—and thereby to construct new understandings of the world.

From Apes: Imagining What Others Perceive

For all our analyses of uniquely human ontogenetic pathways, we begin with great apes. In the current case of social cognition, the analysis focuses on multiple skills—namely, following gaze direction, imagining what another sees or hears or infers, and imagining what another knows or believes.

Great Ape Social Cognition

From the point of view of social cognition, gaze following is a fairly low-level process. But there are some differences between the way that great apes and human infants follow the gaze direction of others that might be related to, or even fundamental to, more complex processes of social cognition. The main issue is developmental timing. In the simplest gaze-following tasks, when the looker and the target are in the same visual field (and so peripheral vision may come into play), two studies have found gaze following in seventeen-month-old human-raised chimpanzees (Okamoto et al. 2004; Tomasello and Carpenter 2005a). Gaze following to more distant targets comes only several years later, however:

- In a test in which a human looked up to the sky, three chimpanzees below three years of age did not systematically follow the looker's gaze direction whereas five individuals older than three years of age did (Tomasello et al. 2001).
- In a longitudinal study, chimpanzees and bonobos first began following the gaze direction of humans between two and three years of age (Wobber et al. 2013).
- In an experiment, chimpanzees under four years of age continued following the gaze direction of a demonstrator who continually looked at nothing whereas older individuals soon quit (Tomasello et al. 2001).
- In another experiment, chimpanzees over five years of age, but not younger, performed "double looks" as they checked back with a demonstrator who was looking at nothing to see whether they got it right (Bräuer et al. 2005).
- In two final experiments, chimpanzees over four years of age (younger juveniles were not tested) locomoted to follow a human's gaze direction to a location behind a barrier (Tomasello et al. 1999), and they could tell when a barrier blocked a looker's visual access to a target (Okamoto-Barth et al. 2007).

These are all much older ages than human infants in the same tasks, as we shall soon see (see also Lucca et al. 2017).

Beyond simple gaze following, a number of studies have attempted to assess whether chimpanzees can imagine the actual content of what others see. In a series of studies, Hare et al. (2000; see also Bräuer et al.

2007) had a dominant and subordinate chimpanzee compete for food in novel situations in which one piece of food was out in the open and one piece of food was on the subordinate's side of a barrier where only she could see it. When their door was opened (slightly before the dominant's), the subordinates chose to pursue the food on their side of the barrier only; they knew that the dominant could not see this food (whereas he could see the food out in the open). In an important variation, Hare et al. (2001) hid only one piece of food on the subordinate's side of one of two barriers (see also Kaminski et al. 2008; Karg et al. 2015b). The trick was that in some cases the dominant witnessed the hiding process but in other cases he did not. The result was that subordinate chimpanzees avoided going for food that a dominant could not see now but might have seen hidden some moments before; they knew that he *knew* where the hidden food was located. And they assigned this knowledge to this particular individual: if, after one dominant had seen the hiding process, he was switched for another, the subordinate subjects knew that the new individual had not seen the hiding process and so did not know where the food was. Great apes can imagine the actual content of what others perceive and know.

In addition, great apes sometimes attempt to actually manipulate what others see. Hare et al. (2006) and Melis et al. (2006a) had chimpanzees compete with a human (sitting in a booth) for two pieces of food. In some conditions, the human could see the ape equally well if it approached either piece of food (one on each side of the booth). In these cases, the ape had no preference for either piece. But in the key condition, a barrier was in place so that the apes could approach one piece of food without being seen. And this is exactly what they did. They even did this in a variation in which the choice confronting them was to reach for food from behind a barrier (such that the human could not see their body) but either through a clear tunnel (where the human could potentially see their reaching arm) or an opaque tunnel. They imagined what the human could see of their reaching arm. In a follow-up study, these same individuals preferentially chose to pursue food that they could approach silently—so that a distracted human competitor could not hear them—as opposed to food that involved making noise en route. This generalization to a completely different perceptual modality—audition versus vision—speaks to the power and flexibility of the cognitive skills involved. In still another impressive skill of social cognition, in a find-the-food game, chimpanzees knew that their competitor would choose a board that was lying slanted on a table (as if some food were underneath) rather than a flat board (under which there could be nothing); they knew what kind of inference he would make from the perceptual situation (Schmelz et al. 2011). Great apes' skills of social cognition are extremely flexible.

A final step in the process is the understanding of false beliefs. In five different studies modeled on classic tasks passed by four- to five-year-old children, great apes have failed (see Tomasello 2014, for a review). But recently great apes have performed well in two different false-belief tasks passed by human infants at around eighteen to twenty-four months of age. In an anticipatory looking task modeled on that of Southgate et al. (2007), Krupenye et al. (2016) had great apes watch an actor observe something being hidden; then, after the actor had left the scene, it was moved. When the actor returned, great apes looked first and most often to the location where the actor was likely to search (where he observed it being hidden), even though the object was no longer there. Great apes also passed another infant false-belief test based on the helping task of Buttelmann et al. (2009, 2017).

We return to this issue in more detail later, but for now we simply state our view that in these ape studies—as well as the corresponding infant studies—individuals are anticipating what others will do based on what those others see or have seen, and the individual's own knowledge of the situation is not salient to them in any way (much less any objective situation). We would thus assimilate these studies to those showing that great apes know what others know, with the fact that the ape herself knows something different being basically irrelevant. One could call this an "implicit" understanding of false belief in the sense that apes can predict what another will do based on what it has seen, even if this differs from what they themselves see or have seen (as their own experience is irrelevant to their prediction of the other's actions).

Taken together, these various studies show that chimpanzees know that others see things, hear things, know things, and make inferences about things. Beyond the studies of gaze following, these more demanding studies clearly demonstrate that chimpanzees can imagine the actual psychological content of what others are seeing, hearing, knowing, and inferring, and what this means for their impending actions. These more demanding studies were carried out mostly with adult apes, almost none below four years of age.

Human Children

Human infants begin following the gaze direction of others to close-in targets, within peripheral vision, at around six months of age (for example, D'Entremont et al. 1997). Following gaze direction to more distant targets emerges at closer to twelve to thirteen months of age (for example, Carpenter et al. 1998b), and this includes when the gazer looks up to the ceiling, as in many of the ape studies (Tomasello et al. 2007a). When an adult looks behind a barrier, infants as young as twelve months of age will locomote some distance so that they can get the right angle to look behind it too (Moll and Tomasello 2004), and fourteen-month-olds know when a demonstrator's gaze is blocked by an opaque barrier (Caron et al. 2002). In all of these ways, the gaze following of human infants is similar to that of great apes, but it appears much earlier in human than in ape ontogeny. If we compare infants and apes in each of the experimental paradigms in which they have both been tested, the ages for infants are in all cases at least one year earlier than those of chimpanzees, and in many cases more like two years (see Figure 3.1).

A second important difference is that many studies have found a surprising insensitivity of chimpanzees to the eyes specifically. For example, Kaminski et al. (2004) found that chimpanzees and bonobos were sensitive to whether a human was looking at them but only based on the human's face direction; they were insensitive to whether the eyes were open. In a direct comparison of species, Tomasello et al. (2007b) tested

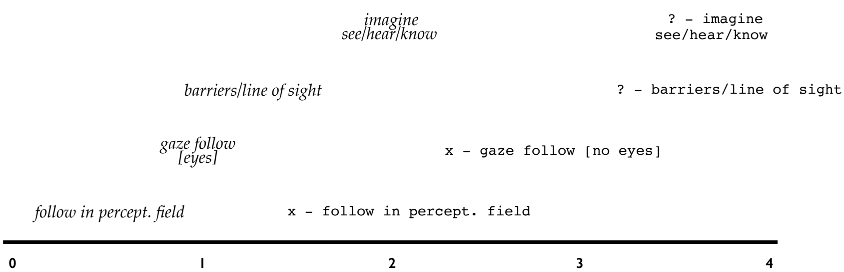

Figure 3.1 Approximate age (in years) of emergence of various gaze-following skills and imagining what others perceive and know for chimpanzee and human (*italics*) infants. Question marks indicate that younger individuals have not been tested, and an *X* indicates clear negative findings at younger ages. Abbreviation: percept. = perceptual.

chimpanzees, bonobos, and gorillas (all over four years of age) and human infants of twelve and eighteen months of age. In a 2×2 design, they varied whether or not the human looker turned his head to the ceiling and whether or not his eyes were open. The apes followed head direction (for example, they looked to the ceiling when the adult turned his head up, even if his eyes were closed), but the infants followed eye direction specifically (for example, they looked to the ceiling when the adult looked up with his eyes only, head oriented straight ahead). Given that of all 200+ species of nonhuman primates only humans have highly visible white sclera that basically advertise the direction of their eye gaze to others (Kobayashi and Koshima 1997), one hypothesis is that human gaze following of the eyes specifically evolved in a cooperative social context in which others did not tend to exploit it. Infants' use of the eyes in gaze following may be one result of this adaptation. Ontogenetically, Brooks and Meltzoff (2005) showed that nine-month-old infants behave like apes—following head direction—whereas ten-month-olds follow eye direction specifically.

As for infants' understanding of seeing, classic studies using various methods, including verbal methods, usually find competence at around two-and-a-half years of age (for example, Masangkay et al. 1974; McGuigan and Doherty 2002). These classic studies establish that young children can imagine what another person sees even when they themselves do not see it—for example, what another person sees on the opposite side of a piece of paper. Moll and Tomasello (2006) reported an experiment finding a slightly younger age for emergence of this ability. The study is of special interest in the current context because it was modeled on the food competition experiments with great apes by Hare et al. (2000). But pilot studies showed that the toddlers did not really take to competition; they needed a cooperative paradigm. Thus, an adult came into the room with a basket searching for her lost toy. The child sat across from her and could see two toys, one out in the open and one on her side of a barrier. The adult looked in the direction of each toy (that is, for the one behind the barrier she looked at the barrier) and then repeated that she needed her toy. Obviously, she could not be talking about the toy out in the open that she had seen or else she would just take it. Twenty-four-month-olds, but not eighteen-month-olds, handed her the toy from their side of the barrier, the one she could not see.

Also similar to chimpanzees but in a cooperative rather than competitive context, Moll et al. (2014) found that twenty-four-month-old infants also distinguished whether an adult had or had not heard two particular sounds previously (because she was either inside or outside the room when the sound occurred), even though they themselves had heard both sounds equally. And finally, as discussed earlier, human infants also perform well in so-called implicit false belief tasks using various looking methodologies (for example, Southgate et al. 2007): they can predict what another will do based on what that other has seen in the immediate past. We will argue below that this represents simply an understanding of what others see and know—since they are not attending to what they themselves see and know at all—and this understanding is transformed by emerging skills of shared intentionality. It is transformed into an understanding that an actor may have a perspective that can be directly compared to my own, and in some cases found to be discrepant both with my perspective and with the objective situation (Tomasello, in press).

These studies thus demonstrate that, beyond gaze following, human toddlers can imagine what others see, hear, and know—in the sense of imagining the content of what others see, hear, and know, especially in cooperative contexts—by at least twenty-four months of age. Unfortunately, not all the comparable studies with great apes were developmental (hence the question mark in Figure 3.1), but the youngest age at which apes have demonstrated similar competence—in competitive contexts—is two years later at around four years of age.

Individual and Cultural Variation

The fact that infants in their first two years of life are following the gaze direction of others and understanding the nonperspectival intentional states of others (seeing, hearing, knowing) in the same basic way as other great apes suggests that maturation is playing a strong role in this developmental pathway. This does not mean that no learning is involved; a child raised in complete social isolation presumably would not on its second birthday display the skills of a typically developing child. What this means is that children do not need to be taught these skills by anyone in their culture (because no one teaches the apes); these skills emerge naturally, assuming a typically developing child growing up in a species-typical social environment. Children with autism have the basics of these skills as well (Carpenter et al. 2001), although there may be some abnormalities in the uniquely human aspects such as in their attention to and use of the eyes and the age at which gaze following emerges (for example, Dawson et al. 1998; Mundy 2003).

In general, there is little individual or cultural variability in the development of skills of gaze following. In the longitudinal study of Carpenter et al. (1998b), twenty-one out of twenty-four infants passed a relatively stringent task of following the gaze direction of an adult to a distal target in a fairly narrow window between ten and thirteen months of age. And in a cross-cultural study, Callaghan et al. (2011) found that human infants growing up in three very different cultural contexts (two small-scale and nonliterate) began following the gaze direction of others at around the same age, including in a task in which they had to follow the adult's gaze to a location behind a barrier. There is thus no evidence of significant individual or cultural variability in normal children's tracking of others' gaze. In terms of the other skills investigated here (understanding what others see, hear, and know), little is known about cross-cultural variability. Individual variability within Western industrialized cultures has been found, of course, but it is never especially great (a modest variance in most studies).

As noted, it is likely that there has been a shift of ontogenetic timing from apes to humans in all these skills. Although the data are not 100 percent systematic, it is likely that human infants are following the gaze direction of others and imagining what others perceive and know at least one or two years earlier than other apes (the data are much more solid for gaze following). Moreover, they are able to use the eyes of others in ways that other apes are not, which is also suggestive of at least some change of process. One speculation is that these changes of process are somehow connected with young children's developing skills of joint intentionality. Thus, the earlier onset of gaze following and infants' special attention to the eyes could represent changes in psychological process as infants begin to engage with others in acts of joint attention.

Joint Attention

Both great apes and human infants follow the gaze direction of others and imagine what others see, hear, and know. But at the same time human infants are developing these skills they are also developing intersubjective skills of joint attention, which typically emerge as a part of the so-called nine-month revolution. To understand the emergence of joint attention, however, we must begin before the nine-month revolution in early infancy. Even young infants engage with others in species-unique ways based on a kind of emotion sharing.

Emotion Sharing in Protoconversations

Infant great apes, like all mammals, form an early and strong attachment to their mothers. Great ape mothers are likewise attached, and they protect and care for their infants. But in the context of cooperative child-care, human infants developed other ways of soliciting attention and care from the many adults who cared for them: they socially bonded with them by aligning and sharing positive emotions. Humans have some important species-unique positive emotions and corresponding ways of expressing them—specifically, the positive social emotions expressed in social smiling and laughter, which tend to increase social bonds between individuals. Infants express these emotions as they interact with adults, even from a distance, whereas other great apes do not smile or laugh as they interact with others at all (that is, great apes do something similar to human smiling and laughing, but only when they are physically tickled in playful activities).

Trevarthen (1979) observed young infants interacting with their mothers, and noted two basic facts about the way these emotions are expressed. First, there was a kind of turn taking in the participants' emotional expressions toward one another: the mother would smile and laugh at the infant, at which time the infant was passive; then the mother would stop, and the infant would start smiling and laughing at her. This exchange could go on back and forth for some time. Second, looking at infants in similar situations, Stern (1985) observed across turns a kind of "emotional attunement" in which infants and mothers would mirror one another's emotional intensity and valence, though sometimes using different means. Thus, the mother might express a positive emotion in her vocalization, and the infant might respond by smiling. Because these kinds of interactions are broadly communicative and reciprocal in their turn-taking structure, Trevarthen and others have called them protoconversations.

The importance of this special kind of emotional engagement for infants is clear if one abruptly terminates a protoconversation *in medias res.* Studies employing what has been called the "still face" paradigm have shown that if an adult suddenly presents an emotionless face in the middle of a protoconversation, infants begin to show various signs of upset—looking away, gnawing at their hands, and so forth (Tronick 1989). In addition, if the timing of the interaction is perturbed, infants become upset as well. Thus, Murray and Trevarthen (1985; see also Rochat et al. 1998) had mothers and infants interact with one another via a closed-circuit television connection. For some infants they delayed the visual feedback from the mother. This asynchronous timing disturbed infants as well. The point is that infants have expectations about how protoconversations should go; when either the content or timing is perturbed, they are perturbed.

Great ape infants and their mothers do not engage in protoconversations. When chimpanzee infants who have been raised by humans interact with humans, they do look at their faces in interesting ways, and they make various kinds of facial expressions (Bard 2012; see also Tomonaga et al. 2004). But since apes do not smile or laugh like human infants, their emotional engagement with the human differs significantly from that which occurs in human mother–infant protoconversations. The social interactions of great ape infants with their mothers may thus be a general starting point, but the first hint of uniquely human shared intentionality is seen in the unique ways in which young human infants share and align their emotions with caregivers, creating a unique form of social engagement.

As noted in Chapter 2, Hrdy (2016) stressed that, in the context of humans' unique forms of cooperative childcare (that is, unique among great apes), human babies are physically separated from their mothers (because they are with nonparent adults) much more often than occurs among other apes. Plausibly, this might set the context for them to develop especially powerful skills to connect psychologically with their mothers and other adults from a distance, for example, with overt emotional expressions such as smiling and laughing. We may thus think of human infants' unique emotional profile for sharing and aligning their emotions with caregivers as the underlying emotional substrate for shared intentionality.

The Emergence of Joint Attention

At around nine months of age, human infants undergo something of a revolution in social cognition. Before this age they can engage with objects directly, such as by grasping and manipulating them. They also can engage with other people directly, such as by exchanging emotions with them in protoconversations. But nine-month-old infants for the first time begin to engage with people and objects together triadically—they begin "triangulating" with others on the entities and situations around them. In the hypothesis of Tomasello et al. (2005), what we have here is the coming together of two development pathways. First is infants' species-unique forms of emotion sharing in protoconversations, which begin in early infancy. Then, second, at around nine months of age infants begin to understand others as intentional agents who have goals and perceptions toward the world (as do other great apes, albeit with other apes this understanding comes at a somewhat later age). The emergence of joint attention may thus be seen as the coming together of a general great ape developmental pathway of individual intentionality and a uniquely human developmental pathway for sharing psychological states with others. This synergy represents nothing less than the birth of shared intentionality.

Joint attention has mostly been studied as joint visual attention. Beyond following the gaze direction of others to external targets at around nine months of age, infants begin alternating their attention between the person and the object, often expressing some kind of emotion to the adult about what they are both (presumably) attending to. Although the infant and adult have been sharing emotions face to face for some time already, this new behavior engages them in sharing emotions with others about the world around them. Importantly, in classic accounts of joint attention (for example, Bruner 1983; Tomasello 1995) the engagement here is not only triadic—the infant and adult are sharing attention to an external entity or situation—but, in addition, it has a kind of recursive social structure. The infant is attending not only to the adult's attention to the object, but also to the adult's attention to her attention to the object, and to the adult's attention to her attention to the adult's attention to the object, and so on. It is not that the infant engages in this kind of recursive thinking explicitly, but that the underlying structure of joint attention means that they both know together that they both are attending to the same thing. They are sharing experience.

Importantly, the emergence of joint attention in infants emerges on a very predictable timetable: within a few weeks of their nine-month birthday (Carpenter et al. 1998b). Because this new skill also manifests itself in a variety of other triadic interactions that emerge in fairly close synchrony, this emergence has sometimes been called the nine-month revolution (Tomasello 1995, 1999). Thus, as we shall see in more detail in Chapter 4, at around this age infants' dyadically structured protoconversations now give rise to triadically structured forms of referential communication, such as showing and offering objects or pointing to them simply to share attention and interest in them. As we shall see in more detail in Chapter 5, infants' already existing skills of mimicking adult body movements now give rise to the triadic imitation of others' actions on external objects. And as we shall see in more detail in Chapter 6, their dyadic engagements with others give rise, later in development, to real dialogue in which child and adult focus together on a joint topic or problem. In all these cases, infants constantly monitor the adult and her attention as they either attempt to direct her attention communicatively, reproduce her actions imitatively, or work together cognitively.

Chimpanzees and other great apes follow the gaze direction of others to external targets, as documented previously, but there is no evidence that they engage with others triadically toward external objects. They can of course look back and forth from a person to an object, but there is no evidence that they engage with the person in a manner enabling us to call it triadic or joint attending. Three studies have specifically looked for joint attention in chimpanzees. First, Carpenter et al. (1995) looked at six chimpanzees interacting dyadically with a human. Although there was some looking back and forth between objects and the human, these were "checking looks" in which the chimpanzee was merely checking to see that the human was still there, not attempting to share attention with her. And there were no ape attempts to initiate joint attention. Second, Tomasello and Carpenter (2005a) had a human adult engage with three young human-raised chimpanzees around objects. Again there was some visual checking back with the human, but the apes did not engage in the kind of active monitoring of the other that human infants do, and they did not engage with the other about the object in any way emotionally. And again there were no active attempts from chimpanzees to establish joint attention communicatively. Third, Tomonaga et al. (2004) also attempted repeatedly to engage several young chimpanzees in triadic activities around toys, but to no avail. They also gave the chimpanzee infants and their mothers opportunities to share interest and attention to objects between themselves, again to no avail. They observed no attempts on the part of the young chimpanzees to actively solicit joint attention from their partner via such acts as showing or offering or pointing to objects.

The progress of joint attention during human infants' second year of life is fairly well documented. Bakeman and Adamson (1984) looked longitudinally at the way in which infants and their mothers engaged in joint attentional interactions from six to eighteen months of age. They categorized different types of joint visual attention, with the most sophisticated—that is, the one that most clearly involved mothers and infants sharing interest and attention to things—being called coordinated joint attention. The overall percentage of time spent in coordinated joint attention was fairly low—such "quality time" requires effort on both their parts—but it increased steadily over the months, especially from twelve to fifteen months of age. Interestingly, Bakeman and Adamson also looked at infant peers interacting together. They found little coordinated joint engagement between them. This finding is consistent with the proposal that at this early developmental period joint attention is a mode of interaction that adapts infants especially for interactions with their adult caregivers.

Carpenter et al. (1998b) replicated and extended these basic results. One interesting new result was that coordinated joint attention began to level off at around fourteen months of age. In two follow-up sessions with this same sample of infants, at eighteen and twenty-four months, this leveling off was further confirmed. The authors took this to indicate that joint visual attention is necessary early in development for infants to share psychological states with others, but during the course of the second year of life linguistic communication takes over much of that function. For example, whereas a thirteen-month-old might coordinate visual attention with her mother and an object, perhaps even holding out and showing the object to her, several months later she might simply name the object for her mother while maintaining her visual attention on the object.

Joint attentional interactions are obviously related to such things as gaze following, on the one hand, and cooperative communication, on the other. Interestingly, Carpenter et al. (1998b) found in their longitudinal sample a fairly stable and robust developmental sequence: most infants engaged first in acts of sharing attention with others to nearby objects, and then later in attempts to follow the gaze direction of others to distant objects, and then later still in active attempts to direct the attention of others to outside objects communicatively. This ordering suggests that one-year-olds' following into the visual attention of others—because it has been preceded by acts of coordinated joint attention—does indeed involve sharing attention once the target is located, and that directing the attention of others is an invitation to joint attention. Our hypothesis is that emerging capacities for joint intentionality transform dyadic behaviors that would be performed by great apes into triadic acts of joint attention constituted by a dual-level structure of sharedness (joint attention) and individuality (perspective).

Common Ground and Cultural Common Ground

When infants share attention with an adult they pay special attention to what he is experiencing. Thus, Moll and Tomasello (2007b; see also Moll et al. 2007) had fourteen-month-old infants observe an adult (from afar) manipulating an object. Later infants did not recognize that he was familiar with that object (they thought it was new for him). But if infants interacted with an adult and an object triadically in joint attention, then later they did know that it was familiar to him. It seems that when an infant and an adult jointly attend to a situation they register and recall that both of them experienced it. And it also creates for them a shared experience, which they can draw on later as their personal common ground.

From almost as soon as they begin to engage in joint attention, human infants begin to create personal common ground with particular others. For example, in a study of twelve- and eighteen-month-olds, Tomasello and Haberl (2003) had an adult approach a row of four objects, look generally at the row (not individual objects), and exclaim excitedly, "Wow! Cool! Look at that! Can you give it to me?" The trick was that the infant and that adult had previously shared attention to three of the objects, and so their existence and characteristics were part of their common ground, but they had never before shared attention to the fourth object. (The infant had actually shared attention to this fourth object with another adult, so all four objects were equally familiar to the infant.) Because it would be bizarre for this adult to express excitement about one of the previously shared objects, which were old news for them, she was presumably excited about the new object that they had not experienced together previously. And indeed infants of both ages made the inference that the adult was excited about the object that they had not shared before which thus was not part of their common ground. One might object that the infants in this study were simply tracking what the adult had experienced as an individual, not what "we" have experienced together. But Moll et al. (2008) specifically compared two conditions in which the adult was equally familiar with an object, but in one case the infant and adult had shared attention to it whereas in the other the adult had interacted with it alone (while the child observed from afar). When the adult (looking ambiguously at all objects) then acted as if he recognized one of the objects and asked for it, fourteen-month-old infants assumed the request was directed at the one that "we" had shared.

In a related study, Liebal et al. (2009) had fourteen- and eighteen-month-old infants and an adult tidy up together by picking up toys and putting them in a basket. At one point the adult stopped and pointed to a target toy, which the infant then tidied up into the basket. However, when the infant and adult were cleaning up in exactly this same way, and a second adult who had not shared this context entered the room and pointed toward the target toy in exactly the same way, infants did not put the toy away into the basket; they mostly just handed it to him, presumably because the second adult had not shared the cleaning-up game with them as common ground. Infants' interpretations thus did not depend on their own current egocentric activities and interests, which were the same in both cases, but rather on their shared experience with each of the pointing adults. In a follow-up study, Liebal et al. (2009) actually found that eighteen-month-olds interpreted the exact same pointing gesture to the exact same object differently if it was produced by different adults with whom they had different common ground; that is, for an adult with whom they had previously assembled a puzzle, they took the object to the puzzle, whereas for an adult with whom they had previously tidied up toys, they put it in the basket. Infants just after their first birthdays were able to keep track of what they had and had not shared—what was in their personal common ground—with specific other individuals.

As documented in Chapter 2, great apes form social relationships with other individuals, and this certainly involves learning and remembering things about their interactions with these specific individuals. But there is no evidence that this is anything other than individual learning. That is to say, although each of them may remember the same things about their past interactions, they do not share the knowledge that they both remember them. In the only experiment testing for something in this direction, Tomasello and Carpenter (2005a) reproduced something like the previous Tomasello and Haberl experiment. Specifically, a human shared an experience with each of three human-raised apes about the contents of a bucket, then later looked in the bucket with surprise and excitement. This should have cued the apes that something additional or different was now in the bucket—because the human would not be expressing excitement if it was the same thing "we" had shared before—but it did not (as it did in human infants). It is possible that the difficulty for the apes was something else having to do with the communicative act—we cannot tell from this single result—but in any case, there is no experimental evidence that apes create common ground with others.

In addition to their forming personal common ground with other individuals, at around three years of age children come to understand the cultural common ground they share with all others in their cultural group, even if they did not experience anything together with those individuals directly. Thus, any two adult Americans meeting on the street can assume as part of their cultural common ground everything from the Humpty Dumpty nursery rhyme to the current president. At around three years of age, as their skills of collective intentionality are maturing, children begin to tune into cultural common ground. Liebal et al. (2013) had three- and five-year-old children meet a novel adult (clearly from their group). This in-group stranger then asked them sincerely, "Who is that?" while they looked together in the direction of a Santa Claus toy and a toy that the child had just made before the adult entered. Children answered by naming the newly created toy, showing an understanding that no one in the culture, not even someone they have never before met, needs to ask who Santa Claus is. (In a second condition, if the stranger seemed to recognize one of the two toys, the children picked Santa Claus.) Children in this same age range also expect that in-group strangers will know the conventional name of an object, but not a novel, arbitrary fact about that same object (Diesendruck et al. 2010). Cultural common ground of this type is indeed almost definitional of culture, as a culture is constituted by those practices, norms, and institutions that we all know that we all know together collectively. An important consequence of children's participation in cultural common ground is thus the ability to take a fully agent-independent perspective on things: an "objective" perspective. This "objective" view is bolstered in important ways by language and pedagogy, as we shall see in the next two chapters, and it represents the first emergence of children's skills not just of joint intentionality but also of the collective intentionality associated with group-minded social conventions and norms.

Joint attention and common ground, both personal and cultural, constitute the necessary intersubjective infrastructure for many other uniquely human activities. Joint attention enables individuals to coordinate their ongoing collaborative activities; personal common ground enables effective and efficient communication; and cultural common ground is the basis for conventional cultural practices based on collective intentionality. These intersubjective engagements also set the stage, as we will soon see, for young children's attempts to coordinate with the perspective of others in various ways.

Individual and Cultural Variation

All available evidence suggests that all human infants are capable of some sort of emotion sharing and protoconversation (with smiling and laughing). The general finding is that, although adults interact with infants in different ways across different cultures, the infants themselves end up with similar skills. For example, LeVine et al. (1994) report that Gussi mothers in eastern Africa engage in mutual eye gaze with their infants less than one-third as much as Western middle-class mothers. Gaskins (2006) reports that Yucatec Mayan mothers make and maintain eye contact with their infants hardly at all. And in the most detailed study to date, Demuth (2009) compared mother–infant communication in a Western middle-class culture with that in a more traditional, rural culture in western Africa (the Nso), and found that the Western mothers tended to treat their infants as equal communicative partners, whereas the Nso mothers treated their infants "as novices who need to learn compliance and subordination" (169). Nevertheless, despite these cultural differences in *adult* behavior, as far as we know infants' skills in protoconversation are similar in all cultures.

In terms of joint attention, many anthropologists report that adults from many small-scale cultures engage very little with infants in joint attentional interactions. Thus, Gaskins (1999) reports that whereas Yucatec Mayan twelve-month-olds spend as much time in object manipulation as do Western, middle-class infants of the same age, the Mayan infants almost always do this in solitary mode, whereas the Western middle-class infants often do it in social interaction with adults. Gaskins (2006) also notes that in many traditional cultures parents almost never play with young infants around objects (she cites the Kaluli, the Somoans, the Gussi, and the Mayans) mainly because adults have little free time to engage in this kind of "nonproductive" play; in addition, adult play with children is inappropriate because children are expected to adapt to the adult world, not vice versa. Most often, parents simply give the infant an object or place it in front of the infant and then go about their business. Nevertheless, despite these cultural differences in adult behavior, as far as we know, infants' skills in joint attention are similar in all cultures. Indeed, in the only experimental test to date, Callaghan et al. (2011) found that eleven-month-old infants in three very different cultures (middle-class Canadian, rural nonliterate Peruvian, rural nonliterate Indian) all engaged similarly in joint attention with a novel adult.

These cross-cultural data thus document differences in adult behavior but overall similarity in infant outcomes, implying a fairly strong maturational component in the ontogeny of children's earliest skills of joint attention. Additional evidence comes from the biological syndrome of autism spectrum disorder. Children on the autism spectrum are often not diagnosed until they are somewhat older, when their deficits in communication and language are especially salient, so there are no studies of protoconversation per se. But Hobson (2002) has found that in general children with autism are not as motivated or capable of engaging with others emotionally as are typically developing children. In addition, other research has documented early and serious deficits in autists' skills and motivations for joint attention. Mundy and Newell (2007) and Rogers and Pennington (1991) have provided theoretical accounts of autism focused specifically on deficits in joint attention. They find that young children with autism engage in less coordinated joint attention with adults, and they are less likely to initiate bouts of joint attention communicatively. The overall proposal of these researchers is that deficits in skills and motivations for joint attention—for sharing emotions and experiences with others—is precisely what children with autism lack, and this accounts for their great difficulties across a wide array of social behaviors from gaze following to linguistic communication.

It is also worth recalling that in samples of children with similar social experience—for example, from middle-class Western families—individual variability in age of emergence is typically quite small (Carpenter et al. 1998b). Nevertheless, as we shall see in the next two chapters, individual differences in the amount and style of joint attentional interactions that children have with adults has significant consequences for their language development and cultural learning. This means that even though there is a strong maturational component in the development of children's earliest skills and motivations for joint attention—all typically developing children in all typical human environments receive sufficient amounts of the right kinds of social experience for normal ontogeny—there is also significant developmental plasticity as well, due in part to individual children's different social experiences.

The Coordination of Perspectives

A key claim in the current account is that children's skills of perspective-taking originate in social interactions structured by joint attention. With joint attention we may say that we are attending to the same thing, only differently; we are triangulating on it, each with our own viewing angle. Without joint attention, there is no common object on which the two of us may have different viewing angles, and so no sense of perspective. A shared focus of attention thus creates the possibility of multiple perspectives on the same thing (Moll and Tomasello 2007a).

As we conceptualize it here, then, perspective-taking requires that a subject imagine more than one way of perceiving or understanding a given entity or situation; there can be no such thing as a single perspective on something without at least the possibility of other perspectives on it. What we have called "imagining what another sees and knows" does not involve different perspectives in this same way; the subject is imagining the other's experience, but her own experience is not part of her mental processing. This is what we meant in saying that in the ape food competition experiments the mental states that participants were tracking were nonperspectival; the apes were tracking what their competitor directly perceived, with their own perception of the situation not an object of attention at all (the participant is seeing "through" his perceptual experience, not examining it or comparing it to something else). When the participant is imagining the competitor seeing something (or not), he is simply tracking her perceptual experience—full stop—irrespective of what he himself is or is not experiencing. Without an awareness of multiple potential ways of seeing the situation, an individual cannot be said to be taking perspectives at all.

Mature humans may of course attend by themselves to an entity or situation from multiple perspectives simultaneously, outside of any social interaction. But this is a developmental achievement, not its starting point. Infants begin by not being able to take perspectives at all outside of social interaction with others. They become capable of such perspective-taking through attempts at social, especially communicative, coordination with others with whom they are interacting. A child growing up in social isolation would not end up entertaining multiple perspectives on a situation at all because she never experienced the necessary joint attentional interactions with others.

There are three types of joint attentional interaction—all involving communication—that lead infants and young children to take the perspective of an interactive partner: (1) attempts at aligning perspectives, as infants engage with others in their earliest communicative (mostly gestural) interactions; (2) exchanging perspectives, as toddlers become capable of multiturn conversations in a conventional language focused on a common topic; and (3) coordinating the conflicting perspectives that arise in conversation (via some kind of executive regulation) as they begin to understand, at around three years of age, that there is an "objective" perspective with which others may conflict.

Aligning Perspectives

Joint attention is a back-and-forth negotiation in which two partners in an interaction not only have shared goals and interests but each has her own individual goals and interests as well. So partners must keep reestablishing or maintaining their joint attention as they move along. The joint attention is defined, in most cases, by what we are doing together: we are eating lunch, we are walking to the park, we are putting on your shoes, and so forth. Individual agents pay attention to things relevant to their individual goals, so partners in a joint agency pay joint attention to things relevant to their joint goals. The process is thus one of individuals constantly attempting to align their goals and attention.

The aligning of attention may happen as one individual simply follows into the attention of the other, and then they somehow acknowledge that they are now in joint attention (for example, by a mutual look). But often one individual actively attempts to align attention with the other via cooperative communication. In the prototypical situation with infant and adult, one of the partners offers an object to the other, or shows an object to the other, or points to some interesting event, or even uses a simple piece of language. The process is one in which the communicator has a goal that the recipient attend to what he, the communicator, is already attending to; his (referential) goal is thus the aligning of their attention in joint attention (Tomasello 1998, 2008). The recipient, if she accedes, goes from her own individual attention on something to jointly attending with her partner. The interpersonal negotiation here is thus each partner's sequential shifting from individual to joint attention, as either communicator or recipient.

I am not claiming that the joint attentional and communicative interactions of fourteen- and eighteen-month-old infants with adults are instances of full-blown perspective-taking, as this term is normally used. But unlike simply imagining what another person is seeing, with no attention at all to one's own seeing, negotiating joint attention brings into focus the *relationship* between the content of my partner's attention and my own. We are not now aligned, but at least one of us wants us to be; to know that we are now aligned, there must be at least some imagining of the content of both perspectives—my partner's and my own—and their relationship. This requires an executive level of functioning in which the two perspectives may be compared in the same representational format to see whether there is alignment or not.

Exchanging Perspectives

Conventional linguistic communication is perspectival all the way down. Words embody perspectives on things. This animal in front of me may be a *dog,* an *animal,* a *pet,* or *pest,* depending on how I choose to construe it for my listener in the current context. This action in front of me may be *running, fleeting, chasing,* or *hunting,* again depending on how I choose to construe it in the communicative context. Grammatical constructions are also perspectival. I can say about a single event using the same basic words that *John kicked the ball, The ball was kicked by John, The ball was kicked, It was John that kicked the ball, It was the ball that John kicked, What John kicked was the ball, What got kicked was the ball,* and so forth. Basically, to communicate effectively using language, one must choose a perspective on the referential scene—at several different levels of analysis—tailored to the knowledge and expectations of the communicative partner.

But beyond just the choice of words and constructions, people often engage in conversations. A conversation involves multiple linguistic turns between partners over time, all relevant in some way to a common topic: the topic-comment structure of conversational interaction. Conversations may thus be seen as a kind of "joint attention to mental content" (O'Madagain and Tomasello, forthcoming). That is, you make an utterance expressing some kind of mental content—"The cat is on the mat"—and I respond with an utterance on the same topic: "It's an Abyssinian." You may then respond with a disagreement: "No, it's a Siamese." We are jointly attending to a topic (the cat), and we are expressing attitudes or perspectives on that topic. Engaging in conversation in this way may be thought of as exchanging perspectives.

Young children's earliest language is organized mainly at the level of the individual utterance. There are some brief exchanges, such as question and answer, and some consecutive utterances about the same referent. But if we define conversation more rigorously as partners taking turns making their own individual comments about a mutually understood topic, then young children only begin the process at about two-and-a-half years of age, a year after they have begun naming things and saying simple sentences (Mannle et al. 1992). And this enables the first joint attention to mental contents: the child says, "That bird has a worm in his mouth," and the mother says, "No, it's a stick," and so on across turns. Mother and child are jointly attending to the child's proposal about the bird and its actions, and they are expressing different perspectives or attitudes toward it. The exchange of perspectives in linguistic discourse—the partners jointly attend to the mental content of both the linguistically expressed topic and each other's comments—is necessary, we would argue, for the child to distinguish between the situation as it is objectively and the situation as each of them believes it to be.

Coordinating Conflicting Perspectives

In many conversations the topic is something simple like the thing in front of us. This topic is often characterized by a linguistic expression that perspectivizes it in some way—for example, as "my pet" or as "a strange-looking cat"—which then determines the relevance of any reply. In this sense all conversations in which the topic has been linguistically expressed involve "joint attention to mental content": a shared focus on a mental construal of something, about which we express different perspectives or attitudes.

But in some of young children's conversations the topic is a proposition. It is some kind of statement such as *That cat is sick,* to which the reply may be *No, it's not* or *You're wrong* or *You're joking,* to which the counter-reply may be *No, really.* The point is that there is a linguistically expressed statement of fact and then some kind of conflicting attitudes (or perspectives) that are linguistically expressed about it. Normally there is pressure in such conversations for the conflict to be resolved in some way. Situations like these are what Perner and colleagues (for example, 2003) call "perspective problems" because the topic of conversation is linguistically expressed mental perspectives about an objective fact that appear to be incompatible. In children's natural conversations, we first see an understanding of such conflicting mental perspectives at around three to three-and-a-half years of age (Bartsch and Wellman 1995).

In general, to resolve the conflict in such cases children must coordinate multiple, simultaneously present perspectives, presumably through some type of executive regulation. Perhaps one of us is wrong; or perhaps we are talking about different cats. Crucially, in perspective problems of this type there always lurks in the background an "objective" perspective that must be coordinated with the partners' differing perspectives as well: the fact of the matter about whether the cat is sick is independent of what anyone believes to be the case, which determines who is correct. Coordinating these three perspectives—yours, mine, and the "objective" perspective—is made possible by the recognition, for example, that some perspectives are illusions, or that some are incorrect, or that the two of them may not be incompatible after all. This manner of functioning is crucial to children's mastery of propositional attitude constructions of the type "I think the cat is sick," "I hope the cat is not sick," or "He believes the cat is sick" (also called sentential complement constructions). In these constructions, the speaker formulates a proposition but embeds it within a propositional attitude such as "I think . . ." Diessel and Tomasello (2001) found that although two- and three-year-olds use such constructions, they mostly use them in formulaic ways that do not require a conceptualization of mental states or perspectives (for example, "I think it's raining" just means, for them, "Maybe it's raining"). It is more like four to five years of age before children understand the coordination of perspectives involved—that is, the cat is "objectively" sick or not, and this is independent of the attitude about this fact that the speaker expresses.

Many different experimental tasks given to children by developmental psychologists document the fact that coordinating conflicting perspectives in some rational way creates great difficulties for young children until they are four or five years of age. Classic social-cognitive tasks of this type include most prominently visual perspective-taking, appearance-reality, false belief, and various tasks of linguistic aspectuality (for example, dual naming, class inclusion). Recent research has shown in each of these tasks that three-year-olds, or even two-year-olds in some cases, can take different perspectives on things on different occasions. But when these different perspectives are about the same situation at the same time—and they conflict with respect to the objective situation—two- and three-year-olds struggle. When two-year-olds and apes perform well in the anticipatory looking version of a false-belief task, they are only attempting to discern how the agent will behave given what it has experienced in the past. Their own point of view on the situation is not salient or relevant, so there is no conflict needing to be resolved. But for four- and five-year-olds there is a conflict, and resolving it requires them to construct, over time, various concepts that depend in one way or another on the distinction between the subjective situation (appearance, opinion, belief) and the objective situation (reality, fact, truth).

Visual Perspective-Taking The classic task of visual perspective-taking is Piaget's famous three-mountains task, but it turns out that this is an especially difficult task for many reasons (especially as the child is not communicatively engaged with the person whose perspective she is supposed to take; Moll and Kadipasaoglu 2013). Almost as famous is the turtle task, in which the child and adult view a picture of a turtle from opposite sides of a table, and the child is asked, in various ways, how the turtle appears to each of them (for example, right-side-up or upside-down). This task forces the child to compare how she sees the turtle to how the adult sees it at the same time; apparently, until children are four to five years of age they see a conflict in saying that the turtle is right-side-up and, at the same time, upside-down (for example, Flavell et al. 1981).

A pair of recent studies have helped to identify what makes this seemingly simple task so difficult for preschool children. Moll and Meltzoff (2011) gave children, around their third birthday, experience with a color filter that changed the apparent color of the things behind it when they looked through it. Children were then presented with two identical blue objects. The trick was that one of the objects was viewed by an adult on the other side of a table through a yellow filter so that it appeared green. Then the adult, looking straight ahead, then requested either "the blue one" or "the green one." Even though the objects appeared identical to the child, they chose the correct one for the adult in both cases. In a second study, children of the same age showed that they understood on which side of the yellow filter they had to place a blue object for the adult to see it as green, even though it still appeared blue from their viewing angle. This study thus clearly shows that children can understand *how* something appears to another person even though it does not appear that way to them—classic level 2 perspective-taking—by the time of their third birthday.

In a follow-up study, Moll et al. (2013) argued that whereas these previous studies clearly showed that children can understand how something appears to another person even when it does not appear that way to themselves, there is still another dimension to the process. In the Moll and Meltzoff study, children could simply look at the two objects to see which one of them appeared green to the other person without really taking their own perspective into account. Moll et al. (2013) therefore modified the task so that children had to identify (either verbally or by pointing to a color sample) the color of the same object from both their own perspective and the perspective of a person sitting on the other side of a color filter, at more or less the same time. (They were asked, "How does it appear to you? And to me?") In this case, three-year-olds were often "pulled to the real"—they said the object appeared blue to the adult. Only the four-and-a-half-year-olds understood that the exact same object that appeared blue to them also appeared green to the adult across the table.

Although there is nothing inconsistent about an object appearing blue to me and green to you if color filters are involved, it is likely that three-year-olds think of color as an objective attribute—something cannot be simultaneously green (all over) and also blue (all over). Thus, given that three-year-olds are quite good at imagining what others see *simpliciter,* it is likely that their emerging sense of an "objective" perspective—what color the thing really is—and their ability to coordinate two perspectives simultaneously end up interfering with their ability to take into account the visual perspective of the other person when they must explicitly compare it with their own.

Appearance-Reality The classic appearance-reality task involves children understanding that an object that appears to be one thing is really another—for example, an object that looks like a rock is really a sponge (for example, Flavell et al. 1981). Again, children struggle with this task until they are four to five years of age.

Krachun et al. (2009; see also Karg et al. 2014) administered a nonverbal appearance-reality task both to chimpanzees and to four-and-a-half-year-old human children. In various conditions, the subjects saw a larger and a smaller grape go behind either a magnifying lens or a minimizing lens that made them appear either larger or smaller than they really were. Some chimpanzees and most children were nevertheless able to track the larger grape. But this is not surprising because once they saw the real size of the grape they could simply discount the distortion when they saw the grape pass behind the lens—they could track the object. Being aware of this issue, in a control condition Krachun et al. had the subjects watch one grape being placed behind a magnifying lens and another being placed behind a minimizing lens, with one lens stacked on top of the other vertically. An occluder was then raised, and the two grapes (still behind their lenses) were moved to left and right positions. In this condition the subject could not actually track through space the physical objects involved. Nevertheless, most children and a few chimpanzees were successful. However, what they likely did was to encode before the occluder was raised that the large one now looked smaller; then, at the moment of choice they selected the one that looked smaller, a kind of simulated tracking. Thus, there is no good evidence to date that apes understand that an object or situation may appear one way but, at the same time, really be some other way. Apes merely zero in on reality as best as they can in the situation, with no processing of alternative perspectives.

Moll and Tomasello (2012) modified the classic appearance-reality task. In a first study they presented three-year-olds with a nondeceptive and a deceptive object: a bar of chocolate and an eraser that looked like a bar of chocolate. The child was asked to point to the "real" bar of chocolate or "the one that only looks like" a bar of chocolate. The children were mostly successful in identifying both objects correctly. However, in a second study children of this same age were presented with a single ambiguous object and asked to point to one of two exemplars—an eraser or a bar of chocolate—when asked what this single object "only looks like" and what it "really is." The children were not able to answer this pair of questions about a single object correctly—even though when asked these same questions about two different objects they could.

Moll and Tomasello interpreted this finding in the same way as their finding about visual perspective-taking: in the first task, children only needed to conceptualize an object in one way at a time (for example, as chocolate or eraser); in the second task, they needed to conceptualize it in two different ways simultaneously, and these were ways that seemed to conflict. As in the visual perspective-taking task, it is likely that the three-year-olds had trouble because they were invoking an "objective" perspective such that the object cannot be two things at the same time. Older children resolve this conflict by constructing a new understanding of the situation that accommodates the different perspectives involved. There is no conflict: objects can appear as one thing but function as another.

False Belief Another problem of this same general type confronts children in the false-belief task. In the classic version, an adult sees an object placed in a cabinet and then leaves the room, at which point the object is moved to the refrigerator. When asked where the adult will search for the object, three-year-olds tend to say the refrigerator (where it really is) whereas four-year-olds tend to say the cabinet (where the adult saw it and so believes it to be) (see Wellman et al. 2001, for a review).

The false-belief task has been given to great apes in a number of different paradigms. We have already reviewed evidence that they, like human infants, look in anticipation toward the location at which an agent imagines an object to be, not where they themselves know it to be (Krupenye et al. 2016). But apes consistently fail false-belief tasks that require them to make a behavioral decision. For example, they do not behave differently with a competitor who does not know where a contested piece of food is located (he is ignorant) from one who believes it is somewhere where it is not (he has a false belief) (Hare et al. 2001; Kaminski et al. 2008; Karg et al. 2015a; for a review, see Tomasello and Moll 2013). One possibility is that the apes do not discriminate ignorance from false belief in these studies because they do not understand the basic notion of an objective situation that opposes different subjective perspectives (which may conflict with each other or with the objective situation). To repeat from earlier: apes simply track the knowledge states of the other—full stop.

Something similar might be said about human infants in looking time studies of false belief (for example, Onishi and Baillargeon 2005; Southgate et al. 2007): they track the knowledge states of the actor but do not compare them to their own knowledge states or to the objective situation. Buttelmann et al. (2009; see also Buttelmann et al. 2014) tested infants' understanding of false belief in a more action-based paradigm. Eighteen-month-olds watched while an adult placed a favorite toy into a box. The adult then left the room (in the false-belief condition), and the child and a research assistant moved the toy to a different box. The adult then returned to room, approached the box in which he had placed the toy, and tried to open it. The research assistant told the child to "help him." The children did not try to help the adult open the box he was struggling with; rather, the children retrieved the toy from the other box—they presumably thought that the adult wanted the toy but believed it was still in the first box. In a control condition in which the adult stayed in the room and watched the toy's transfer, the children did not fetch the toy but rather tried to help the adult open the difficult box. Once again, in this case we might argue that although the infants are tracking knowledge states in impressive ways there are no conflicting perspectives to be coordinated. The infant in this study is not trying to determine the adult's belief but rather his goal—she is asking herself, "What is he trying to do?" and is answering it differently, depending on the knowledge state of the adult. The infant has no need to compare or coordinate perspectives.

The classic tasks of false belief could, in principle, be solved by a similar method of focusing only on the agent and what she has and has not experienced (and how this might affect her behavior). But this would not explain why three-year-olds systematically fail the classic tasks by consistently choosing the location where the object really is. If they were just tracking the actor's knowledge states, like infants, they should pass. Our hypothesis is that this mistake actually represents conceptual progress in that it emanates from an emerging conceptualization of an objective perspective on the situation—how it really is, independent of any individual's subjective perspective. As this understanding is just emerging, three-year-olds apply it too widely, assuming that people guide their search for things by an objective perspective (that is, there is a "pull of the real"; see Perner and Roessler 2012). This assumption makes sense because children are frequently exposed to situations in which an adult knows something that they have not seen her learn; for example, their mother often knows what happened at a friend's house even though she was not there. Three-year-olds' confusion is only exacerbated by the fact that they have a cooperative bias that may lead them to take the experimenter's question about where the agent will look as a question about where he should look (Helming et al. 2014). Eventually, four-year-olds come to see the conflict (she believes it's here when it's really there), so to be successful they have to coordinate these perspectives.

Development is thus, in a sense, *U*-shaped: infants succeed based on tracking the experience of others. Three-year-olds fail as they begin to be able to take an objective perspective on things, which leads them to default to this objective perspective. Four-year-olds succeed as they learn to coordinate subjective and objective perspectives. In the next subsection we will propose an explanation for this developmental trajectory that focuses on children's linguistic discourse with others, especially perspective-shifting discourse about truth-bearing propositions. We should also note that Rubio-Fernandez and Geurts (2013) report an experiment that makes coordinating with an "objective" perspective easier, and they find successful performance in an explicit false-belief task at around three years of age (see also Carpenter et al. 2002).

We do not have absolutely convincing evidence for this view, but one implication is that a child who fully understands beliefs and false beliefs should know that where her evidence is extremely strong (even in the false-belief task when she sees the object being moved to a new location), in principle she herself could be wrong. Infants (and apes) do not know that they themselves could be wrong; if they think something is here but it turns out to be there, they just update their thinking and move on. Three-year-olds also do not know they can be wrong, as they are so focused on the very powerful "objective" perspective. But four- and five-year-olds know that they themselves, as well as the duped protagonist, could be wrong.

In a recent study, O'Madagain, Helming, and Tomasello (forthcoming) found that four- and five-year-old children, but not younger, double-check when challenged to make sure that a previous judgment they made is indeed correct. This means that four- and five-year-olds, unlike apes and infants, can potentially see a conflict of three perspectives—the two "subjective" perspectives in play (theirs and that of the actor) and how each of them might match to an "objective" perspective—and attempt in various ways to coordinate them. One important fact is at least consistent with this view: children's performance in various tasks involving perspective problems is highly correlated, suggesting a common underlying psychological process that presumably involves the coordination of perspectives. Another important fact consistent with this view is that children's skills of executive function—which enable them to attend to multiple things simultaneously and to coordinate them in rational ways—are highly correlated with their ability to solve various perspective problems, including the false-belief task.

The "objective" perspective that plays such an important role in this analysis is not often explicitly singled out for attention in theoretical analyses of false-belief understanding. But it is precisely this perspective that makes it possible that either or both of the participants in the experiment could be wrong. The child's belief in the situation—that the object has moved to a new location in the refrigerator—is implicitly equated with the objective situation (because she has such good evidence). But, in fact, to really understand beliefs and false beliefs, the child must understand that whatever belief she or the adult has, backed by whatever evidence, can always be incorrect. Without an objective standard, we can have all kinds of mind-reading, but not an understanding of false beliefs.

Aspectuality in Language A final task of the same general type is the dual-naming task (Doherty and Perner 1998). Children before the age of four or five years again have trouble reconciling the fact that the same object may be called *horse* or *pony* or in another case *horse* or *animal* (a version of the classic class-inclusion task). Again, in point of fact there is no conflict here once one learns how linguistic labels work; one may call something an animal or a horse or a pony or a filly or a nag or a nuisance, all depending on how one wants to perspectivize the entity or situation for one's communicative partner. In linguistic philosophy, it is said that the same object is being seen or construed under different descriptions or different aspects. But young children may not initially understand the situation exactly like this, and may assume that an object's label is an inherent property such that there is only one objectively correct label (at one time; see Markman 1989), which creates the conflict.

Recently, Rakoczy et al. (2014; see also Perner et al. 2011; Oktay-Gür et al. 2018) tested young children for their understanding of aspectuality. They first saw a trick object in one state and assumed it was a toy carrot and then later saw it in another state and assumed it was a toy rabbit. It was only by four to five years of age that children understood that an object they knew under two different descriptions—carrot and rabbit—could really be the same objective thing. So, again, we may posit that the younger children somehow thought that once something was under one description which defined what it was, it could not simultaneously be something else. Importantly, Rakoczy et al. also found that children's ability to perform well in this dual-identity task correlated quite highly with their performance on a false-belief task designed to be similar in its task structure and demands. This finding provides further support for the idea that many of the classic social-cognitive tasks—all of those described here, for example—involve a coordinating of perspectives, and that children below four or five years of age have difficulty if the coordination involves simultaneously two or more perspectives that conflict, based on a further coordination with an "objective" perspective.

Summary Whether in everyday discourse or in psychological experiments, young children are motivated to resolve conflicting perspectives. Even two-year-olds are motivated to correct someone who calls an animal by the wrong name. But the perspective problems in the classic tests of preschool social cognition present conflicting perspectives on propositions with truth conditions: the toy is either in here or in there; this is really an *x* or a *y*. That is, these tests involve in addition to individual perspectives an "objective" perspective that must be figured into any resolution of the conflict. That is done in different ways in the different tasks. For example, children see an object that appears from different directions as either green or blue (all over), and this seems, on the surface, to not be possible. The solution is simply to recognize that the objective situation may simultaneously appear in different ways from different viewing angles. Similarly, an object may appear to be of one type but, from a different perspective (with different perceptual information), turn out to be something else in terms of what it actually does or is designed to do. The solution again is to recognize that there are two possible perspectives on the same thing—in this case, one of which accords with an "objective" perspective and one of which does not. In false-belief tasks, it is clearly the case that the toy cannot be in two locations at once—which would be the case if both protagonists had an "objective" perspective—so one of them simply has a false perspective (belief) on the situation. And finally, although young preschoolers may find it natural to think of objects' labels as an objective property, this leads them to a non-adult-like reluctance to label the same object with different words. An understanding of the perspectival / aspectual nature of linguistic conventions resolves the problem. Resolution in all of these cases requires a flexible coordination of all the perspectives involved, including an "objective" perspective with which all others must somehow be compatible.

Constructing an "objective" perspective is only possible at the second step of shared intentionality: collective intentionality. Whereas infants and toddlers aligning perspectives with others or even exchanging perspectives with others may involve some coordination of individual perspectives, there is not, in addition, an objective perspective that needs to be coordinated with these. I have previously argued that an objective perspective derives from the attempt of individuals who understand perspectives to construct a kind of perspectiveless perspective (the "view from nowhere," in the terminology of Nagel 1986), as paradoxical as that may seem (Tomasello 2014). This requires "collectivizing" many—potentially an infinity—of perspectives and positing a kind of invariant objectivity that grounds them all. So the claim here is that only after three years of age do children begin to construct an objective perspective; this initially creates difficulties for them by putting two or more perspectives into conflict, but ultimately it facilitates solutions to perspective problems. It does these things because the executive level of cognitive functioning abhors a conflict; to resolve it children are led to construct an understanding of the subjective–objective distinction.

We will see in subsequent chapters covering other developmental pathways that three years of age is indeed a kind of watershed in young children's cognitive and social functioning. This is the age at which they begin to transition from understanding and engaging with other individuals to understanding and engaging with various kinds of group-minded phenomena.

Individual and Cultural Variation

Perspective-taking in all of its various forms has at least some maturational component. First, children with the biological deficit of autism struggle mightily with tasks of false belief and other perspective problems. Some researchers even posit that the inability to understand false beliefs—as indicative of a representational theory of mind—is the key deficit in autism (for example, Baron-Cohen 1997). Second, the age at which children master the false-belief task across a wide range of cultural contexts—from hunter-gatherer to industrialized and highly educated—is very similar (for example, Avis and Harris 1991; Callaghan et al. 2005; Wellman et al. 2008). And third, typically developing children in Western, middle-class culture all begin to understand false beliefs within a fairly narrow age range between four and five years of age (Wellman et al. 2001).

However, there is one dimension of social experience that has been found to have a significant effect on the age at which children come to understand false beliefs, and that is linguistic communication. A number of studies have found correlations in children's skills with language and false-belief understanding (for a review, see Milligan et al. 2007). This relationship does not lead to cross-cultural differences because children growing up in virtually all cultural contexts get enough of the right kind of linguistic interaction for normal development, so individual variation in normal contexts is limited. But children who experience drastic reductions in their linguistic experience are a different story. Peterson and Siegal (1995; see also Woolfe et al. 2002) report that children growing up deaf (and with varying degrees of experience with a conventional sign language) are significantly delayed in their understanding of false beliefs. Moreover, there is a correlation such that the more linguistic experience they have, the better their skills with false beliefs. Even more striking, Pyers and Senghas (2009) report the extreme case of deaf children who grow up with little or no experience with a conventional sign language who fail nonlinguistically administered false-belief tasks even as adults. These atypical cases support the view that the normal developmental pathway for coming to false-belief understanding—and this may apply to the other tasks involving conflicts of perspectives as well—requires an environment in which children experience linguistic communication.

There is no consensus as to which aspects of linguistic communication are key. I have stressed the exchange of (sometimes conflicting) perspectives that occurs in everyday discourse as it is structured by joint attention to mental content. This view is strongly supported by the training study of Lohmann and Tomasello (2003; see also Hale and Tager-Flusberg 2003). They gave three-year-old children who had failed a false-belief task three sessions of training then readministered a similar but different false-belief task. There were four training conditions. In one (the No Language control), children were given experience with deceptive objects that led them, and the experimenter, to have a false belief about the identity of the objects (for example, an apparent chocolate bar that turned out later to be an eraser). In this condition, there was no relevant language (just things like, "Oh, look!), and the children did not progress in their false-belief understanding. But in three other conditions they did progress. In the first of these, children had the same experience with deceptive objects, but the experimenter and the child engaged in discourse about the experience as it unfolded (notably, without the use of any mental state language). For example, initially the experimenter asked the child to say what the object was; then the experimenter presented new information and asked the child to say what the object was; then the experimenter asked the child to say what she had believed the object was at the beginning. This was called perspective-shifting discourse, and it was designed to highlight for the child linguistically different perspectives on—or beliefs about—one and the same object. In a second successful condition, children were not given a deceptive experience but only extra training in propositional attitude constructions of the type: "He knows that it's an eraser." Building on the work of de Villiers (for example, de Villiers and Pyers 2002), Tomasello and Rakoczy (2003) argue that such sentences encode a kind of potential perspective-shifting within a single sentence: the clause *he knows* signals different possible perspectives or beliefs about the fact that the object is an eraser. Finally, the third successful condition produced even greater progress than the other two successful conditions, and that is because it was a combination of the two: children were given experience with deceptive objects while engaging in discourse containing propositional attitude constructions about this experience.

This study demonstrates that perspective-shifting discourse—especially when it contains propositional attitude constructions coordinating a subjective attitude with a potential objective fact—is sufficient to produce, in a relatively short period of time, false-belief understanding in children who otherwise would not attain it (as they did not in the No Language control condition). Why does discourse of precisely this type lead three-year-olds to an understanding of false beliefs? Children have nonlinguistic experience all day every day in which they believe something to be the case that turns out not to be, or in which they see a person making a mistake that she would never make if she understood the true situation. Why is this not enough? Following O'Madagain and Tomasello (forthcoming), my view is that discourse around a common topic creates exactly the kind of dual-level structure that makes the notion of different perspectives on a common focus of attention possible in the first place—but now on a new level. With language, we overtly specify conversational topics, and we may then express different perspectives or attitudes about those topics' mental contents. We now have joint attention to, and different perspectives toward, mental content. When the topic is a truth-bearing proposition, different discourse perspectives on that mental content can actually conflict in the sense that both cannot correspond in a straightforward way to the objective situation. I believe that this kind of discourse leads children to construct a distinction between subjective (appearance, opinion, belief) and objective (reality, fact, truth). And it may be that such discourse is especially effective when it occurs between or among peers, although this has never been experimentally tested. Suggestive evidence comes from the fact that children with siblings pass false-belief tasks reliably earlier than do children without siblings (Ruffman et al. 1998).

The other variable consistently found to correlate with false-belief understanding is executive function. In many different studies, young children's ability to coordinate perspectives and inhibit perspectives—as measured by various tasks of executive function—correlate quite highly with tasks of false belief and other perspective coordination problems (for example, Carlson and Moses 2001). When executive resources are experimentally "depleted," performance in false-belief tasks suffers (Powell and Carey 2017), suggesting not just a correlational but a causal link. Coordinating different perspectives on one and the same situation requires powerful capacities of executive regulation presumably because two perspectives, and perhaps an objective perspective as well, must be directly compared in a common representational format (and any conflicts resolved).

As in the case of language, there is no consensus about precisely which skills of executive function are involved in the development of false-belief understanding. However, three different studies suggest that it is not just skills of inhibitory control at work (for example, the child coming to inhibit the pull of the real), but rather skills for coordinating perspectives or mental states. First, in the meta-analysis of Devine and Hughes (2014), the strongest correlation with false-belief understanding across many studies did not come from any measure of delay of gratification (inhibition only) but rather from the Dimension Change Card

Sort (DCCS) task, which measures something more like coordination of perspectives (often characterized as "cognitive flexibility"). Second, Diaz and Farrar (2017) found basically the same thing, with the DCCS task in their longitudinal study, showing a stronger correlation with later false-belief understanding than other (inhibitory control) measures of executive function. Finally, and even more specifically, Fizke et al. (2014) administered several measures of executive function and several measures of mental state understanding to four-year-olds. They found that "relations [between executive function and false-belief understanding] are strongest in such tasks where the ascriber herself is one of the two agents, that is has a belief or desire herself that stands in contrast to that to be ascribed to someone else. All in all, these findings suggest that executive function figures . . . in coordinating others' and one's own conflicting perspectives" (315). It is perhaps relevant in this same vein that one recent study found that executive function does not correlate with performance in infant false-belief tasks (perhaps because they do not involve any coordinations), but it does correlate with classic false-belief tasks (Grosse Wiesmann et al. 2017).

Overall, the understanding of perspectives and beliefs is a developmental achievement requiring the species-typical ontogeny of basic skills of joint intentionality such as joint attention and, after age three, skills of collective intentionality for taking an objective view of things. An integral part of this ontogenetic process is some specific social-interactional processes—those that occur in perspective-shifting discourse with others, involving participants engaging in joint attention to mental contents. In normal human environments across cultures, all typically developing children get enough of the right kinds of experience so that cross-cultural variations are typically small. The clash of perspectives in such discourse serves as the raw material, as it were, to processes of executive self-regulation. These executive processes naturally work to resolve clashes of perspective in the raw experiential material by constructing—in the single representational format of the executive level—new forms of understanding in order to make initially puzzling phenomena comprehensible: an object can appear differently to different individuals; an object can appear to be one thing but really be another; people can believe something that is not the case; and one item of experience may have many labels.

Becoming "Objective"

A chimpanzee sees a monkey escaping, and he knows that his conspecific sitting next to him sees the monkey escaping also. The conspecific knows the same of his partner. They both are attending to the monkey escaping, and each knows that the other is too. But they are not *jointly* attending to it; they are not attending to it together as a "we." Two humans in that same situation could, if so motivated, attend to the monkey escaping together in joint attention. This creates between the two of them a kind of shared world, within which they each distinguish their two perspectives. They each also understand that both of their perspectives—that is, their beliefs—on the situation could potentially contrast with an objective (perspectiveless) view of it. Welcome to human reality.

Theoretical Explanations

The existing range of theoretical explanations for the ontogeny of humans' unique skills of social cognition is very broad. Different accounts focus on different explanatory factors—invoking everything from innate modules to explicit instruction from the culture—and sometimes focus on different segments of the total development pathway as I have described it here.

Focusing on the finding that children with autism perform poorly on tasks of false-belief understanding, theorists such as Leslie (1994) have hypothesized the existence of an innate "theory of mind" module. Based on similar findings concerning children with autism and deficits in joint attention, Baron-Cohen (1995) has proposed as additional innate modules a shared-attention mechanism and an eye-detection device. Innate modules are supposed to unfold relatively independent of specific experiences, and they are not supposed to interact in meaningful ways with one another or with other domains of psychological development. Empirically, the problem is that much evidence suggests that joint attention and "theory of mind" are neither innate, in the sense intended, nor totally modular. The main problem with innateness is the finding that children with impoverished linguistic experience are severely delayed in false-belief understanding, to the point that those with extreme impoverishment never acquire such understanding at all. The claim that experience is not a necessary factor in the development of false-belief understanding is therefore clearly false. It is not that the ontogeny of false-belief understanding does not have a strong maturational component; it clearly does. But a strong maturational component does not mean an innate module impervious to experience.

The case for joint attention as innate or maturational is much stronger, as befits a skill that emerges so early in ontogeny. Indeed, there are no systematic studies documenting significant individual or cultural differences in skills of joint attention (that is, not just differences in frequency, but qualitative differences), despite wide variation in children's social experiences. But in this case the question is about modularity. In general, the criteria for establishing what is a module are far from rigorous, and they differ significantly among investigators, with no widely accepted procedures for resolving the differences (for a proposal for replacing modules with something more evolutionarily appropriate, see Barrett 2015). In addition, in a recent study, Sodian et al. (2016) found significant correlations between the joint attentional skills of twelve-month-old infants and their subsequent skills of false-belief understanding some three years later (independent of any mediating influence of language). This study not only provides support for a coherent developmental pathway from joint attention to the coordination of perspectives, it also undermines any strong modularity account (see also Nelson et al. 2008). With respect to false-belief understanding in particular, one could still maintain a "two-systems" view (for example, Apperly and Butterfill 2009), but I would maintain that what turns infants' submentalizing into four-year-olds' mentalizing is precisely joint attention and the coordination of perspectives, which provide a plausible explanation for children's performance in a number of other tasks as well.

On the opposite end of the theoretical continuum are approaches emphasizing the role of culture and socialization in the ontogeny of joint attention and false-belief understanding (and related competencies). With respect to joint attention, theorists such as Bruner (1983) and Kaye (1982) have posited that treating infants as intentional agents and competent communicative partners is critical to the development of joint attention. Somewhat similarly, theorists such as Gergely and Watson (1996) and Rochat (2001) have posited that within social interactions it is critical for the infant's social-cognitive development that the adult "mirror" many of the infant's behaviors back to her in face-to-face interactions to provide feedback on their similarity as intentional agents but their difference as individuals. The problem is that there are no data supporting any of these ideas. As I have already noted, there are no systematic studies documenting significant individual or cultural differences in skills of joint attention (that is, not just differences in frequency of participation, but qualitative differences), despite the wide variation in children's social experiences. It is possible that these kinds of learning experiences facilitate the process in some way or to some degree, but the cross-cultural data in particular suggest that they are not a necessary component in the normal developmental pathway.

With respect to false belief, cultural anthropologists for some time have insisted that not all cultures view the workings of the human mind in similar ways (for example, Shweder 1991). That may well be true of adults, as each culture may develop its own folk theory for explaining all kinds of complex adult behaviors. But the data we have discussed on the similarities of false-belief understanding of young children from different cultures—from Western industrialized countries to hunter-gatherer groups—suggest that adult differences are an overlay on the universal childhood process. Nevertheless, Heyes and Frith (2014) have recently proposed that young children do not develop a "theory of mind" spontaneously, on the basis of their own experience, but rather it must be taught to them by adults. Indeed, these authors push an analogy between learning to read books and learning to read minds, that both are cultural skills that need to be culturally inculcated. Much of the evidence they cite in support of this view has to do with the role of language in the development of false-belief understanding, but experience with linguistic communication is not the same thing as cultural instruction. What the data support is the hypothesis that children construct understandings of mental states from their linguistic interactions with others, not that they are explicitly taught about mental states via language, the way they are taught to read. There is basically no empirical support for the idea that young children can only develop an understanding of false belief and the coordination of perspectives if they are taught this by adults.

In between these two extremes of innate modules and adult instruction are theories that stress individual learning and cognitive construction. With respect to false belief, the most well-known account is the so-called theory theory (for example, Gopnik and Wellman 2012). Although there is explicit acknowledgment of a maturational component (expressed as a "starting state nativism" in Gopnik and Meltzoff 1997), the focus is on processes of hypothesis testing and learning. Through the use of something like Bayesian learning algorithms, children come to propose, as does a scientist proposing a theory, hypothetical constructs (for example, beliefs and false beliefs) to explain their observations. The theory theory is in principle applicable to all domains of cognitive development, including an understanding of causal relations in the physical world, with children forming different theories to explain different sets of phenomena. The problem with this approach, in the current view, is that it is insufficiently social. In effect, in this approach young children are operating in the manner we have hypothesized for great apes: they treat inanimate objects and social partners all in the same way, as data for their theory construction using Bayesian algorithms (albeit in domain-specific ways). This way of viewing things could account for the ability to imagine what others perceive and know, in the manner of great apes and human infants; however, without some account of shared intentionality and joint attention, there is no notion of perspective. And without perspective, I would argue, there is no raw material for the coordination of perspectives in coming to understand such things as false beliefs and the appearance-reality distinction. Adding in processes of simulation helps (for example, Harris 2005; Tomasello 1999), but again my view is that a focus solely on the individual child is not sufficient.

Shared intentionality theory occupies the same middle ground as does the theory theory and simulation theory, but the process is not conceptualized as individual learning and cognitive construction but rather as social co-construction within the context of children's shared intentionality interactions with others (including linguistic communication). To specify and concretize our account, I offer the developmental diagram in Figure 3.2. Our starting point is great ape social-cognitive ontogeny (in the "tube" occupied by an infant and juvenile chimpanzee at either end). The key competencies are gaze following and imagining what others perceive / know / infer, which first emerge in great ape ontogeny between three and four years of age (and which have migrated in human ontogeny to an earlier age—see the dotted arrow). But none of these individual abilities is sufficient for uniquely human social cognition; the creation of shared worlds with individual perspectives requires that skills for reading other minds be transformed by the uniquely human skills of shared intentionality.

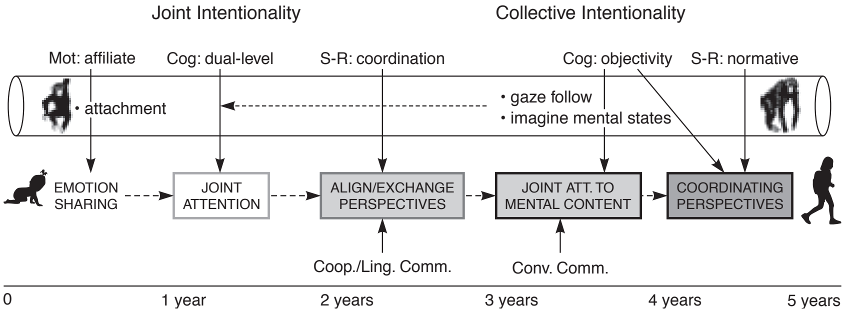

Figure 3.2 The ontogenetic emergence of young children's uniquely human skills of social cognition. Abbreviations: ATT = attention; Cog = cognition; Coop. / Ling. Comm. = cooperative / linguistic communication; Conv. Comm. = conventional communication; Mot = motivation; S-R = executive self-regulation.

The focus of our explanatory attention is the middle row of rectangular boxes in Figure 3.2, flanked by an infant and young child at either end. The explanatory strategy is to invoke basic processes of shared intentionality (depicted in the top two lines above the great ape tube) as the ultimate source of human uniqueness. I conceptualize these ontogenetically as capacities that enter into great ape developmental pathways at the time points indicated (nine months for joint intentionality, and three years for collective intentionality) and, by fundamentally changing the kinds of social experiences individuals may have, transform it.

The first step (first box) is infants' emotion sharing in protoconversations at around two months of age, which evolved as a new way for infants to affiliate and bond with the many adults serving as their caregivers. It is unlikely that learning and experience play significant roles in the early ontogeny of this evolutionarily new form of social engagement (hence no surrounding shaded box); infants smile and laugh with their caregivers naturally, thus strengthening their social bonding without so much learning. Because infant apes also have affiliative emotions and direct emotional expressions toward their caregivers—just not these uniquely human ones—ontogeny in this case is aptly characterized as a transformation of the basic great ape pattern.

Joint attention emerges at around nine to twelve months of age (second box) as infants exercise in their social interaction with others their newly matured capacity for triadic engagement with an adult around an external entity (here labeled as "dual-level," indicating the overall cognitive structuring of joint intentionality as comprising simultaneously shared attention and individual perspectives). There is no question that the great apes' ability to imagine what others perceive and know nonperspectivally is foundational here, and indeed I have argued that in implicit tests of false belief human infants display this great ape ability already in the second year of life. But infants' already existing motivation to share emotions with others, along with the maturation of the dual-level structure, transforms the apes' basically individualistic social cognition into socially shared cognition. The foundation of the nine-month revolution is that infants become able to form with others a joint agent, comprising two partners who act and experience things together as a "we." The lightly shaded box around "joint attention" depicts my contention that this skill would not emerge without social interaction with others, although it does not require adult socialization or instruction and the requisite social interactions are invariably present in basically all human cultures.

The next steps in our account require a child with some reasonable competence in cooperative and linguistic communication (hence the "Cooperative / Linguistic Communication" and "Conventional Communication" skills listed below the boxes, depicting other emerging skills with their own developmental histories). The key skill is conversation in which the child and an adult jointly attend to a common topic of discourse, with each then making comments about that topic, expressing their own perspective on it. First I depict simply exchanging perspectives (third box, requiring a coordination of perspectives, back and forth); "joint attention to mental content" (fourth box) follows, as child and adult focus on the propositional content of what each of them is saying, each recognizing the two distinct perspectives involved. I do not propose in these later cases any additional maturational capacities. Children's skills of joint attention and linguistic communication are sufficient, given the way that human social interaction works in general, for them to begin jointly attending to mental content and seeking to resolve discrepancies. The child on a desert island would have no such clashes, and so no need to resolve anything, which suggests that the process is one of social co-construction.

Of special importance in such discourse interactions are disagreements over the truth-value of propositions because in this case there is an incompatibility of perspectives that would seem, on the surface, to preclude any simple and straightforward solution. What is required is that the child construct some new conceptualizations that resolve the incompatibility.

In the most important cases, a key element in that resolution is a maturing of the capacity of collective intentionality, leading the child to conceptualize the objective situation as distinct from any one person's perspective on it. Indeed, I have argued that the maturation of this conceptualization is initially misleading to three-year-olds; they default to the view that others directly perceive the objective situation, or that an objective entity or event cannot have two different labels, or that an entity is objectively either one thing or another. But then, by activating processes of executive (normative) self-regulation in which she can compare different perspectives or construals of something in one cognitive workspace, in one representational format, the child constructs a solution: only one person is correct about the objective situation, or language actually allows different labels for the same objective situation, or an object can simultaneously appear like one thing but function like another (fifth box). The dark surround in this case indicates that the child herself constructs the outcome from her various social interactive experiences, on the executive level.

In terms of the respective roles of maturation and experience in all of this, the clear pattern is, not surprisingly, that the earlier skills and motivations of joint intentionality are more maturational and less plastic, whereas the later skills and motivations of collective intentionality can only come into being in individuals who have certain kinds of social and communicative interactions with others. But even in this latter case, we are not talking about adult instruction or socialization; rather, children construct, or co-construct, from their sociocultural experiences, and the general nature of these constructions is set by the developmental level of the children's skills and motivations of shared intentionality.

One interesting way of looking at the maturational component is from the point of view of the biological deficits characteristic of children with autism spectrum disorder. Children with this disorder seem to have the general capacity to imagine what others perceive and know (Carpenter et al. 2001), but they display one or another form of atypical development along the uniquely human pathway structured by shared intentionality, with severity varying widely across the spectrum. One hypothesis is that this variation depends mainly on age of onset of the disorder, as an indicator of the skill that is impaired. Thus, high-functioning autistic children (the ones tested in experiments) may have a later onset of the disorder and so have deficits mainly in coordinating perspectives and understanding false beliefs. In more severe cases it may be that the key deficit is in something earlier and more basic, such as in the joint attentional skills that create the possibility of perspectives and beliefs in the first place. And it is even possible that deficits in emotion sharing during early infancy produce children at the most severe end of the spectrum, who have trouble relating to others at all.

The other set of explanatory factors—after maturation and experience—is processes of executive self-regulation. As we discussed earlier, many studies have found that children's skills of executive function underlie their skills in false-belief and similar tasks. Perspectives need to be coordinated—and new ones constructed—in a common representational format on the executive level. Although this interpretation is most plausible for these later tasks involving perspective problems, I would also argue that it is characteristic of children's earlier aligning of perspectives in cooperative communication. Thus, as I have claimed previously, the one-year-old child's new skills of joint attention enable her to view the social interaction in which she is engaged from a bird's-eye view, with both her own and her partner's perspective in a single representational format, which enables the aligning of those perspectives. The coordination of perspectives involves focusing on some, inhibiting others, and sometimes constructing new conceptual perspectives in what we called in Chapter 2 "the individual self-regulation of unique content." Importantly, this coordination is a strategic process involving not just attention and inhibition but also the strategic evaluation of different possibilities (Lee and Carlson 2015).

This account of the early ontogeny of human social cognition is thus not nativistic—although it invokes the maturation of uniquely human capacities as an integral part of the process—but neither does it imagine that children learn these basic capacities from adult instruction. The account is rather constructivist, requiring both the maturation of uniquely human capacities and the unique kinds of experience that these new capacities make possible. Required as well is an executive level in which various subjective perspectives may be coordinated with each other and with an objective perspective and new concepts constructed. The current account is also not a "dual systems" view (so-called modularity lite), but rather one of genuine developmental change or transformation (see Rakoczy 2015).

Cognitive Implications

And so we have the most basic structural framework of uniquely human cognition: socially shared realities and the ability to flexibly manipulate and coordinate different perspectives on aspects of those shared realities (mental coordination). This structural framework fundamentally transforms great ape cognition by turning straightforward cognitive representations into perspectival cognitive representations. Moreover, this framework fundamentally transforms great ape thinking by enabling humans to coordinate these different perspectival representations, first in social / communicative interactions with others, then within their own internalized thinking processes (Tomasello 2014). This creates the possibility of new kinds of concepts—including those that depend on an objective perspective—for understanding not only such social things as false beliefs and linguistic aspectuality, but also such nonsocial things as the relations between different concepts in a hierarchy (as we shall see in Chapter 6).

I have stressed that the construction of this conceptual framework by individual children occurs within their shared intentionality interactions with others (experiences that other species are not capable of having). The medium through which this most often happens is cooperative, including linguistic, communication. Cooperative and linguistic communication are thus of crucial importance in children's developing skills for jointly attending with others to external situations and to one another's ideas—and for mentally coordinating within those shared realities. But cooperative and linguistic communication are interesting and important in their own right as well.

⁓ 4 ⁓

Communication

Joint attention and perspective-taking are so critical to human cooperation and social interaction that the species has evolved new forms of communication built out of them. Although many primates make inferences about what caused an individual to vocalize or act in a certain way (so-called functional reference), humans intentionally refer one another's attention to outside entities and situations—thereby establishing joint attention to them—with the goal of triggering particular inferences. The intentional-inferential structure of human communication gives rise to a number of especially powerful types of mental coordination and perspective-taking (Sperber and Wilson 1986; Tomasello 2008).

In ontogeny, the process begins early as part of the nine-month revolution. With basic skills of joint attention already in place, at around eleven or twelve months infants begin to produce the pointing gesture with the immediate goal of establishing joint attention to some referential situation. But simply following the direction of a pointing finger cannot determine the intended referent. A child pointing in the direction of a dog, for example, might be intending to direct attention to the dog's digging activity, or to the dog's unusual fur, or to the simple fact of the dog's presence. Determining which it is requires a pool of common ground between the pointing infant and her recipient, including shared assumptions about why she wants to establish joint attention in the first place. Thus, if the infant and I are searching together for the dog's bone, I might interpret her pointing gesture based on our common ground understanding that dogs often dig for bones, resulting in something like "perhaps the bone is there, where he is digging." Within the space of our common ground, I make a recursive inference about what she *intends* for me to *think*. The pragmatic infrastructure of this species-unique form of gestural communication is thus none other than the skills and motivations of joint intentionality: joint attention, common ground, cooperative motives, recursive inferences. Iconic gesturing or pantomime—for example, miming a dog chewing a bone—evokes the intended referent symbolically while still depending on the same joint intentionality infrastructure.

At some point in evolution, human communities began to conventionalize the whole process. That is to say, they created particular gestures and sounds that everyone in the community used in the same way when they wanted to establish joint attention to particular referents, even in their absence. These conventions worked because, and only because, everyone shared in cultural common ground how they were conventionally used by everyone. In ontogeny, children do not need to conventionalize communicative symbols because the conventions already exist around them; they simply need to conform. But conforming to the use of a communicative convention is far from straightforward because communicative conventions embody perspectives on things: for example, the exact same entity is *a ball, a toy,* or *a gift from Papa.* In addition, grammatical constructions are conventional schemas whose major function is to symbolize events from a particular perspective: for example, *The apple was eaten* encodes the event from the perspective of the apple, whereas *The girl ate the apple* encodes the event from the perspective of the girl. The perspectival nature of linguistic symbols and constructions—as opposed to the simple abstract representations of apes—endows the language learner's thinking with extraordinary flexibility and power. In addition, the use of linguistic skills of these types in discourse with others—involving all kinds of misunderstandings and perspectival mismatches—facilitates or even enables young children's remarkable abilities to coordinate perspectives as they executively self-regulate their discourse interactions with others.

Obviously, great apes do not communicate with one another using a conventional language. When humans attempt to teach them one—in the form of a manual or graphic sign language—the result is a socially thin version of the real thing. This is no surprise because, in fact, great apes do not even point for one another referentially or gesture for one another iconically in their natural communication. When they are interacting with humans, great apes can learn to use something resembling a pointing gesture, but again the result is a socially thin version of the real thing. The reason great apes do not naturally communicate referentially or conventionally—and thus why their human-taught skills are socially thin—is that they do not possess the shared intentionality infrastructure on which human gestural and linguistic communication is built.

In this chapter, then, we attempt to describe and explain the ontogeny of the quintessential skill of human uniqueness: linguistic communication. But to explain the ontogeny of linguistic communication we must first explain uniquely human cooperative communication, as manifest in the earlier emerging gestures of pointing and pantomiming (which themselves depend on skills and motivations for joint attention). But before this, as always, we begin with great apes to see what they can tell us about evolutionary foundations.

From Apes: Intentional Communication

Biologists consider all kinds of things to be communication, from the bright coloration of birds to the large antlers of deer, requiring only that someone can gain some information from them. But if we focus on the communicator and its psychology, the birds and deer are not using their coloration or horns actively to attain goals. They do not direct these signals to individuals, they do not adjust these signals for different circumstances, and they do not modify these signals if they fail. Indeed, intentional communication with these characteristics is exceedingly rare in the animal kingdom. The majority of nonhuman primate communication is thus not intentional at all, and this includes almost all vocal signals, which are mostly inflexible and stereotypic.

Great apes distinguish themselves from other mammals and primates in using their gestural communication flexibly and intentionally. We know this because, unlike vocalizations, (1) there are many and large individual differences in the gestural repertoires of different individuals of the same species; (2) individuals use the same gesture flexibly for different communicative ends, and also different gestures for the same communicative end; (3) individuals typically produce a gesture only when the recipient is appropriately attentive, and afterward often monitor the recipient's reaction and wait for a response; and (4) individuals sometimes use sequences or combinations of multiple gestures when the other does not react appropriately (see Tomasello et al. 1985, 1989, 1994, 1997; Call and Tomasello 2007). And so, although primate vocal communication obviously shares with human linguistic communication the vocal-auditory channel, great ape gestural communication shares with human linguistic communication foundational aspects of its manner of functioning—the intentional and flexible use of learned communicative signals.

Great Ape Gestural Communication

Great apes employ two basic types of intentional gestures: intention-movements and attention-getters. Intention-movement gestures are social actions that have been ritualized ontogenetically. Ontogenetically ritualized intention-movements are such things as *arm-raise* to initiate play and *touch-back* (by infants to moms) to request being carried. Intention-movement signals are basically abbreviations of full-fledged social actions, and they are almost always dyadic in the sense that the communicator is attempting to influence the behavior of the recipient directly in the interaction (not refer to some third entity).

For those intention-movement gestures that are learned, the learning process, using *arm-raise* to illustrate, goes something like this.

1. Initially one youngster approaches another with rough-and-tumble play in mind, raises his arm in preparation to play-hit the other, and then actually hits and jumps on to begin playing.
2. Over repeated instances, the recipient learns to anticipate this sequence on the basis of the initial arm-raise alone, and so begins to play upon perceiving this initial step.
3. The communicator learns to anticipate this anticipation, and so raises his arm, monitors the recipient, and waits for her to react—expecting this arm-raise to initiate the play.

This process yields an ontogenetically ritualized gesture, *arm-raise,* that the communicator produces intentionally to initiate play. She then monitors the response of the recipient, trying something else if the desired response is not forthcoming. The *touch-back* gesture is learned in a similar way, as the infant initially grabs the mother's back and pulls it down physically so as to climb on; this is then ritualized into a light touch of mom's back, waiting for her to lower it in response (for a detailed longitudinal analysis of this behavior in infant bonobos, see Halina et al. 2013). With intention-movements, the meaning of the gesture derives directly from the original social action.

The other kind of ape gesture is attention-getters, which may be unique to primates or even great apes. Attention-getters are such things as a *ground-slap, poke-at,* and *throw-stuff,* which serve to attract the attention of the recipient to the slapping, poking, or throwing communicator—again mostly in dyadic fashion without external referents. But they operate somewhat differently from intention-movements. What happens in the prototypical case is that the youngster is in a play mood—which is apparent from her mood-induced "play face and posture" display—and the attention-getter serves to draw attention to the display. Another example is when male chimpanzees who are in the mood for sex engage in *leaf-clipping* behavior, which makes a sharp, loud noise that attracts the attention of females to their erect penis. Importantly, in both of these cases the "meaning" or function of the communicative act as a whole resides not in the attention-getting gesture but in the involuntary display, which the individual knows the recipient must see in order to react appropriately. Evidence for this interpretation is that on some occasions apes will actually hide a display from others, such as covering up a facial fear-grimace display with their hands.

Great apes do not use a pointing gesture with one another; it is not a part of their natural communicative repertoire. Interestingly, however, apes who grow up around humans can learn to command others by "pointing" using their whole hand, mostly to things they want to have or locations they want to access (Leavens and Hopkins 1998). One interpretation of this behavior is that it is a kind of ritualized reaching that humans (but not other apes) respond to (as if it were efforts at real reaching) by retrieving objects for them. Thus, for example, van der Goot et al. (2014) presented chimpanzees with a desirable object next to a human but some distance away. Chimpanzees basically never pointed to the desired object; instead they locomoted over to it and then reached ritualistically through the mesh for it (that is, "pointed" for the human). Human infants in this same situation mostly just pointed from a distance. In another recent study, Halina et al. (in press) had a human respond to apes' pointing to food either by looking at it but not giving it (unwilling condition) or by looking in a wrong direction (misunderstanding condition). Apes did not respond differently in the two different conditions, as human infants do (Grosse et al. 2010a), suggesting that their pointing is not so much about directing the attention of others as it is about getting what they want. A reasonable interpretation, therefore, is

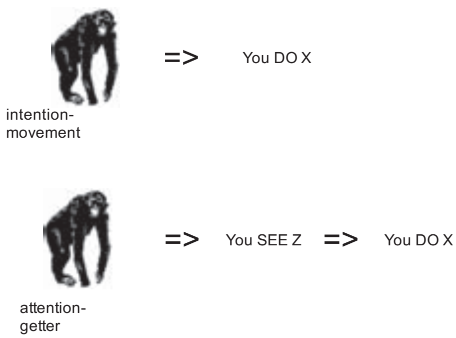

Figure 4.1 Intentionality underlying the two main types of great ape gesture (from Tomasello 2008).

that apes' pointing comprises commands to humans via ritualized reaching.

To summarize, from a psychological point of view, Figure 4.1 depicts the intentional structure of apes' two types of gesture. In all cases, the gesturing ape wants the recipient to do something, and this is effected either directly by an intention-movement or indirectly by an attention-getter in which the gesturing ape wants the recipient to see something (and then, as a result, to do something). As we shall see, these two types of gesture form the evolutionary basis for human children's pantomiming and pointing, respectively.

Human Children

Soon after the middle of the first year, before the nine-month revolution, infants often produce ritualized body movements that are similar to great apes' intention-movement gestures. For example, having tried to climb up an adult and having been picked up as a result, later they might raise their arms toward the adult (and perhaps whine) as a request to be picked up. Such gestures are like great ape intention-movements in that they are exclusively (1) imperative or directive, not informative, in intent, and (2) aimed at regulating the dyadic interaction between the gesturer and another person, not at directing the other's attention to some third, external entity or situation referentially.

Infants also at this age do something similar to great apes' attention-getters by making movements or sounds that draw attention to themselves in acts of what Bates (1976) calls "showing off." And analogous to apes' ritualized reaching *cum* pointing, infants at around nine or ten months of age begin producing a "whole-hand pointing" gesture. Similar to apes, infants perform a kind of ritualized reaching, in which they expect an adult to retrieve an object for them. Liszkowski and Tomasello (2011) found that infants did a fair amount of such ritualized whole-hand pointing in some contexts, always for imperative purposes. Interestingly, this behavior did not correlate with infants' comprehension of an adult's index-finger pointing (whereas infants' own index-finger pointing did so). In a similar vein, Cameron-Faulkner et al. (2015) reported that infants' index-finger pointing was not predicted by their earlier ritualized reaching but rather by their earlier attempts to offer or show objects to adults cooperatively. These findings suggest that whole-hand pointing and index-finger pointing are distinct acts; it is possible that the former represents a legacy from apes whereas the latter emanates from the nine-month revolution and skills of joint intentionality. Indeed, this will be the hypothesis in the next section.

In general, human infants' ritualized gestures emerge at more or less the same developmental period as great apes' ritualized gestures (Figure 4.2). The assumption in both cases is that the particular gestures that apes and infants ritualize derive from particular social interactions,

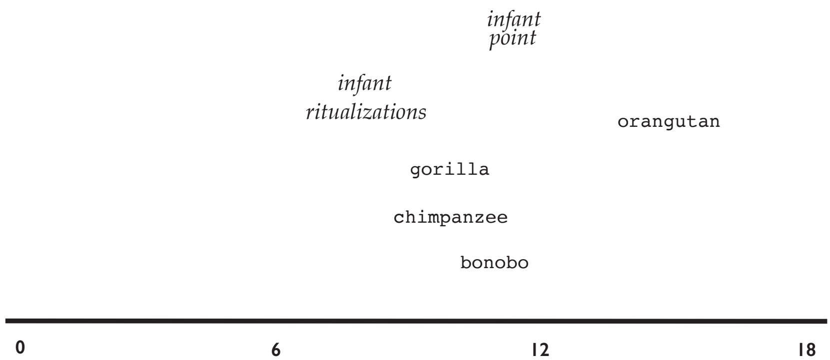

Figure 4.2 Approximate age (in months) of emergence of ritualized gestures for infants of humans (*italics*) and four species of great apes. There are no systematic differences between intention-movements and attention-getters. The age of emergence of human infant pointing is indicated for comparison. Ape data are based on compilation from Tomasello et al. (1994) and Schneider et al. (2012); child approximations are from Bates (1976).

which include reaching and attempts to attract the attention of others to the self. So what infants are inheriting phylogenetically is a capacity for ritualizing social behaviors, although of course each ritualization is individually learned.

Cooperative Communication

Some months after they start producing ritualized gestures, in conjunction with the nine-month joint intentional revolution, infants begin producing some new and species-unique forms of gestural communication. The two main types of infant gesture are (1) pointing, in which the infant invites another person to jointly attend with her to some external situation by protruding her finger in a direction, and (2) pantomiming (or iconic gesture), in which the infant invites another person to join her in imagining a situation by representing it in her own action. Pointing is similar to great ape attention-getters in that the communicator is attempting to manipulate the recipient's attention. Iconic gestures are similar to great ape intention-movements in that the communicator is attempting to communicate by performing, in stylized form, an action. But infants' pointing and pantomiming are used referentially; that is, they are not just to demand action or draw attention to the self but to direct attention (that is, to share attention) to external entities or situations. And the underlying motive is not just to demand something but also, just as often, to inform others of things helpfully or to share information and attitudes with others as a way of expanding common ground.

Pointing

Beginning at around their first birthdays, human infants use index-finger pointing for three basic communicative motives, all cooperative: to request help from the recipient (requestive), to offer helpful information to the recipient (informative), and to express an attitude, such as excitement, that they hope the recipient will share (expressive). These social motives predate the emergence of pointing—requesting help by crying, sharing emotions in protoconversations, and physically helping (emerging contemporaneously)—and are clearly apparent in the contrasting vocal intonations that typically accompany the pointing act: the requestive motive is accompanied by crying or whining; the expressive

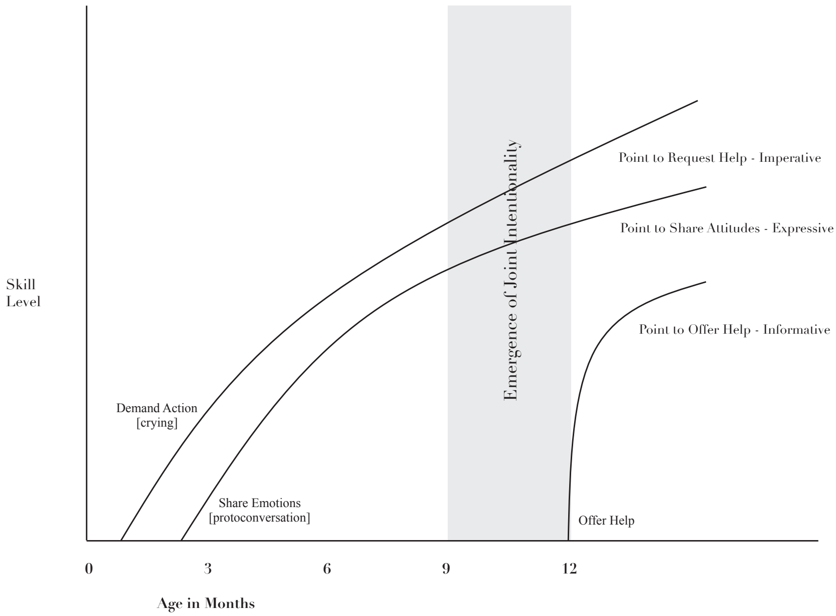

Figure 4.3 A developmental depiction of how three fundamental social motives become transformed by shared intentionality into the three main types of infant pointing, all referential (from Tomasello 2008).

motive is accompanied by expressions of excitement and joy; and the informative motive typically is accompanied by no overt emotional expression at all. Figure 4.3 depicts these originating social motives and also the fact that the emergence of joint intentionality at nine months of age provides the cognitive and motivational infrastructure necessary for infants to begin using pointing communicatively to effect these preexisting social ends.

Expressive Pointing Beginning with the classic research of Werner and Kaplan (1963) and continuing with the first modern researchers of children's early gestures such as Bates (1976) and Bruner (1974), everyone has recognized that human infants often point simply to share interest and attention to some exciting situation, and no one has seriously posited such a communicative motive for any other primate. For example, if an infant and his mother encounter an interesting animal across the park, from around twelve months of age the infant will typically point excitedly toward it, looking to the mother to share his excitement—the basic process of emotion sharing, extended referentially. Importantly, he will also point in this same manner if an object he has already sharing his attention to with an adult begins to do something new and interesting. The referent of a pointing gesture is thus not an object but a whole situation: the fact that an interesting animal has just appeared or the puppet we are looking at is now dancing. (Situations are precursors of propositions; see Tomasello 2014.)

Liszkowski et al. (2004) attempted to identify experimentally exactly what motivates the infant to use an expressive pointing gesture. They had an infant watch some dolls; then suddenly one of the dolls would begin to dance in an animated manner. An adult sat facing the infant with his back to the dolls so that he could not see them without turning around. What was experimentally manipulated was the adult's reaction to the infant's pointing gesture. (1) When the adult did nothing, the infants soon quit pointing. (2) When the adult reciprocated the infant's emotion but never turned around to look at the dolls (testing the hypothesis that the infant simply wanted the adult to show some emotion), the infants kept pointing insistently to try to get the adult to look. (3) When the adult turned around and looked but expressed no emotion (testing the hypothesis that infants simply wanted the adult to look), the infants repeated their pointing gesture for a while but soon became discouraged. (4) When the adult reacted to the infant's pointing gesture by turning around to look at the dolls and then looking back at the infant to express positive emotion and excitement (the key condition: reflecting what adults naturally do most often in the real world), the infants ceased pointing because their goal of sharing interest and attention with the adult had been successfully accomplished. Infants' expressive pointing is designed to share emotions and attitudes with an adult about some external situation.

From an adult point of view, we may think about what infants are doing here as a kind of gossiping (Dunbar 1996). When adults gossip their main goal is simply to share information and attitudes with another person so as to build their common ground, both conceptually and emotionally. If I excitedly inform you that I got a new job, I expect you to be excited about it as well; if you look sad, I will not know how to react. Thus, Liszkowski et al. (2007) followed up on their (2004) study by having the adult follow the infant's pointing gesture at the dolls and then either match the infant's emotional expression (by showing excitement) or not match it (by showing a lack of interest). The infants were clearly more satisfied with the communicative exchange when the adult matched their emotional expression.

The development here may be seen as going from protoconversations, in which infant and adult share positive emotions directly face to face, to something resembling a real conversation in which they share interest and attention about some external situation or topic.

Requestive Pointing Great apes' and other animals' communicative acts are aimed almost exclusively at getting others to do what they want them to. Many human speech acts are also aimed at this imperative goal, but it can be achieved in two different ways (actually two ends of a continuum). On the one hand, an individual can command another, perhaps even backed by a threat, to do something. On the other hand, an individual can politely, even indirectly, request that another—if it is not too much trouble—help her with something. Such requests for help are possible because both interactants assume that the other is a cooperative being who wants to help. Indeed, the majority of such requests are actually, if taken literally, simple statements of the requester's internal state or even of some state of the world, and it is left up to the requestee what to do about it. For example, I can ask for the window to be opened by saying "I'd like the window open" (articulating my need or desire), "Could you open the window?" (asking about your ability to help), or "That window is closed" (making a statement about the world). Only a fundamentally cooperative person would take the hint and respond to these indirect requests by actually helping.

Human infants get adults to attend to their needs by crying. At the beginning, crying is not an intentional act, but it soon becomes one by being ritualized into whining. As noted earlier, whole-hand pointing with whining is a way that infants, even before their first birthdays, command adults to get a specific object for them. But not long after the nine-month revolution infants begin not just commanding adults but making cooperative requests, informing them of their needs and trusting them to react appropriately. Two recent studies with one-year-old infants illustrate this.

First, Grosse et al. (2010a) set up situations in which eighteen-month-old infants requested that an adult fetch them an object, typically by pointing at it and whining. The study employed a 2×2 design. In some cases the adult understood the request correctly, but in other cases she did not. In some cases the adult fulfilled the child's request faithfully, but in other cases she did not. The result was that even these mostly prelinguistic infants were not focused on commanding adult behavior but rather on communicating their desire to the adult, knowing that it was up to the adult whether or not she would comply. Thus, if the adult misunderstood their request but (miraculously) fetched the appropriate object anyway (in response to the child pointing and whining at the cow, the adult said, "Oh, you want the horse? Sorry, I can only give you the cow"), the infants' nevertheless repeated or attempted to repair their request so that the adult would know what they had intended. In contrast, if the adult understood the request correctly, infants did not repeat or repair it, even if the adult refused to give them the desired object (in response to the child pointing and whining at the cow, the adult said, "Oh, you want the cow? Sorry, I can only give you the horse"). The point is that the goal of the children's requestive gesture was to make sure that the adult knew what they intended; they knew that afterward it was up to the adult whether or not she decided to comply.

Second, in a study of infants' comprehension of requests, Grosse et al. (2010b) had an adult request that infants (twenty-one months of age) fetch them a battery that would allow them to turn on a flashlight. The trick was that there was one battery right in front of the adult, within his reach, and another on a table some meters away. With no other cues available, children automatically understood the request to be for the faraway battery, presumably because a cooperative person would never request that someone do something that he could more easily do for himself. Note that if the child understood this simply as a command to do something, with no assumptions about cooperativeness, then either battery could be the target of the adult's request. In a variation, Grosse et al. repeated the experiment but in this case the adult had her hands full carrying heavy objects. In this case it made sense to request help fetching an object even if it was close by; indeed, in this case infants were just as likely to fetch one battery as the other. The point is that infants understand requests as reflecting the basic logic not of command and threat, but of cooperation and helping. And they can use this same logic to make even "larger" inferences: when eighteen-month-olds run out of blocks and then see an adult holding up a key for them ostensively, they infer that this key may be used to open the door of the cabinet containing more blocks (Schulze and Tomasello 2015) because they trust that the adult is attempting to help them.

Informative Pointing Humans also point to situations for others altruistically, simply to supply them with helpful information. For example, Liszkowski et al. (2006) placed twelve-month-olds in various situations in which they observed an adult misplace an object or lose track of it in some way and then start searching. In these situations infants pointed to the sought-for object (more often than to distractor objects that were misplaced in the same way but were not needed by the adult); in so doing, they showed no signs of wanting the object for themselves (no whining, reaching, or so forth). The infants simply wanted to help the adult by informing her of the location of the sought-for object. Liszkowski et al. (2008) did something similar but in this case the sought-for object was contrasted with another whose location the adult knew (both objects had fallen onto the floor on either side of the adult, one while the adult was looking and one while she was not). This variation shows that the infants understood that the adult was ignorant of the location of one of the objects, so the function of their informing gesture was to help her not with something she knew but with something she did not know. Chimpanzees and other apes do not point for humans with this same informative motive. Indeed, Bullinger et al. (2011c) attempted to elicit pointing from chimpanzees in various situations, and found that they pointed only to request something for themselves, not to help the human get something for herself (as human infants did).

The importance of the informative motive in infant communication cannot be overemphasized. Not only does it highlight the cooperative nature of the communicative act, but it also highlights the inferences that are required to comprehend that act in the manner intended. The recipient of a cooperative communicative act asks herself: given that we know together that he is trying to help me, why does he think that I will find the situation he is pointing out to me relevant to *my* concerns. Consider great apes. If food is hidden in one of two buckets and then a human points to one of the buckets, apes are clueless (for a review, see Tomasello 2006). Apes follow the human's pointing and looking to the bucket, but then they do not make the seemingly straightforward inference that the human is directing their attention there because he thinks it is somehow relevant to their current search for the food. They do not make this relevance inference because it does not occur to them that the human is trying to inform them helpfully (because ape communication is always imperative), and this means that they are totally uninterested in why the human is pointing to one of the boring buckets. Importantly, it is not that apes cannot make inferences from human behavior at all. If a human first sets up a competitive situation with them then reaches desperately toward one of the buckets, the great apes know immediately that the food must be in that one (Hare and Tomasello 2004). They make the competitive inference "He wants in that bucket, so the food must be in there," but they do not make the cooperative inference "He wants me to know that the food is in that bucket."

This pattern of behavior contrasts markedly with that of human infants in this object-choice task. In this same situation, prelinguistic infants of only fourteen months of age trust that the adult is pointing out to them something relevant to their current search—they comprehend the informative motive—and so they know immediately that the pointed-to bucket is the one containing the reward (Behne et al. 2005). Moreover, Behne et al. (2012) tested twelve-month-old infants, just beginning to point themselves, for comprehension in this situation and then reversed the roles, giving them the opportunity to point informatively to help the adult. What they found was a strong correlation between performance in the two tasks: infants who were good at comprehending adult informative pointing were the ones who pointed informatively for the adult. This suggests that from the beginning infants produce their informative pointing gestures with comprehension of both its cooperative and its social-cognitive bases.

Cognitive Underpinnings Engaging in cooperative communication of this type requires some new types of cognitive representation and inference. With respect to cognitive representation, the key novelty is that the participants in the communicative interaction share some common-ground understanding of a situation, which serves to perspectivize it. For example, in pointing to the bucket in the object-choice task—given a common-ground understanding that we are searching for a hidden object—the communicator is not pointing to it *qua* physical object or *qua* vessel for carrying water, but rather *qua* location for the hidden object: I am informing you of the fact that that the reward is located *in there.* Cooperative pointing thus already creates different conceptualizations or construals of things—it perspectivizes the referent for the recipient—which prefigures the ability of linguistic creatures to place one and the same entity under alternative "descriptions" or "aspectual shapes."

With respect to inference, the key point is that the inferences used in cooperative communication are socially recursive. Thus, to comprehend an informative gesture as intended, there occurs a kind of backing-andforthing with individuals making inferences about the partner's intentions toward my intentional states. In the object-choice task, for example, the recipient infers that the communicator intends that she know that the hidden object is under that bucket—a socially recursive inference that great apes apparently do not make. This inference requires in all cases an abductive leap, something like: his pointing in the direction of that otherwise boring bucket would make sense (that is, would be consistent with common ground, relevance, and newness) if it is the case that he *intends* that I *know* where the object is. The communicator, for his part, is attempting to help the recipient make that abductive leap in the way he intends. To do this the communicator must engage in some kind of simulation, or thinking, in which he imagines how pointing in a particular direction will lead the recipient to make a particular abductive inference: "If I point in this direction, what inferences will she make about my intentions toward her intentional states?" And then, when making her abductive inference, the recipient can potentially take into account the communicator's taking into account of what kind of inference she is likely to make about his communicative intentions.

Further in this direction is the phenomenon of "markedness" (typically described with respect to language, but also applicable to nonlinguistic communication). Liebal et al. (2011) had an adult and a two- or three-year-old child tidying up toys into a large basket. In the normal course of events, when the adult pointed to a small box on the floor the child took this to suggest that she should tidy up this box into the basket as well. But in some cases the adult pointed to the box with flashing eyes and a kind of insistent pointing directed at the child, obviously not the normal way of doing it. The adult clearly intended something different from the norm. In this case, many children looked at the adult puzzled but then proceeded to open the box and look at what was inside (and tidy *it* up). The most straightforward interpretation of this behavior is that the child understood that the adult was anticipating how she would construe a normal point, which he did not want; so he was marking his pointing gesture so that she would be motivated to search for a different interpretation. This is the child thinking about the adult thinking about her thinking about his thinking.

Finally, another important type of inference in infants' communication is the exclusion inference. For example, Moll et al. (2006) had fourteen- to eighteen-month-old infants play with an adult and a toy drum. When a new adult entered the room and pointed to the drum excitedly, the child assumed he was talking about the drum. But if the adult with whom the child had just been sharing interest in the drum pointed to it excitedly in exactly the same way, the child did not assume that he was excited about the drum as a whole: how could he be, since it is old news for us? Rather, infants assumed that the adult's excitement must be aimed at something new about the drum that they had not previously noticed, so they looked for some new aspect, for example, on the adult's side of the drum. Infants made the inference that, because the adult desired to be informative, she was not excitedly indicating something already shared but rather something new.

Iconic Gestures and Pretense

The second form of uniquely human gestural communication used by infants and young children is iconic gestures or pantomime, in which the child represents some external entity or event via her own bodily actions—again in an effort to get the recipient to share attention (in imagination) to it. As this could be seen as a form of pretense, it is not surprising that children's skills with iconic gestures and pretense seem to emerge along a similar development course.

Iconic Gestures Iconic gestures would seem to be uniquely human. Great apes could easily gesture with their hands the way that humans do to mime eating or drinking, but they do not.* Indeed, great apes do not even understand iconic signs. In a modified object-choice experiment, a human held up a replica of the object under which food was hidden. Two-year-old human children knew that this meant to search under the similar-appearing object, but chimpanzees and orangutans did not (Tomasello et al. 1997; Herrmann et al. 2006). In a variation on this theme, young children but not apes understood that when a human mimed an action associated with an apparatus, the food they were seeking was on the side of the apparatus where that action was actually operative (Bohn et al. 2016). In an attempt to elicit iconic gesturing from young children and

* Some researchers have claimed that some great ape intention-movements are actually functioning iconically—for example, when one gorilla ritualistically motions another in a direction in a sexual or play context (Tanner and Byrne 1996). But these are most likely ritualized behaviors that appear to humans to be iconic because they derive from attempts to actually move the body of the other in the desired direction; they are not functioning iconically for the apes themselves.

apes in situations in which it would benefit them to gesture (that is, to show a naïve human how to extract food for them from an apparatus that only they knew how to operate), again the young children but not the apes were successful (Grosse et al. 2015).

Presumably, great apes do not understand iconic gestures because they do not understand communication marked ostensively as "for you" (cooperatively). If an ape views someone hammering a nut, they know perfectly well what he is doing; but if they view him making a hammering motion in the absence of any stone or any nuts, they are perplexed. To comprehend iconic gestures one must be able to see intentional actions performed outside of their normal instrumental contexts as communication—because they are marked as such by the communicator via various kinds of ostensive signals (such as eye contact). Extending an analogy from Leslie (1987) on pretense, the bizarre action must be "quarantined" from straightforward interpretation as an instrumental action by marking it as "for communication only."

Infants begin using various kinds of nonpointing gestures from as early as they begin pointing—so from around their first birthday. For example, Iverson et al. (1994) report such things as shaking the head "no," waving "bye-bye," raising the palms for "all gone," raising arms high for "tall," blowing for "too hot," flapping arms for "birdie," and panting for "doggie" (see also Acredolo and Goodwyn 1988). The problem is that many of these "baby signs" are simply imitated from adults. This does not mean that they are uninteresting, but it means that their status as iconic for the child is not certain. If our focus is on spontaneously produced iconic gestures that children create and not learn, there has been little research. But Carpenter et al. (in preparation) have reported diary observations of what were almost certainly spontaneously created iconic gestures by infants in the months immediately after the first birthday. These were rare, but all the infants observed produced one or more of these on several different occasions.

> Example 1: At age thirteen months, the infant playfully pantomimes biting to indicate an action he was not supposed to do on a particular object.
>
> Example 2: At age fourteen months, the infant tilts his head to the side to indicate to Mom what she should do to dump a bucket off her own head.

Example 3: At age fourteen months, the infant "fingers" his chest, looking and smiling at Mom whose shirt has strings he likes to play with.

Example 4: At age seventeen months, the infant pantomimes crumpling a ball of paper to ask that it be done.

In a more systematic study of infants' iconic gesture production, Behne et al. (2014) showed infants at around their second birthdays how to operate an apparatus. An ignorant puppet then entered and began fumbling unsuccessfully with the apparatus. Infants as young as twenty-one months—who were blocked from actually operating the apparatus by a barrier—mimed for the puppet how it should push or poke the device for success.

To produce such creative iconic gestures, infants need to have some skills of imitation, simulation, symbolic representation, or pretense, in the sense that they must enact a familiar action not for real to bring about its normal effect, but rather only in pretense to communicate something related to that absent action. Creative iconic gestures thus involve some kind of symbolic representation, produced for purposes of interpersonal communication, in a way that pointing to (mostly) present entities does not. It is perhaps for this reason that infants in the second year of life use iconic gestures much less frequently than they use the pointing gesture. Indeed, over the second year of life iconic gestures (imitated and spontaneous) actually go down in frequency in comparison with pointing (Iverson et al. 1994; Acredolo and Goodwyn 1988). The explanation most often given is that children are learning language during this time, and imitated and iconic gestures compete with linguistic conventions in a way that pointing does not—perhaps because iconic and imitated gestures, but not pointing, share with linguistic conventions some kind of symbolic representation and even categorization of a referent.

Pretense The suggestion is thus that iconic gestures compete with language for the same function of communicating symbolically, so their function is quickly usurped as language acquisition begins. But, interestingly, infants do continue to do something like iconic gesturing for noncommunicative purposes during this same developmental period: they begin to engage ever more frequently in pretense or symbolic play. Thus, when a young child pretends to drink from an empty cup, she is in some sense iconically representing the real act; she is just not doing this for communicative purposes. It may then be that humans' biological predisposition to iconically represent absent entities and actions for communicative purposes in the gestural modality is supplanted by vocal language in normal ontogeny; but this ability manifests itself instead in children's pretense activities in which they symbolically represent absent entities and actions for playful purposes. Indeed, when a young child pretends to drink from an empty cup and looks to the adult's face playfully, one could say that in addition to pretense for the self this is also an iconic gesture to share this representation with the adult communicatively.

There has been a great deal of research on young children's pretense or symbolic play, but just as in the case of gestures, in many cases acts of pretense with objects are simply imitated from adults pretending for them. Thus, Tomasello et al. (1999), Striano et al. (2001), and Rakoczy et al. (2005) gave children various kinds of objects in various kinds of situations and encouraged them to pretend, while at the same time modeling for them no pretense actions. The overall outcome was that young children before two years of age engaged in little pretend play with an object unless they had first seen others do so in a similar way. One possible explanation is motivational. One-year-olds can "pretend" using an iconic gesture if their goal is to communicate, but if the goal is only to engage in pretense for its own sake, they need a social-communicative context in which the adult is playing with them. Another possibility is that pretending with objects in particular is harder than using iconic gestures because objects also have affordances for physical action, such as grasping, and in many cases conventional functions as well. In the spirit of DeLoache's (2000) dual-representation theory, it may be that young children have trouble representing an object as both an object and a symbol. Supporting this view, studies of comprehension (see especially Tomasello et al. 1999) also find that young children are better at comprehending iconic gestures than they are at the use of objects as symbols.

Children continue to engage in pretend play throughout childhood—coming at some point to specialize in all kinds of role playing—and end up as adults in all kinds of artistic endeavors such as theater and representational art.

Cognitive Underpinnings Iconic gestures and pretense both require cognitive skills of imitation, mental simulation, and imagination of the type that may not be possessed by other apes. This is in addition to the skills of cooperative communication—discussed previously in connection with the pointing gesture—that apes may not possess either. Moreover, iconic gestures and pretense are used by individuals to represent things for themselves and others symbolically; indeed, unlike pointing, this creates cognitive categories. When an individual uses a hammering gesture to request a hammer, it is much like using a noun like *hammer* in language. There is no indication in the gesture by itself about which particular hammer is desired; the gesture indicates a category of things, and the particular item (hammer) must be indicated by other means, including from the common-ground context of the communicative event.

Individual and Cultural Variation

The large majority of infants in longitudinal studies of communicative development begin pointing at around eleven to twelve months of age (for example, Camaioni 1997; Carpenter et al. 1998b). Moreover, infants who are destined to have autism show an absence of expressive (and perhaps informative) pointing at this and older ages. These infants do point imperatively to get what they want, but the study by Baron-Cohen et al. (1992; see also Baron-Cohen 1989) found that when looking back retrospectively at children assessed across development, children with autism almost all had failed to point expressively as infants. These findings suggest at least some maturational component for the pointing gesture, a view backed up by both cross-cultural and training studies.

There are three cross-cultural studies that look carefully at the pointing behavior of infants in a variety of cross-cultural contexts. First, Callaghan et al. (2011) had mothers and ten- to thirteen-month-old infants explore a richly decorated room together. The infants and mothers were from a Western industrialized culture as well as two small-scale, nonliterate cultures (rural India and rural Peru). Approximately half of the infants across cultures pointed at least once for their mothers (expressive point), although the Indian infants pointed a bit less often. Second, Lieven and Stoll (2013) compared the pointing behavior of eight- to fifteen-month-old infants from a Western industrialized culture and a small-scale rural culture in Nepal; they found a similar age of onset for children from both cultures. Third, in the largest study to date, Liszkowski et al. (2012) looked at ten- to fourteen-month-old infants from seven different cultural contexts, at least one of them an isolated, small-scale culture (Rossel Island, near

New Guinea); they found no cultural differences in the age of onset of the pointing gesture. These studies have reinforced the conclusion that the pointing gesture develops naturally in many different cultural settings.

Interesting complementary data come from a short-term training study. Matthews et al. (2010) trained for a one-month period over 100 infants aged nine, ten, or eleven months in pointing. The training consisted of mothers giving their infants daily interactions with large amounts of pointing around shared activities (in a control group, other mothers gave their infants training in music). The infants were tested in an elicited pointing task at the end of the one-month period. No differences were found in the age of onset of the pointing gesture as a function of training. Interestingly, the degree to which infants monitored their mothers visually as they pointed was affected by training, so the extra experiences did affect the infants in some ways. But the onset of pointing was the same regardless of training, providing further support for the idea that the developmental trajectory of the pointing gesture has a strong maturational component.

Iconic gestures and pretense have not been systematically studied in any of these ways to the same degree as pointing. It is a general finding that children with autism are poor at pretense, which might suggest the importance of maturational factors. But at the same time it has been frequently noted that infants in small-scale cultures typically have no representational toys and do not engage in extensive amounts of pretense (Gaskins, personal communication). Supporting these informal observations, the one systematic cross-cultural study found a strong effect of cultural context. Callaghan et al. (2011) found that all three-year-old children from all three cultures they studied (Westernized culture versus rural India and Peru) produced at least one pretend / symbolic act in their elicitation task; however, children from the Western industrialized culture engaged in significantly more pretense / symbolic play than did children from the two small-scale traditional cultures. This finding is consistent with the training study of Rakoczy et al. (2006) in which children were given extra experience with pretend actions and discourse about pretense. Children given such training showed a better understanding at the end of training (than did a control group) at understanding the relation between pretense and reality. A general conclusion might thus be that the ability to engage in pretense is available to all typically developing children (although not children with autism), but that the frequency with which they engage in such activities and the manner in which they understand them are strongly dependent on experience.

An important point in the current context is that there is functional continuity between gestures and the acquisition of words. Iverson and Goldin-Meadow (2005) found that one- and two-year-olds often pointed at an object and simultaneously named it "cookie." But even more important, children of this age sometimes point at an object and simultaneously predicate something about it, such as pointing to a cookie and saying "eat." Interestingly, gesture-word combinations of this type were extremely highly correlated with their subsequent grammatical combinations in language (see also Ozcaliskan and Goldin-Meadow 2005), presumably because they already manifest a kind of simple grammar: a pointing gesture to an object, as topic, combined with a word for an action or property as predicate (see also Tomasello 1988). So not only do pointing and pantomiming communicate referentially, resting on many of the same underlying cognitive and social skills as language, but when they are integrated with language it is done seamlessly, in the same way that linguistic items such as words are combined with one another in grammatical constructions. The fact that they fit together so seamlessly—united by processes such as joint attention, perspective-taking, and emotion sharing—suggests that all are underlain by the same basic skills and motivations of shared intentionality.

Infants and toddlers are thus very capable communicators before they really get going with language. But for the current hypothesis it is important to observe that they are doing all this almost exclusively with adults. Indeed, Kachel et al. (in press) found—in the context of an object-choice task—that eighteen-month-old infants produced more informative pointing gestures for adults than peers, and they comprehended the adults' informative pointing gestures better than those of peers as well. Effective communication by infants and toddlers depends on an adult partner who scaffolds the interaction.

Conventional Communication

Linguistic communication is an extension of natural gestures. Both are invitations to jointly attend to an external situation for one of several cooperative motives. The difference is that linguistic communication achieves these functions via social conventions. This means that achieving joint attention and expressing emotions and attitudes within a linguistic act are achieved through means that reside in, and only in, the cultural common ground of our, and only our, linguistic community. Needless to say, the child knows nothing of the historical process of convention creation in the language she is acquiring. All that she needs to acquire a piece of conventional language—and in the end to construct a language—is two basic sets of skills: (1) intention-reading and (2) pattern-finding (Tomasello 2003). *Intention-reading* refers to the meaning or intention side of the process, involving such things as joint attention, common ground, and socially recursive inferencing. *Pattern-finding* refers to the more structural or grammatical side of the process, including such things as categorization, sequence learning, and analogy.

Acquiring Words

The age at which young children begin using language productively can be somewhat variable because it is a complex task that must recruit many different cognitive and social skills. However, the most precocious Western children begin producing their first words at around twelve to fourteen months of age. A very basic question is thus, why are children first able to use language productively at this age and not some other (Bloom 2000)?

Some researchers would claim that language acquisition actually begins months earlier, as children "comprehend" words that others use (for example, Tincoff and Jusczyk 1999; Bergelson and Swingley 2012). But the method used to investigate this claim is a looking measure, so when an adult says "car," the six-month-old infant looks preferentially to a picture of a car over a cup. What this shows is that six-month-old infants have heard the word *car* in association with cars enough to make this connection. This is a necessary prerequisite for learning the linguistic conventions we call words, but it is far from sufficient. If simple association were sufficient, then we would have to say that many domestic dogs—as well as some apes, parrots, and dolphins—are linguistic creatures. For the child to understand a word as a piece of language she must understand it as something the adult is using to direct her attention to some referent in the environment—he is inviting her to jointly attend with him to that referent—in a way that she, the child, could do in reverse toward the adult if she so wished. Then we can say that the child is comprehending language qua language. So this is why children first begin using language at the age at which they do: it is not until then that they have (1) solid skills of joint attention in their nonlinguistic interactions with others, (2) a solid understanding of the communicative intentions of others as expressed in referential gestures, and (3) the ability to express their communicative intentions to others with their own referential gestures.

The reliance of language acquisition on skills of joint attention and the comprehension of communicative intentions is a well-established empirical fact. And conceptually it could be no other way. If a person enters into a situation with no shared context with the others already there, and one of them turns and says to her, "Gavagai," there is no way that she could possibly comprehend what this linguistic expression is intended to communicate. But one could imagine instead a situation in which a one-year-old infant is interacting with her mother in a well-known shared activity such as eating food in a high chair. Now if the mother brings the infant a new and unknown fruit and utters, "Gavagai," then it is possible, perhaps even likely, that this unknown expression is intended to refer to this new fruit. (For a word learning study based on exactly this scenario, see Grassmann et al. 2009.) This possibility would be strengthened if the mother were looking back and forth from the child to the fruit and expressing excitement, or using a gesture like pointing or holding up and showing the new fruit.

The problem of referential indeterminacy (as indicated by the socially barren initial example) may apply many times a day every day for a young child, as adults talk about things about which she knows nothing. But several times a day, at least, children hear a new word in a situation in which they have much rich information of a nonlinguistic nature about what the adult might be intending to refer their attention to. These special situations are the ones in which they actually acquire new language. This is essentially the social-pragmatic theory of word learning (Bruner 1983; Tomasello 1992, 2000, 2003). In terms of empirical evidence, many studies have shown that one-year-old children learn new words best when they are interacting with an adult in a joint attentional interaction. For example, Tomasello and Farrar (1986; see also Tomasello and Todd 1983) coded the social interactions of mothers and their one-year-olds for joint attentional engagement. The most general finding was that the more joint attention engaged in at twelve months, the larger the child's vocabulary at eighteen months. In addition, these researchers identified some things that mothers did that facilitated children's word learning, but these only had an effect if they occurred within a joint attentional interaction (for similar findings, see Carpenter et al. 1998b). Joint attentional interactions are thus kind of hot spots for the initial steps in word learning.

The most facilitative contexts for word learning in very young infants are thus those that take place within a well-known, well-understood joint attentional context with an adult. Given such a context, it is further helpful if the adult follows into the child's attentional focus on a particular entity or event within that interactive context (Tomasello and Farrar 1986; Carpenter et al. 1998b). But as children progress toward their second birthdays, they do not have to rely on such a "child friendly" learning environment to acquire new language. Many studies have shown that when there is a discrepancy between the adult and child's focus of attention—when young children hear a novel word in situations in which their focus of attention differs from that of an adult—they nevertheless are able to do the extra work to determine the adult's referential intentions, almost never assuming that the new word is being used for whatever is their own focus of attention irrespective of what the adult is attempting to do (Baldwin 1991, 1993a, 1993b). In all cases of word learning, children make active attempts to understand adult communicative intentions; it is just that in some situations they have to work a little harder to do it.

The point is made most clearly in a series of studies by Tomasello and colleagues in which young children had to discern the adult's communicative intentions in using a new word in some fairly complicated social-interactive situations (for a review, see Tomasello 2001). That is, in Baldwin's studies, the eighteen-month-old infants had to shift their attention to what the adult was focused on visually in order to learn the new word. In the studies of Tomasello and colleagues (2001), to learn a new word children had to do much more complicated social-pragmatic work. Here are some examples.

- In the context of a finding game, an adult announced her intentions to "find the toma" and then searched in a row of buckets all containing novel objects. Sometimes she found it in the first bucket searched. Sometimes, however, she had to search longer, rejecting unwanted objects by scowling at them and replacing them in their buckets until she found the one she wanted. Eighteen- and twenty-four-month-old children learned the new word for the object the adult intended to find (indicated by a smile and termination of search) regardless of whether or how many objects were rejected during the search process (Tomasello and Barton 1994; Tomasello et al. 1996).

- In the context of a finding game, an adult had the child find four different objects in four different hiding places, one of which was a distinctive toy barn. Once the child had learned which objects went with which places, the adult announced her intention to "find the gazzer." She then went to the toy barn, but it turned out to be "locked." She thus frowned at the barn and then proceeded to another hiding place, saying, "Let's see what else is here" (taking out an object with a smile). Later, eighteen- and twenty-four-month-old children demonstrated that they had learned "gazzer" for the object they knew the experimenter wanted in the barn, even though they had not seen the object after they heard the new word, and even though the adult had frowned at the barn and smiled at a distractor object (Akhtar and Tomasello 1996; Tomasello et al. 1996).
- A child, her mother, and an experimenter played together with three novel objects. The mother then left the room. A fourth object was bought out, and the child and experimenter played with it, noting the mother's absence. When the mother returned to the room, she looked at the four objects together and exclaimed, "Oh look! A modi! A modi!" Understanding that the mother would not be excited about the objects they previously had shared in play, but that she might very well be excited about the new object, twenty-four-month-old children learned the new word for the object that she and the mother had not shared previously (Akhtar et al. 1996).
- An adult set up a script with the child in which a novel action was performed always and only with a particular toy character (Big Bird on a swing, with other character-action pairings demonstrated as well). She then picked up Big Bird and announced, "Let's meek Big Bird," but the swing was nowhere to be found—so the action was not performed. Later, using a different character, twenty-four-month-old children demon-

strated their understanding of the new verb even though they had never seen the referent action performed after the novel verb was introduced (Akhtar and Tomasello 1996).
- An adult announced her intention to "dax Mickey Mouse" and then proceeded to perform one action accidentally and another intentionally (or sometimes in reverse order). Twenty-four-month-old children learned the word for the intentional not the accidental action regardless of which came first in the sequence (Tomasello and Barton 1994).

Simple association cannot account for children's word learning in these studies. In classic associationist accounts, word and referent should occur in relatively close spatial-temporal contiguity (Smith et al. 2014). But that is clearly not the case in these studies, as in the first two studies distractor objects are actually experienced in closer spatial-temporal contiguity with the new words than are target objects. In the third study, both distractors and the target are simultaneously present when the new word is said, and in the fourth and fifth studies the referent action is either not performed after the new word is heard or else it is performed (intentionally) along with another action (accidental). Young children are thus able to discern the adult's focus of attention in fairly complicated situations, and the way they do this goes well beyond using social cues. Thus, in the first study, to learn the adult's intended referent for the novel word *toma,* children had to first understand the game of hiding-finding and all of the intentional relations therein. That is, the child had to infer in the first study that when the adult frowned at an object, that was not the one she was seeking, and when she smiled at an object, that was the one she was seeking. But then in the second study the adult frowned while she was attempting unsuccessfully to open the toy barn containing the desired toy, so in this case the frown meant frustration at not being able to obtain the intended toy inside the barn—which was the actual target of her referential intentions. The adult's specific behaviors, such as a smile or a frown as cues, were not sufficient by themselves to indicate for the child the adult's intended referent.

The point is that word learning is not like an adult learning the words of a foreign language in the classroom. Children may learn some words like this—as adults hold up objects and name them, for example—but this is a relatively rare learning context in many non-Western cultures in which adults engage in virtually no linguistic pedagogy. Young children must learn the vast majority of their words within the ongoing flow of social interaction, and they must do this as well for words whose referential conditions are more highly variable than object labels across instances—for instance, verbs such as *share* and *finish,* as well as adjectives like *happy* and *bad.* Moreover, they learn words that regulate social interaction such as *hello, goodbye, please, thank you,* and *sorry,* which are not referential in any straightforward way at all. Word learning is thus not about putting labels on things but rather is about acquiring conventional means for coming to share attention with others in a variety of complex social contexts. Moreover, acquiring these conventional means, in the form of words, has a normative dimension in the sense that there are conventionally correct and incorrect ways of using them to invite joint attention.

Acquiring the words of a conventional language has momentous consequences both for children's cognitive representations and for their inferencing. With respect to representation, the basic point is that children are inheriting from their culture a whole system of concepts that their forebears have found useful for categorizing and organizing their world. In acquiring the words of a conventional language, children are learning to carve up the world in all the ways that others in their culture have found useful—for all their myriad communicative purposes—over the entire cultural history of their cultural group. With regard to inference, the lexicons of human languages are hierarchically organized, such that one can make various kinds of deductive inferences. So if we know that all the animals have been cleared out of these woods, we know that all the foxes are gone. Young children struggle with these implicational relationships until late in the preschool years, but they soon become a part of their everyday thinking. In addition, the fact that the words of a language form a kind of system leads to pragmatic inferences based on the word the speaker chose out of those she could have chosen. For example, if I say that the child ate "some of the meat," the inference is that he did not eat all of it because if he had eaten all of it I would have said so. Children become able to make such inferences sometime after three years of age (Grosse et al., in press).

Transitions in Language around Age Three

Language acquisition is a continuous process, with no real breaks or stages. But a number of new developments nevertheless seem to unfold within a few months on either side of the child's third birthday, perhaps reflecting emerging capacities of collective intentionality—such as understanding the conventionality and normativity of language as a group-level cultural practice, as well as a growing understanding of the "objectivity" of propositions.

Conventionality and Normativity In my larger theoretical claims, I have hypothesized that age three signals the initial emergence of young children's skills of collective intentionality. A natural language is conventional, so children's sophisticated learning of language at one to three years of age—before the emergence of collective intentionality—might appear to conflict with the hypothesis. But it does not. When young children are first becoming linguistically proficient, they understand what they are doing as something instrumental, like tool use, without an understanding of its conventionality. They acquire a piece of language by imitatively learning its use, just as they do a tool, and they do not really have to know anything else. Initially they operate without an understanding that the conventions of a language are shared by, and only by, people in the linguistic community and that they are normative for that group.

Some studies suggest that children as young as two years of age understand the conventionality of language because they predict that a new adult will know the name of an object whose name they themselves have just learned (but not an arbitrary fact they have just learned; Henderson and Graham 2005). But young children generalize many things, and not others. A better test would be one in which they also display, in addition, an understanding that people outside their linguistic community do not share their linguistic conventions. Using this dual criterion, Diesendruck (2005) found that it is not until three to four years of age that young children understand the conventionality of linguistic items. And—in this same direction but with nonlinguistic materials—Schmidt et al. (2016a) found that it is only at three years of age that young children understand that conventional rules in general are established by the agreement of relevant parties, an understanding critical to an understanding of conventions of all kinds.

Conventionality also implies some degree of normativity: there are correct and incorrect ways of using the conventions of a language. Although two-year-olds will sometimes give the correct name of an object when another person misnames it (Pea 1982), the child might just be focusing on saying the right name herself, not on correcting anyone. Aimed at normative evaluation, Rakoczy and Tomasello (2009) found that three-year-olds but not two-year-olds selectively criticize and correct someone who makes a statement that does not match reality, whereas a reality mismatch caused by a listener not accurately carrying out a command does not elicit criticism of the speaker (but rather of the listener).

The proposal (which is in fact not controversial) is thus that when one- and two-year-olds are using a language, they are simply doing what they see others doing. This is a creative process because to do this appropriately they must understand the others' referential and communicative intentions. But they do not initially understand the conventionality of the linguistic items they are using in the sense of their sharedness and normativity in the community (but not outside the community) or the fact that they are derived by agreement. This proposal fits well with Vygotsky's repeated insistence that children are scaffolded by cultural artifacts and symbols, enabling them to accomplish things before they are able fully to understand, from an adult point of view, what they are doing. So my claim here is that the second step in children's acquisition of communicative competence—underlain by the emergence of skills of collective intentionality—is not their initial use of language, which they effect with their skills of joint intentionality and cultural learning, but rather their emerging understanding, at around three to four years of age, of conventionality per se.

Grammatical Abstraction, Propositions, and Generics Soon after they begin learning individual words, young children begin learning grammatical constructions. Initially these are quite concrete, comprising specific words and perhaps an open slot: for example, *More* ___, *Eat* ___, and ___ *gone.* These lexically specific constructions become more elaborate after the second birthday, but they still remain tied to a single lexical item that structures them (mostly the verb or predicate; for evidence, see Tomasello 2003). Interestingly in the current context, Croft (2001) argues that the linguistic items in a multi-word construction do not gain their communicative functions via their syntactic relations to other items, but rather from the syntactic role they play in the construction as a whole: the subject of an English sentence is defined by its role as the topic, or starting point, of the utterance as a whole. A linguistic construction may thus be seen, in a way, as a kind of symbolic collaboration among all the contributing functional elements (a kind of dual-level structure expressed symbolically).

By around the third birthday, young children have constructed abstract constructions that are meaningful in and of themselves, independent of the lexical items involved. For example, they know that *The dax mibbed the toma a modi* indicates that the dax somehow transferred a modi to the toma, without understanding any of the content words. From a cognitive point of view, abstract constructions give children a new kind of abstract, syntagmatically organized, conventional format for cognitive representation. These abstract constructions enable linguistic items to be used then reused in a wide variety of different constructions, playing different roles on different occasions. Importantly, this flexibility in how items are used creates the need to explicitly mark the roles being played by different items. If I gesture or vocalize *man, tiger, eat,* it is important to know who is the agent and who is the object of the eating activity. Modern-day languages have a variety of means for doing this, such as case marking and contrastive word order. These markers used to indicate participant roles may be seen as kind of second-order symbols, as they are about the role the participant is playing in the larger construction (Tomasello 1992, 2003). They serve as markers enabling children to analogize across utterances to form abstract constructions.

Abstract constructions also contribute to children's understanding of objective facts represented propositionally. Thus, virtually all languages have different constructions for speech acts such as requestives and informatives, both of which may contain the "same" fact-like propositional content. A person may say, "She is going to the lake," "Is she going to the lake?," "Go to the lake!," and so forth. In addition, communicators indicate through various linguistic devices their modal or epistemic "attitude" toward some propositional content in an utterance. Thus, a communicator might opine, modally, that "She must go to the lake" or "She can go to the lake," or, epistemically, that "I believe she is going to the lake" or "I doubt she is going to the lake." The idea is that this independence of the propositional content—she goes to the lake—from any particular communicative motive or attitude encourages the conceptualization of propositional content as a quasi-independent fact, in this case independent from how speakers feel or think about it (Searle 2001). Diessel and Tomasello (2001) found that, although children sometimes use such constructions at earlier ages, it is not until about four years of age that children fully understand the relationship between the propositional attitude expressed in the main clause and the objective proposition expressed in the subordinate clause. An understanding of objectivity goes along, as we have argued, with skills of collective intentionality.

Finally, and relatedly, children regularly encounter facts about the world that are presented to them by adults as objective propositions in pedagogy using generic language ("Birds lay eggs" or "Dreidels spin") or in norm enforcement using normative language ("We don't do that here" or "One shouldn't do it like that"). Young children begin both producing and comprehending generic propositions reliably at around two-and-a-half to three years of age (see Graham et al. 2011; Gelman and Ramann 2003; Gelman et al. 2008). This emerging competence may very well reflect, in a more or less direct way, young children's emerging understanding of an "objective" perspective on things, as characteristic of emerging skills of collective intentionality.

In all these ways, young children come to understand the conventional, normative, and objective dimensions of linguistic communication, all at around or soon after the third birthday.

Executive Self-Regulation of Discourse Words and grammatical constructions are of no use if the child cannot use them effectively to communicate with others. This often requires her to take into account the perspective of the listener in order to choose the most effective linguistic expression. In the beginning the process is a kind of dialogic negotiation, as the child says something, the listener misunderstands and possibly asks for clarification, and then the child produces some kind of "repair" (for example, Anselmi et al. 1986). Such discursive negotiation involves processes of executive self-regulation as the child self-monitors the dialogue and repairs for the listener as needed. In a Vygotskian analysis, the process begins interpersonally (dialogically) with conversational breakdown and repair, then becomes intrapersonal as the child anticipates breakdowns and precorrects them, as it were, by the choice of an appropriate referential expression without feedback from the listener.

After some experience with requests for clarification, children begin to self-monitor and anticipate when their listener might have difficulties. They thus say things like "He . . . um, I mean . . . Jeffrey . . ." in which they correct themselves before the listener has a chance to query them. They have internalized the dialogic process and used it to executively self-regulate. The ultimate internalization comes when the child does not even need to say out loud the potentially ambiguous expression, but simply simulates and evaluates different potential ways of expressing things for the listener—on the executive level—and chooses the most appropriate one. An interesting instance of this is when children decide when to use pronouns which, in communicative circumstances with much common ground about the intended referent, can substitute for nouns. It is possible that in this case as well children are prompted into giving this decision some executive-level attention by previous instances of clarification requests, but then these become unnecessary. Thus, Campbell et al. (2000) found that two- to three-year-old children's choice of referring expression (noun versus pronoun) was strongly affected by the discourse common ground they had with the interlocutor, especially whether or not the referent had previously been mentioned in the conversation (if so, then they more often chose a pronoun). Relatedly, Matthews et al. (2006) found that three- and four-year-olds chose different referring expressions (noun versus pronoun) depending on whether they and the listener were jointly focused visually on the intended referent (if so, then they more often chose a pronoun).

Children's executive regulation of discourse and conversation sets them up to construct listener-sensitive discourse strategies that coordinate perspectives among themselves and their communicative partner. They are learning to perform the most basic forms of this coordination from two to four years of age. Monitoring what others comprehend of one's linguistic expression of one's thoughts is a fundamental process in learning to think and communicate rationally—that is, in conformity with the culture's norms of rationality.

Brief Aside: The "Language" of Kanzi et al.

Great apes do not use anything like a conventional language in their natural communication. But a few great apes have been raised by humans and taught some form of humanlike communication, either using manual signs or graphic symbols. These apes end up doing very interesting things, but it is not clear in which ways they are humanlike. (For a more thorough review with more detailed citations, see Tomasello 2008, 2014, 2017.)

With regard to words, it is clear that apes can acquire and use more or less arbitrary signs. They can learn to both comprehend and produce them as indicators of categories of referents, from bananas to chasing. The contexts in which they are able to learn words has never been investigated systematically, but it is unlikely that they can learn them in complex social situations such as those reported for one-year-old children. Systematic studies have found that over 95 percent of the communicative acts produced by these individuals are some form of imperative (and the other 5 percent are things like naming games: Greenfield and Savage-Rumbaugh 1993; Rivas 2005). This is because no matter how they are trained by humans, great apes will not acquire a motive to simply inform others of things or share attitudes with them (Tomasello 2008). They also do not learn such things as pronouns (for example, *he, she, it*), which require assessment of common ground.

With regard to grammar, language-trained apes can learn to combine their words, sometimes in novel ways, but there is no real syntax. They have preferred orderings of words and word types, but they do not use second-order symbols such as case markers or contrastive word orders to mark semantic roles and to indicate who is doing what to whom in the utterance. In general, what is missing is all the aspects of syntax that are geared at making the utterance comprehensible to the recipient, from his perspective—they do not "ground" their acts of reference for listeners to help them identify the referent (for example, with articles or relative clauses). They do not have constructions or other devices for indicating for listeners what is old versus new versus contrasting information. And they do not choose constructions based on perspective (for example, "I broke the vase" versus "The vase broke," depending on the perspective most useful to the listener). The point is that in strictly imperative communication, there is little functional need for all the complexities of human linguistic communication (prototypically, imperatives have no subject, no tense, and so forth).

The overall theoretical point is that apes trained in humanlike communication systems do lack skills of cognition and pattern-finding per se—they can use words for categories and combine words in novel ways. What they are almost totally lacking is the skills of intention-reading that are necessary for acquiring and using appropriately different words and constructions adapted for different recipients' knowledge, expectations, and perspectives. Humans also conventionalize expressions of motives and epistemic/modal attitudes in their constructions, and their discourse strategies are geared for their listener as well. We can call all of this the pragmatic dimension of grammar—and we can call it all uniquely human.

Individual and Cultural Variation

Children growing up in different cultural contexts can have fairly different linguistic experiences. In particular, in many traditional cultures infants and toddlers are not directly addressed linguistically nearly as often as are children in Western industrialized cultures (for example, Schieffelin and Ochs 1986). Nevertheless, all typically developing children in all cultures readily acquire skills of linguistic communication over the first several years of life. It is thus plausible to posit that there is a relatively strong maturational component to language acquisition.

But the maturational component of this developmental pathway is complex. The biological deficits that affect it almost invariably concern one or another component process. For example, children with pervasive developmental disorder (and also Down syndrome) typically have general cognitive disabilities, so they also have general problems with language learning, from learning a word to forming a grammatical category. In contrast, some children with specific language impairment (some researchers would say the prototypical case) seem to have all the other prerequisites for language acquisition, but have problems of speech perception and production, which then have knock-on effects in such things as the acquisition of word endings and other small, nonsalient grammatical items. Finally, of special interest in the current context, children with autism have trouble with skills of joint attention and perspective-taking, so half of all these children acquire no serviceable language at all, and any language they do acquire is used in pragmatically odd ways. The fact that joint attention is a key problem is clear from a number of studies that have found that these two sets of skills are related to one another in autistic children in the same way they are in typically developing children (Loveland and Landry 1986; Mundy et al. 1990; Rollins and Snow 1998). Astoundingly, Siller and Sigman (2008) even found that autistic children's nonlinguistic joint attentional skills during early childhood are extremely strong predictors of their linguistic skills many years later in adolescence. Despite the role of maturation in these component processes of language acquisition, there is no evidence that particular linguistic categories and structures—such things as the subject of a sentence or the passive construction—are universal or innate (Tomasello 2003, 2008; Evans and Levinson 2009).

At the same time that there are strong maturational components in children's acquisition of language, it is clear that variations in the language children hear—the raw material for their language learning, as it were—have profound effects on the developmental pathway. Cross-cultural studies have documented different rates of acquisition, sizes of vocabulary, and so forth across cultures. Individual differences within cultures are also due, in large measure, to differences in children's language learning environments (see Lieven and Tomasello 2008). One especially striking finding is a strong correlation between the amount of language children hear and their vocabulary size at school age (Hart and Risley 1995). And children brought up without a normal amount of linguistic input for various reasons end up with more-or-less seriously impaired linguistic skills (for example, Candland 1995; Goldin-Meadow 2003). Many particular studies of language acquisition have used training methods to show the effect of particular kinds of linguistic experience on the child's acquisition of particular linguistic structures (for a review, see Ambridge et al. 2015).

Finally, an interesting fact of relevance in the current context is that young children display their linguistic skills mostly with adults, not with peers. Ninio (2016) found that two- and three-year-old children only rarely attempted to get peers to jointly attend with them to some external situation, whereas the same children did so much more often with adults. Children in this age range also have difficulty engaging in extended conversations with peers in which they exchange turns about a common topic over time. In one of the few quantitative comparisons, Mannle et al. (1992) found that toddlers' conversations with their mothers were much longer (comprised more turns) than their conversations with their preschool-aged siblings. The point is simply that, once again, before three years of age or so, children are mainly adapted for interacting—in this case linguistically—with adults far more than peers. To communicate and mentally coordinate with peers requires still more learning.

In all, language acquisition is the textbook case of a developmental pathway that is maturationally robust in its general arc, given a species-typical social environment, but one that is at the same time completely dependent on a specific set of cultural experiences, differences in which lead to large differences in phenotypic expression (that is, the language actually learned). The process may be disrupted by either biology or an atypical social environment. The answer to the nature-nurture question, again in this case, is not either / or but both / and.

Becoming Symbolic

Virtually everyone who has thought about uniquely human psychology assigns a powerful role to language. But many theorists invoke it as a kind of magic bullet, with little analysis of the processes of linguistic communication and how they work their magic from a psychological point of view. What I have attempted to explicate here is the complex pragmatic infrastructure of human communication—built from skills and motivations of shared intentionality—that make it possible for a child first to communicate with gestures referentially and cooperatively, and then ultimately to acquire a conventional language.

Theoretical Explanations

Any typically developing human infant could be placed into any normally functioning human culture and acquire its particular linguistic conventions on the species-typical developmental timetable. And no infant could acquire any linguistic conventions without being exposed to others using them. There is thus no doubt: children individually learn from their social-communicative experience the linguistic items and constructions of the language(s) into which they are born, and they are capable of learning any existing set of them. Many studies attest to the role played by linguistic experience in producing individual differences of linguistic competence (for example, Ambridge et al. 2015).

All this language learning rests on biologically evolved cognitive and social capacities and is carried out with biologically evolved social learning skills. However, there is much controversy over the nature of humans' biological predispositions for linguistic communication. At the extreme, Chomsky and his followers have maintained that children are born with a kind of innate template that guides language acquisition, a so-called universal grammar, modeled as a quasi-mathematical system. The evolution of its particular structure was a kind of accident, as it has nothing to do with human cognition or communication. The problem is that this proposal is contradicted by cross-linguistic investigations, which do not find any of the kinds of universal structures that universal grammar supposedly makes available to all the world's languages (Evans and Levinson 2009). It also is contradicted by empirical investigations of language acquisition, which have not found the kinds of abstract linguistic representations that universal grammar is supposed to make available to children (Tomasello 2000, 2003). Moreover, there are fundamental logical problems of how a child born with a universal grammar, abstract enough to fit any of the world's 6,000 languages, could actually link its structures to the particular linguistic conventions she experiences (Tomasello 2005).

At the other extreme, at least since the demise of behaviorism, there have been no serious proposals that children acquire language by the same kind of the simple and straightforward learning processes as other animals (the view of word *learning* comes close in Smith et al. 1996, 2014). Human beings are clearly biologically prepared for special forms of communication, including linguistic communication based on social conventions. The key is that this preparation is not about specific linguistic structures, as the universal grammar hypothesis claims; rather, it is about more general and basic psychological processes that are recruited for this specific task.

The social-pragmatic view of language acquisition—as a specific instantiation of shared intentionality theory—thus again occupies a kind of theoretical middle ground, recognizing the importance of both maturational and experiential processes. The theory argues and provides evidence for continuity from joint attention through pointing and pantomiming to linguistic items and constructions (later understood as group-wide communicative conventions), all underlain by the same skills and motivations of shared intentionality. For this account to work we need a theory of gestural communication of the "rich" variety that is not based simply on behavioral or interactive patterns between adult and child (for example, Carpendale et al. 2013), but rather is based in a richer set of cognitive processes involving such things as attention alignment, perspective-taking, and recursive inferences (see Tomasello et al. 2007a). For this account to work we also need a theory of word learning of the rich variety that is not based on association learning as employed by animals (for example, Smith et al. 1996, 2014), but rather is based again in joint attention, communicative intentions, and conventional symbols (see Tomasello and Akhtar 2000). And finally, for this account to work we need a theory of the acquisition of grammar that is not based in contentless abstract rules (for example, Pinker 1991) but rather is based in a schema-based notion of linguistic constructions acquired with the same basic cognitive and social processes as all other aspects of conventional linguistic communication (with an added boost from processes of categorization, analogy, and statistical learning; Tomasello 2003). Our account must also be able to explain children's growing understanding of conventions in terms of the several components involved (for example, Kalish 2005) as well as "objective" propositions.

Our attempt to explicate this general account of uniquely human communicative development is depicted in Figure 4.4, which shows when and how the most important factors involved in the acquisition of cooperative and linguistic communication enter into the process. In the beginning are infants' and toddlers' pointing and pantomiming. These uniquely human communicative acts are especially clear cases of how the capacity for shared intentionality transforms basic ape skills into uniquely human skills. Ape attention-getters simply draw attention to the self, whereas human pointing invites joint attention to an external referent. Ape intention-movements signal an impending action via a ritualized performance of the initial step, whereas human iconic gestures symbolically represent an external action or event. For pointing and pantomiming to work communicatively, it is necessary that apes' two types of communicative gestures be reconfigured by the maturation of the dual-level structure of joint intentionality.

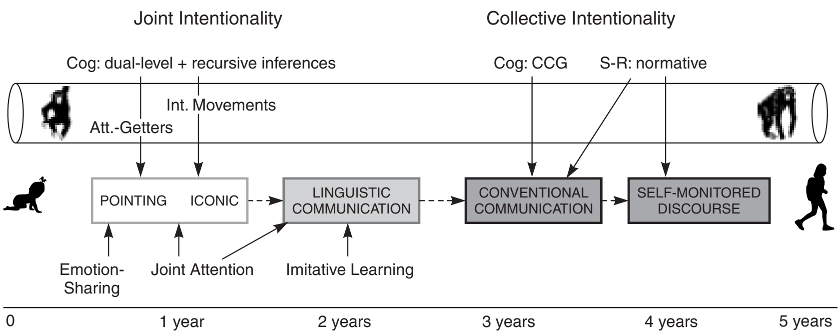

Figure 4.4 The ontogenetic emergence of young children's uniquely human skills of communication. Abbreviations: Att.-Getters = attention getters; CCG = cultural common ground; Cog = cognitive; Int. Movements = intentional movements; S-R = executive self-regulation.

Of primary importance are skills of joint attention, which underlie in a very direct way the possibility of acts of reference (inviting joint attention to an external referent); these develop first, as indicated by the skills listed at the bottom of the figure. Also necessary is the reading of communicative intentions recursively, which is indicated here as an evolutionarily new capacity entering the process (from the top of the figure). There is also the need for new cooperative motives, especially the motive to share emotions and attitudes, inherited from younger infants' emotion-sharing protoconversations (as well as cooperative motivations to request help and to help others, which have at least some roots in nonhuman apes). The fact that these unique communicative behaviors emerge so early in ontogeny—and are used almost exclusively with adults—supports the proposal that many of infants' most distinctive social behaviors evolved, partly or wholly, in a cooperative breeding context in which they competed with other infants for adult care and attention.

Productive linguistic communication emerges some months after and draws on the same joint intentionality infrastructure as pointing and pantomiming: joint attention to a referent, recursive inferences to recover the communicative intention, cooperative motives of helping, and the sharing of emotions and attitudes. But in this case the form of communication does not come naturally the way that pointing and pantomiming do, but rather the child must imitatively learn the conventional means of the social group for performing acts of reference and communication (indicated, again, by a skill listed at the bottom of the figure, indicating that it has its own developmental history). But, I have argued, to do this they do not need to understand linguistic conventions as conventions per se. They merely need to understand them as artifacts or tools designed to perform a job. In the case of linguistic constructions, there are a number of other cognitive processes involved, such as categorization, statistical learning, and analogy (all of which are processes also employed, at least on a basic level, by other apes). But, given these processes, young children acquire linguistic constructions and the meanings and perspectives they symbolize with the same joint intentionality infrastructure with which they acquire words: understanding invitations to joint attention, recursive inferencing, and cooperative communicative motives.

As children's capacity for collective intentionality matures, they come to understand many cultural practices as conventions—as cultural practices in which most or all of the individuals in their cultural group engage (and which individuals in other cultural groups mostly do not engage). Children follow conventions at the outset just to conform to adults, but in a third step in the ontogeny of uniquely human communication they come to understand and respect them as a kind of agreement of individuals—in their cultural common ground—to coordinate with one another by always doing things the same way. Experiments suggest that young children do not understand this conventional dimension until around three years of age, exactly the age at which children's skills of cultural common ground can be seen in a variety of other contexts.

Finally, throughout this whole process children's communicative interactions with others have a discursive dimension: they produce a communicative act to the adult, and the adult responds, or vice versa, with the potential of further turns. Each communicative act is to some degree adapted for the particular interactive context, including the discursive context, in which it is produced. But early in communicative development, young children are poor at this, and they only become capable of a real conversation—with multiple relevant turns on a common topic—as they approach their third birthday. During this process they become sensitive to feedback from the listener, and ultimately they self-monitor their own discourse by imagining the comprehension processes of the listener and adjusting for her ahead of time. This kind of internalized social self-regulation—albeit a bit indirect, as it does not involve adult instruction per se—is part and parcel of six-year-olds becoming reasonable creatures.

Language acquisition is arguably the most complex developmental process of the human species. It involves pretty much the whole child, with all of her cognitive and social competencies fully engaged. But when we take account of the fact that great apes communicate intentionally in some sophisticated ways as well, and we bracket the processes involved there, most of what goes beyond that involves in one way or another skills and motivations of shared intentionality. So our account is only focused on these dimensions of the process. But they are, arguably, the key dimensions from a cognitive point of view. (Of course, there are uniquely human processes of vocal-auditory processing as well, but they are not our concern here, especially as all the key aspects of uniquely human communication are also present in conventional sign languages.) Given this limited focus, I have attempted to provide a thorough accounting of the way that developmentally earlier capacities for such things as joint attention and emotion sharing transform great ape communication and thereby give rise to uniquely human cooperative and conventional communication.

Cognitive Implications

Human linguistic competence defies pigeonholing. It is clearly an evolved capacity of the human species, but it is totally learned. It is a fundamental cognitive capacity, but it is totally social. It is mastered and practiced by individuals, but it is culturally normative through and through. We cannot capture these many complexities in one simple account. Similarly, the cognitive implications of acquiring skills of cooperative and linguistic communication are so multifarious and so momentous that they cannot be readily summarized. But it is important to emphasize that it is indeed the acquisition process that creates the many and various new cognitive functions. A child growing up on a desert island would not be evolutionarily equipped with these whole cloth; the biologically inherited capacities for communicating with others in uniquely human ways must be exercised in interaction with others for all their cognitive effects to be realized in individual human beings.

But we might characterize at least some of the effects as follows. Engaging with others in acts of cooperative communication with the goal of aligning perspectives leads young children to create perspectival cognitive representations. It also leads them to begin engaging in recursive and reflective inferences. Conventional linguistic representations are acquired through a process of cultural learning (see Chapter 5) and provide the child with the panoply of perspectives that her forebears in the culture considered useful to conventionalize, and these representations do this with normative force. The grammatical dimension of conventional languages provides a conventional representational format for symbolizing whole situations as propositions and then expressing propositional attitudes about them. Inserting words and other items into abstract linguistic constructions, whose slots have conventional significance already, leads to various types of relational thinking, analogy making, and metaphor. Engaging in joint attention to the mental content of linguistic expressions in conversation and discourse—in which individuals express differing perspectives and attitudes toward a topic of joint attention—represents a crucially important part of the process by which human beings come to represent situations "objectively." And finally, the child executively monitoring her communicative acts with others is a form of social self-regulation that, when internalized, plays a key role in the child becoming normatively rational—that is, formulating and expressing her thoughts in ways recognized as rational by her cultural group.

Acquiring a conventional language means acquiring a culturally created set of cognitive and social tools. One's forebears in the culture have already anticipated the kinds of perspectives one might like to take and the kinds of categories one might like to form. But at the same time, going beyond one's forebears, these tools enable the individual to create all kinds of new conceptual combinations that have never been thought previously. Conventional languages are the quintessential Vygotskian cultural product: inviting conformity to their conventions and simultaneously empowering the individual to go beyond them.

— 5 —

Cultural Learning

Social learning and cultural transmission, in their broadest senses, are ubiquitous in the animal kingdom. But the human versions are clearly special. This can be most directly seen in the process of cumulative cultural evolution, characterized by the ratchet effect (Tomasello et al. 1993a; Boyd and Richerson 1996). When one individual in a group invents something useful, in ideal circumstances we all get it immediately. Then the stage is set for someone else to improve upon the original invention, which we all then get as well. The result is a process that, in an important sense, pools the cognitive resources of everyone in the cultural group because we all benefit from the insights of each of our groupmates. Cumulative cultural evolution via the ratchet effect is made possible by special skills of imitation and even conformity, as well as uniquely human pedagogy and instructed learning (adults, as representatives of the culture, insist that children learn). These unique cultural learning processes all derive in one way or another from processes of shared intentionality, especially those constituting the second step of collective intentionality.

Great apes have some skills of social learning, and indeed some great ape populations have established behavioral "traditions" that persist across generations. But to survive and thrive in a culture, human children must possess more powerful skills of cultural learning. Thus, human infants and toddlers do not just gather information for instrumental tasks by observing others, as do apes, but they actively conform to others, even when that means overriding what they have learned on their own. In doing so, they do not just reproduce the results of the other person's actions, as do apes, but learn *through* the other person as they take her perspective. And adults actively teach things to young children so that, beginning at around three years of age, children trust this transmitted knowledge even more than they trust their own experience. This is because they understand such instruction as coming not from an individual but from the culture at large: they understand pedagogy as an attempt by an authoritative cultural expert to transmit objective knowledge to them. As children internalize the process of instruction, they learn to executively self-regulate their own actions and thinking in terms of adult perspectives and, ultimately, in terms of the normative expectations (standards) of the group.

But human cultural learning is not just about acquiring important skills and knowledge, it is also about establishing important social relationships. One of the main sources of cohesion in all types of human social groups, including most human cultures, is conformity. People especially like and trust those who share their cultural practices—those who speak and dress and eat like them. So people copy one another and even conform to one another in order to affiliate and fit in with the group. They even copy non-instrumental cultural rituals. The result is that for humans, but not for other apes, cultural learning is not just about acquiring useful skills and knowledge but also about displaying, and hopefully reinforcing, one's social solidarity with others and the group.

Having looked at how children come to mentally coordinate with others, in the previous two chapters, we now focus in this chapter on the transmitive dimension of culture: how, during ontogeny, young children absorb all of the skills and knowledge that others in their culture have developed and, in many cases, that those others are attempting to teach them. Much of this knowledge—this cognitive content, as it were—is necessary for individual survival; in addition, much of it functions to solidify the individual's place within the cultural group. The major ontogenetic transition occurs at around age three, when young children go from just imitating and culturally learning from others to a full understanding of adult pedagogy as the cultural transmission of objective knowledge.

From Apes: Social Learning

Most mammals and many primates interact with the world based almost solely on knowledge they have acquired individually. In some cases they learn things on the basis of being social animals—for example, by following the herd they learn where to find water—but they are not actively seeking information from others, and no one is teaching them anything.

Great apes definitely acquire new information from actively observing the actions of others, though this generally does not include things that they could not, if given the time and opportunity, learn on their own. And even for apes there is no active teaching; social learning is exclusively about one individual exploiting the skills and knowledge of others, not about cooperating with them.

Great Ape Social Learning

Different populations of chimpanzees in the wild exhibit different behaviors (Whiten et al. 1999), and this is true on a more limited basis for orangutans as well (Van Schaik et al. 2003). Population differences of behavior have also been reported for a number of other mammalian species, such as capuchin monkeys (Perry et al. 2003) and whales and dolphins (Rendell and Whitehead 2001). Some of these differences are clearly due to ecological differences: termite fishing cannot occur in a population without termites. But across a number of field sites at which extensive observations of chimpanzees have been made, several dozen population-specific behavioral traditions have been identified as "cultural," which means that they are used by most members of a population, are not used in most other populations, and are most likely due to social learning (because they are not due to ecological factors). One problem in labeling these behavioral traditions as "culture" is that in some cases subtle ecological differences between populations—initially thought to be absent—might actually be present. For example, in one famous case it was initially thought that two populations of chimpanzees used different techniques in fishing for ants. But it turns out that the different techniques were driven by the fact that the ants at the two locations were differentially aggressive; because the chimpanzees did not want to be bitten, they adopted different techniques in response (Humle and Matsusawa 2002). It is thus not clear that the population differences are due to social learning at all.

In an attempt to clarify these issues, investigators have conducted experiments with captive apes, mostly chimpanzees. One finding is that in many cases the social learning at work is only weakly social. For example, in many cases an individual chimpanzee observes an actor make something happen in the environment, then reproduces that effect. But what the observer has actually done is to notice an effect in the environment that can be produced (which she would otherwise not have noticed), and then she reproduces that effect using her own techniques. These techniques often match those of the actor because the observer has the same basic cognitive and motor capacities as the actor, but there is no attempt to copy the actions per se. This is so-called emulation learning, in which the observer is focused not on an action but on an outcome (for reviews, see Tomasello 1996, 2011). In a series of studies Whiten and colleagues have found that chimpanzees pay more attention to the actions of others when the actor is another chimpanzee who is a member of their group (for example, see Whiten et al. 2005, 2009; Horner et al. 2006).

But in other studies Whiten et al. (1996) found that three-year-old human children reproduced demonstrated actions far more faithfully than the chimpanzees (also see Call et al. 2005). The chimpanzees' relative neglect of actions in the process of social learning becomes even clearer when the observed behavior is an action with no environmental outcome. Thus, Tomasello et al. (1997) report an experiment in which one chimpanzee was taught a novel gesture and put back into the group to demonstrate it (on two different occasions using two different gestures and demonstrators). The other members of the group did not acquire this gesture, reinforcing the conclusion that chimpanzees do not normally learn the specific actions of others. In all, the clear pattern is that chimpanzees are more focused on the outcome of an action than the action itself.*

An interesting twist to the story is that great apes raised or trained by humans are better at imitating the specific actions of demonstrators. Tomasello et al. (1993b) systematically compared apes raised by humans (so-called enculturated apes) with typical captive apes and found that the human-raised apes learned the specific actions of others much better. In addition, Custance et al. (1995) trained two four-year-old chimpanzees over a several month period to reproduce demonstrated actions in the "do as I do" paradigm. After this period of training, they could learn to reproduce even some novel actions, but only around a third of the actions demonstrated for them (for a similar study with a single human-raised orangutan, see Call 2001). Most impressively, Tomasello and Carpenter (2005a) found that three enculturated juvenile chimpanzees reproduced only intended and not accidental actions, and they produced a demonstrator's

---

* Newborn chimpanzees engage in neonatal mimicking of mouth movements in much the same way as human infants (Myowa 1996; Myowa-Yamakoshi et al. 2004), but so do rhesus monkeys (Ferrari et al. 2006), who do not imitate others at all as adults. So the meaning of this behavior is unclear.

desired outcome even when the demonstration was of a failed attempt (paradigms first used with human children, with comparable results). Buttelmann et al. (2007) even showed that six enculturated chimpanzees engaged in so-called rational imitation in which they took into account why the demonstrator had chosen the action she had then checked to see if those reasons applied in their own case as well. The conclusion is thus that great apes raised by humans display special skills of social learning and imitation relative to typical great apes, many of them comparable to the skills of human children. But even enculturated apes have not shown great facility for imitating gestures and other actions without an instrumental goal. Those taught human-like gestural signs mostly acquired them not by imitation but by shaping and reinforcement. Nonhuman primates do not imitate vocalizations at all.

A reasonable hypothesis, then, is that chimpanzees naturally focus more on outcomes than on actions in social learning situations. Being raised or trained by humans can lead them to focus more on actions. Human children naturally focus much more readily on the actions involved, but it is important to note that they too focus quite a bit on outcomes in concrete problem-solving situations (Nagell et al. 1993; Tennie et al. 2006). One might therefore say it this way: in observing instrumental actions, apes in general, including humans, tend to focus on the outcome, either produced or intended, but in some cases they analyze the outcome backward to the behavioral technique used to see how that outcome was achieved. Human children engage in such analysis more naturally and perhaps more skillfully than do chimpanzees. Supportive of this conclusion, Buttelmann et al. (2014) found that even when they did not perform the specific actions of a human demonstrator, chimpanzees could still discriminate in a simpler task the demonstrated action from other actions. And Haun and Call (2008) showed that at least some apes know when they are being imitated.

Human Children

From soon after birth, human infants (just as chimpanzees and other nonhuman primates; see footnote on previous page) mimic the simple facial expressions of others (for a review, see Meltzoff 2007). During the rest of the first year of life, they learn to reproduce the effects produced by others in their intentional actions by emulating either the outcome or goal of an action, again in the general great ape manner (for a review, see Tomasello and Carpenter 2005b). Then, in the months following their first birthdays, infants begin to reproduce the actions of others in a variety of new ways, but these are all things that apes do, as we have just seen. Thus, in the so-called failed attempts paradigm infants at twelve months of age begin to reproduce not the actual actions of others but those they intended (Meltzoff 1995; Bellagamba and Tomasello 1999), and in the intention-accident paradigm this occurs at around fourteen months of age (Carpenter et al. 1998a). Moreover, human infants also engage in rational imitation—in the period from twelve to fourteen months of age—in which they take into account whether an adult performed an action as a free choice, in which case they reproduced it, or whether the action was forced by external circumstances that did not apply to them (for example, the adult's hands were full), in which case they did not reproduce it (Gergely et al. 2002; Schwier et al. 2006). From soon after their first birthdays, then, human infants imitatively learn the actions of others in ways that demonstrate an understanding of their goals, their chosen behavioral means or intentions for achieving that goal, and the reason they selected the behavioral means that they did. There are almost certainly quantitative differences in the human and ape versions of these social learning skills—human children employ them more frequently, more readily, and more skillfully—but these are all things that other apes also do in some settings.

In all these processes of social learning that human children share with other apes, there is a clear difference of developmental timing, although the vast majority of studies with great apes have not looked at individuals younger than three or four years of age. Figure 5.1 summarizes the data from Tomasello and Carpenter (2005a), who gave a systematic battery of imitation tasks to three human-raised chimpanzees longitudinally over the first few years of life. The figure also includes the results of imitation tasks from the Wobber et al. (2013) study with chimpanzees and bonobos (discussed in Chapter 2). Finally, we summarize the results for human children from the many studies just reported. The tests include straight imitation, in which individuals had to learn a new action on an object; the imitation of intentional over accidental actions; the reproduction of intended actions in a failed attempts paradigm; the reproduction of the "style" of an action, even when it was causally irrelevant; and rational imitation. Human children, as just reported, are successful in all

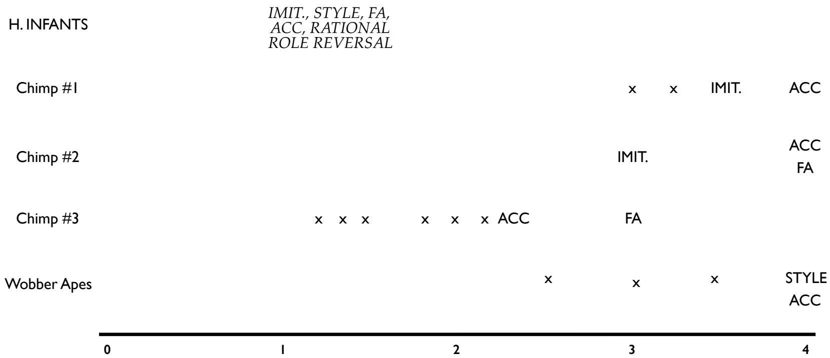

Figure 5.1 Age (in years) of success in various types of imitation tasks for human infants (summarized across many studies) and three chimpanzee youngsters (plus a summary of a larger study: Wobber et al. 2013). The *X*s represent task failure at younger ages. Abbreviations: ACC = imitation of intentional over accidental actions; FA = reproduction of intended actions in a failed attempts paradigm; IMIT = straight imitation; RATIONAL = rational imitation; STYLE = reproduction of the style of an action, even when it was causally irrelevant.

these tasks at around twelve to sixteen months of age. Great apes, in contrast, show no evidence of any of these kinds of imitative learning until two-and-a-half to three years of age. Importantly, because of the developmental focus of these ape studies, in Figure 5.1 we have a number of well-documented data points where great ape infants failed to imitate (which are marked with *X*). Such data points are crucial for setting the lower limit in ontogeny.

So once again—as in the case of gaze following (but not in the case of ritualized gestures)—we have a clear developmental shift of skills to a period more than one year earlier in human infants. Importantly, a distinctive fact about social learning and imitation in chimpanzees and other great apes is the marked way they are affected by human interaction. Indeed, the reviews of Call and Tomasello (1996) and Tomasello and Call (2004) found that social learning was one of the two domains (the other being communication) most strongly affected by human rearing and interaction. This great plasticity in the ontogeny of great apes' skills of social learning and imitation provides exactly the kind of individual variability needed for the evolution of human children's stronger and more consistent skills of imitation and cultural learning, which we shall now examine in more detail.

Imitation and Conformity

The data are clear that human children are much more focused than great apes on the actions of others and are more motivated to reproduce them. One evolutionary hypothesis for this difference is that during earlier stages of human evolution it was important for individuals to acquire the use of causally opaque artifacts that one could not figure out on one's own (for example, Lyons et al. 2006; Whiten et al. 2009). This would include also social conventions, such as linguistic conventions, that have no observable causal link to any environmental outcome.

An alternative, not mutually exclusive, hypothesis is that early humans also came to use imitation for a new and different function: to show that they are like others in order to affiliate with them and to conform to the group. This is the "social side of imitation," and it is clearly important in many ways in human cultural life (Carpenter 2006). When children are learning and enacting behaviors whose function is not just instrumental but social or cultural—for example, imitating or conforming in order to affiliate or bond—the label that is perhaps more appropriate than *social learning* is *cultural learning*. In the next three subsections we briefly describe three forms of cultural learning that are, by all indications, unique to the human species (with an account of instructed learning, which is also uniquely human, in the section that follows).

Role-Reversal Imitation

From soon after the first birthday, human infants and toddlers begin engaging in a form of cultural learning that requires perspective-taking. The phenomenon is what has been called role-reversal imitation. The basic idea is this: if I tickle your forearm, you could imitate me either by doing exactly the same thing—tickling your forearm, like I did—or you could do the same thing with a perspective switch by reciprocally tickling my forearm. There is no correct response in such cases, only an issue of how the original action is interpreted. There is also the situation in which we collaborate and you play one role and I play another, and then, on a second round, the question is whether you can readily and easily switch perspectives and play my role.

Carpenter et al. (2005) tested human infants for both of these types of role-reversal imitation. They found that eighteen-month-olds quite often responded to an adult acting on their body (tickling their forearm) by doing the same to her (on her arm) in reverse. They also found that after these same infants played one role in a collaboration with a partner, they could quickly switch to the other role; for example, they could go from being the one who held the toy steady while the other placed things on it to the reverse. Children with autism in this study struggled to reverse roles in this way. In addition, Tomasello and Carpenter (2005a) found that chimpanzees did not reverse roles in either of these ways. A reasonable explanation—based on our analysis of great ape and human infant social cognition in Chapter 3—is that great apes simply do not take the perspective of others in the same natural way as human infants.

I have argued previously that role-reversal imitation is necessary for learning linguistic conventions, as, in most cases, children must learn to perform the same vocalization toward an adult that she has previously performed toward them (Tomasello 1999). But the point is actually more general. When the members of a cultural group begin engaging with one another in some activity, they in some sense learn the activity from both sides, learning both roles, in a way that other apes do not (see Chapter 7). If, for example, we collaborate in net fishing by one individual holding the net while the other herds fish toward it, role-reversal imitation enables each of us in the future to play either role. Thus is born a convention in which everyone knows that everyone knows (ultimately in cultural common ground) how to slot into each of the roles in a cultural practice.

Social Imitation

As documented at length in the previous chapter, infants and toddlers readily acquire via cultural learning arbitrary social conventions, such as linguistic symbols. Linguistic symbols require children to reproduce the actions of others more or less precisely—in the prototypical case, vocally (whereas apes are basically incapable of vocal learning)—for communicative ends. Apes who have been taught humanlike forms of communication do not acquire them in this way. Either they are laboriously conditioned into making appropriate hand signs (the same ones that deaf children imitate from others easily), or else they learn to indicate a graphic sign by touching it (which does not require action imitation). These behaviors are, of course, extremely interesting in their own right, but from the point of view of cultural learning, apes are clearly not adapted for imitating social actions aimed at social ends (recall also apes' failure to copy a conspecific's experimentally trained gesture in the context of their social group).

It is possible that this difference between apes and humans is at least partially explained by the fact that humans, unlike apes, reproduce the actions of others not just for instrumental reasons but also for social reasons. That is to say, one of the main ways that humans affiliate with others—beginning already with infant emotional attunement and joint attention—is to align psychological states with them. Imitating actions is another form of this same alignment process, in this case of intentional actions. Thus, the main way that unfamiliar toddlers break the ice and begin to play together is through the imitation of each other's actions (Eckerman et al. 1989; Nadel 2002). Imitation in order to affiliate scales up later in ontogeny to conformity as a way of identifying with the group. Thus, Kinzler et al. (2011) found that young children are more prone to imitate the actions of an in-group member than an out-group member. Also, Herrmann et al. (2013) and Watson-Jones et al. (2014) found that when preschoolers see a clear goal to an action, they quite often focus on that goal and its associated outcome; but when they see an action with no clear external goal, they assume that the actor is doing something else, perhaps performing some kind of cultural ritual aimed at affiliation, and so they focus more on actions.

What this all means is that in many cases young children have two simultaneous motives for imitating an adult: to learn something useful and to affiliate. When one's goal is to learn something useful, it is not always necessary to focus on the exact actions performed; focusing on the outcome is often sufficient (because one can create an effective set of actions on one's own). But to display similarity, a focus on actions is almost always required. A variety of factors determine which motive, and so which strategy, predominates (Over and Carpenter 2012). A general finding is that human infants and toddlers, from age one to two, gradually focus more and more on actions over outcomes (Nielsen 2006), perhaps because they are just discovering that aligning actions, in addition to emotions and attention, facilitates social bonding (or perhaps just because they are becoming motorically more capable of imitating exact actions).

The conclusion is that when the goal is purely to learn useful instrumental behaviors, the imitative learning of great apes and young children is not so very different. But young children usually have to some degree—and in some contexts to a high degree—a wish to affiliate with the person they are learning from (or a wish to identify with that person's social group). Therefore, young children focus more—a lot more in some contexts—on aligning with the actual actions performed by others with whom they wish to affiliate. Perhaps supportive of this hypothesis, Nielsen (2006) found that young children imitate actions more often when the adult demonstrator interacts with them in a warm and friendly manner instead of in an impersonal manner. And Nielsen et al. (2008) reinforced this result by having children observe adult demonstrators either live or over television, finding that, again, children focus more on actions when the demonstrator is more socially responsive to them.

Conformity to Others or the Group

In some situations, children do not just display their likeness to others to affiliate with them, they feel the need to conform—either to them or to their group. This need is so strong that they will override their own already established knowledge or preference in order to do so. The phenomena are typically labeled as conformity or overimitation.

Following the classic adult study of Asch (1956), Haun and Tomasello (2011) presented four-year-old children with some perceptual judgments (for example, "Which is the larger elephant?") that were quite easy to make, but three children before them had publicly announced a clearly incorrect judgment. When children had to give their judgment publicly as well, they conformed with the other three children's clearly erroneous judgment. They did not conform when they could make the judgment in private, thus showing that this was clearly an instance of conformity with the other children. Haun and Tomasello (2014) adapted this paradigm for two-year-olds by making it more action-based, which also enabled them to make a direct comparison to great apes. Children learned on their own into which hole of an apparatus they should insert a ball for it to eject a reward. Then they saw three other children put balls into a different hole, and the apparatus still ejected a reward. A majority of children on their next turn switched to the new hole, especially if the three children were watching them, again providing support for an interpretation in terms of conformity. In stark contrast, chimpanzees and orangutans preferred to stick with what had worked for them before as individuals and so almost never switched their preferred hole after watching three peer apes be successful with a new one.*

Studies of so-called overimitation also demonstrate a strong social component to young children's imitative learning. Horner and Whiten (2005) found that observer chimpanzees tended to ignore irrelevant actions on a box when their causal ineffectiveness was clear, whereas three- and four-year-old human children paid much more attention to these actions, reproducing them no matter their causal effectiveness. In other comparative studies, Nagell et al. (1993) and Clay and Tennie (2017) found similar results, with only children (and not apes) imitating irrelevant actions. In a study with children, Lyons et al. (2007) showed preschoolers how an apparatus worked. In some cases the demonstrator performed clearly causally irrelevant actions—and even told the children that they were irrelevant—but the children quite often reproduced them nonetheless. Interestingly, Kenward (2012) found that when children in this age range observed another child failing to reproduce the irrelevant actions that had been demonstrated (that is, failing to overimitate), they intervened and corrected her, often with normative language about how one ought to be doing it. This finding fits with those of Schmidt et al. (2011) that young children intervene to correct the actions of third parties when they deviate from what they perceive to be the culturally normative way of doing them. Normative intervention goes beyond simply conforming in order to affiliate or to please others, and suggests that in some instances young children perceive an adult intentional action as the right way for everyone in the group, including themselves, to perform it. Importantly in the current context, such group-mindedness is only possible after the emergence of skills and motivations of collective intentionality at three years of age.

We should also note at this point that, in many contexts, human infants and toddlers are more motivated to imitate adults than peers (Zmyj et al. 2010), including overimitation (McGuigan et al. 2011). They also conform to the majority more strongly with adults than peers (McGuigan and Stevenson 2016), and conform to rules more readily with adults than peers (Rakoczy et al. 2010). These findings again comport well with the hypothesis

* There is one study suggesting that chimpanzees also conform even when they have an already effective method (Whiten et al. 2005), but closer inspection of the data shows that only one individual reliably switched its method of tool use to match that of others.

that the transmitive dimensions of culture come to children most naturally from adults.

Individual and Cultural Variation

Callaghan et al. (2011) gave a number of different tests of imitation to infants and toddlers in three very different cultural contexts—for example, imitation of arbitrary instrumental actions and failed attempts—and found very similar ages of emergence in all three (two of them small-scale, nonliterate cultures). A reasonable hypothesis is thus that the basics of imitative and cultural learning are present in infants and toddlers in all cultures. In addition, the basic phenomenon of overimitation has also been demonstrated in a number of different cultural contexts (for example, among Kalahari Bushmen by Nielsen and Tomaselli 2010; Nielsen et al. 2014). Indeed, although adults in different cultures may interact and teach children in different ways (see the next section), there are, to my knowledge, no findings demonstrating qualitative differences in children's imitative learning across different cultural contexts. Children in different cultures may be differentially prone to imitate, and adult behavior may influence this as well, but the basic way that children imitatively learn from others is very likely a human universal—indeed, something that is necessary for the creation and maintenance of distinct cultural groups in the first place.

Children with autism are clearly different from typically developing children in their skills of imitative learning. However, the data are extremely complicated. One problem is certainly that children with autism do not form a homogeneous group, and different studies may be dealing with different populations. Classically, studies have found that children with autism are less skillful at imitation (for example, Hobson 2002), but Nielsen and Hudry (2010) found overimitation in children with autism. Using a similar but different paradigm, Hobson and Lee (1999; see also Hobson and Hobson 2008) found that children with autism did not copy the "style" of the demonstrator (for example, scratching something vigorously versus tepidly), and Hobson and Hobson (2007) found that children with autism did not engage in role-reversal imitation (acting on the other person as the other person had acted on them) in the manner of typically developing children. And so, although the details are unknown at this point, it would seem to be the case that children with a biological deficit leading to autism do not imitate others in the species-typical way.

Instructed Learning

The other side of uniquely human cultural transmission is adult teaching or instruction. Active teaching is extremely rare in the animal kingdom; typically it occurs with a given species for only one specific function. For example, mother lions "teach" their cubs to kill mice by initially bringing them partially incapacitated ones, then later bringing healthier ones. Among primates, only humans actively instruct their young (Thornton and Raihani 2008). Boesch (1991) observed mother chimpanzees allowing their youngsters access to tools and food that they would not allow to other individuals—which might have facilitated learning—but there was little that one would call active instruction.

Our focus here is on instruction from the child's perspective, what Tomasello et al. (1993a) called instructed learning. One might think that being capable of receiving instruction is trivial, but it is not. Of course, many animals can be trained to do all kinds of things by various forms of conditioning with rewards and punishments, but this is not instructed learning. Instructed learning requires that a learner understands that the instructor intends to instruct her, and that she trusts this information and generalizes it appropriately. Indeed, one of the signature characteristics of instructed learning is that learners generalize immediately to large classes of objects and activities. They do this because they understand that the instructor is doing more than expressing a personal opinion about a singular item; rather, she is passing along generic cultural knowledge. Although even infants and toddlers learn some things when adults attempt to instruct them, recognizing the generic mode of communication characteristic of human pedagogy only becomes possible with the emergence of children's skills and motivations of collective intentionality at around three years of age.

Instruction of the type we shall be concerned with here is a specific type of cooperative communication. Adults may facilitate children's learning in many ways while still staying in the background—for example, by simplifying the task for them, directing their attention to relevant task components, or otherwise "scaffolding" their learning (Wood et al. 1976). But what we are concerned with here are cases in which the adult shows the child something or tells the child something overtly with the intention that she learn it. To do this, adults use the same kinds of ostensive signals (such as distinctive eye contact or calling the child's name) used in other forms of cooperative communication (Csibra 2010). These are signals to the child that this is "for you" and you should trust it.

Testimony and Trust

From the beginning children almost always trust the information that adults convey to them via intentional communication involving showing and telling. Harris (2012) has mapped out the diverse ways in which young children are predisposed to trust the information provided to them by adults, along with the many ways that they assess different adults for their potential trustworthiness and reliability. Haux et al. (2017) indeed found that five-year-old children trust what others tell them as much as if they had seen it with their own eyes. And Bonawitz et al. (2011) found that when a child is instructed in how to use a novel, multifunctional artifact for a particular use, they tend to stick with that use almost exclusively and ignore its other uses (much more than if they are left to explore it on their own without instruction). None of this can be taken for granted; when a human attempts to show or tell chimpanzees where some hidden food is located—to intentionally communicate useful information to them—they seem not to comprehend the communicative intention at all (Tomasello 2006; also see Chapter 4).

There comes a point when children must be more discerning about the source of information being communicated to them—they must learn to show a certain amount of "epistemic vigilance" (Sperber et al. 2010). But most of the time—and pretty much all of the time at an early age—young children trust anything coming to them from a source known to be generally reliable, whether it is being communicated or taught (Harris 2012).

Pedagogy and Instructed Learning

Following the general lead of Vygotsky (1930), Tomasello et al. (1993a) took as the prototypical case of instructed learning situations in which the child actually internalized the adult's instructions and used them subsequently to self-regulate her own behavior (for example, telling herself to "find the corner piece" as she worked to solve a puzzle). To engage in instructed learning of this type—typically not until four years of age or so—the child has to take the adult's mental perspective as he attempts to affect her mental perspective. But this is a special case to which we shall return later. There are more basic forms of instruction.

A recent theoretical advance in the understanding of instructed learning is the theory of natural pedagogy (Csibra and Gergely 2009; Gergely and Csibra 2006). This theoretical perspective has identified and characterized a form of instructed learning that goes beyond adult-scaffolded child learning but still does not involve the internalization of instructions. The basic idea is that human children are evolutionarily prepared to be instructed by adults via one or another form of cooperative communication. First, as previously noted, children are already prepared to comprehend cooperative communication more generally, including special sensitivity to ostensive signals. Second, children are also prepared to be instructed in that they expect adult instructors to be attempting to convey to them not just episodic information about the world, as in cooperative communication generally, but rather generic, kind-relevant information. Thus, an adult might communicate to a child that there is a nut on the ground that she might want to eat; however, in another context, the adult might attempt to teach her that nuts like these are edible ("One can eat these kinds of nuts"). Csibra and Gergely (2011) have emphasized that adults in all cultures communicate with their children in this generic mode at least some of the time in instructional contexts (see Kruger and Tomasello 1996; Hewlett and Roulette 2016). As far as we know, no other animal species communicates in order to teach at all.

Csibra and Gergely (2009, 2011) have provided much evidence that human infants are extremely sensitive to signs of ostensive communication. They have theorized that this represents a sensitivity to pedagogy, but in fact there are few empirical data to separate out a sensitivity to pedagogy in particular. Two studies show that eighteen-month-old and two-year-old infants expect the attitudes and knowledge that one individual has about a novel artifact to be displayed as well by other individuals (Egyed et al. 2013; Vredenburgh et al. 2015). The problem is that this does not address the question of kind-relevant knowledge about objects and events in the external world, and is just as likely to reflect generalizations about people's psychological states. In general, the theory of natural pedagogy does not specify sufficiently how children distinguish the cases in which the adult is communicating episodic information from the cases in which the adult is teaching.

There are only a few studies focused on whether children understand adult instruction to convey culturally significant, kind-relevant knowledge about objects and events in the external world. Butler and Markman (2014) found that when children are shown pedagogically how a novel artifact works, they infer that what they are being taught is not something superficial like the object's color but rather its functional properties defining what it is; they assume that pedagogy is about culturally relevant and significant things. More importantly, Butler and Markman (2012) had an adult instruct four-year-old children (using pedagogical cues) how a toy with a hidden magnet could be used to pick up paper clips. They then were left with some paper clips and several other toys that looked like the original one. The question was how many of the new versions of the toy would they try before giving up (given that none of them worked). The result was that, after instruction, the children were much more likely to generalize to the novel toys of the same type than they were if they saw the magnet use of the original toy without any pedagogical marking of the adult's behavior.

Because we are interested in the question of age, a key study is that of Butler and Tomasello (2016). Using the same magnet toy paradigm, they investigated younger children. The first finding was a clearly positive result for three-year-old children; they behaved basically like the four-year-olds in Butler and Markman's study. But the two-year-old children did not—that is, when they were taught pedagogically about the magnet toy, they did not generalize to other similar toys any more than if they just observed its use without pedagogy. Interestingly, if the magnet toy was named, and the other similar toys were verbally indicated to be of the same type ("Here are some more of those"), the two-year-olds showed some positive effects of pedagogy. But presumably the generalizing part was coming mostly from the linguistic label, which has been found by many studies to facilitate categorization. In contrast, three-year-olds do not need a linguistic label to make a generic inference from a pedagogical demonstration, and they do not even need the object acted upon to be an artifact (which one could argue signals generalizability because artifacts are cultural objects). Thus, when Schmidt et al. (2016a) taught three-year-olds how to use a novel junk object, if a puppet then used it in a different way the child objected in a generic way, using normative language such as "It doesn't work like that." The conclusion is thus that three-year-olds, but not two-year-olds, understand pedagogy as such (see also Gelman et al. 2013).

Several interpretations of the effect of pedagogy on children's generic inferences are possible, but a plausible view is that children trust pedagogical communication and generalize it to new items because they see its generic formulation as coming from the cultural knowledge of the social group, with the instructor acting as a kind of authoritative representative. Thus, when the adult says, "These kinds of nuts are edible," the child understands that he is not just giving his opinion—he is imparting an objective fact about the world as "we" know it. It is a culturally important and relevant general fact. Instruction of this type is the authoritative, objective voice of culture, as represented by the instructor, and children know this. Arguably, the fact that young children take adult pedagogy to be about generic cultural knowledge requires them to think within the framework of collective intentionality, what "we" in the group take as an objective fact independent of anyone's particular perspective.

Children thus have many ways of acquiring knowledge, and they attribute to that knowledge different degrees of reliability, generalizability, and importance. Direct experience is in some sense primary, but it accounts for only a tiny fraction of all the knowledge and skills young children acquire. What they acquire most is culturally transmitted knowledge—from knowledge of dinosaurs to knowledge of algebra—that comes to them via adult communication and instruction. Knowledge that comes prepackaged in generic format presented pedagogically—for example, "birds eat insects" or "one holds scissors like this"—occupies a special place because it means that children do not have to observe numerous instances to make an induction; they only have to recognize that pedagogical packaging marks the contents as reliable, generalizable, and culturally important. Such recognition is made possible, beginning at around three years of age, by children's emerging capacities of collective intentionality.

Self-Regulated Learning

Human children themselves engage in instruction at a much younger age than previously thought. Some evidence for this is apparent in the studies of "transmission chains," in which preschool children learn something and then teach another child (and then another down the chain; for example, Flynn and Whiten 2008; Tennie et al. 2014). Other evidence comes from studies in which children as young as three years old become experts in something and then instruct naïve children when they arrive on the scene (for example, Ashley and Tomasello 1998; Göckeritz et al. 2014). Children's instruction in these studies is often formulated in generic language about the object or apparatus involved, such as "These things go there!" or "It works like this!" And recent evidence suggests that children as young as two years old imitate adult teaching, though they do not seem to understand what they are doing until three years of age (Hardecker and Tomasello 2017). The two main ways that young children use generic language are in instructing others pedagogically in generalized cultural knowledge and in enforcing the norms of behavior formulated by the cultural group (Köymen et al. 2014a, 2015; see Chapter 9). This lends support to the characterization of instructed learning as collective intentionality whose authority emanates from the cultural group transmitting to children objective facts that predated their arrival on the scene.

The fact that young children can both teach and be taught enables them to engage in the kind of self-directed, self-regulating speech whose importance Vygotsky (1930) repeatedly emphasized. That is to say, once young children are both understanding adult instruction and instructing others, they can direct their own attention to things and self-regulate their own problem-solving activities by, in effect, instructing themselves. Given that the voice of instruction is the "objective" voice of the culture, the child is, in an important sense, self-regulating in terms of the normative understandings and standards of the cultural group as she understands them. When she exhorts herself, "These things go here," she is overriding any momentary impulses she might have in order to think about and do things in the culturally normative way. Such normative self-regulation constitutes a kind of enculturation of the child's self-regulatory capacities.

In a recent study, Herrmann et al. (2015) gave a battery of self-regulation tasks to chimpanzees and to children at three and six years of age. These included a number of tasks best described as cognitive—for example, the capacity to persist at problem-solving attempts through failures and repeated distractions. The main result was that children at three years of age self-regulated in a manner similar to the chimpanzees. In contrast, the six-year-olds looked very different; they were much more competent at controlling their momentary impulses in order to complete tasks successfully. One possible interpretation of this finding is that the period from the age of three to six years is the crucial for the emergence of uniquely human forms of social self-regulation, especially those based on children's emerging skills of collective intentionality. Our hypothesis would be that this is the age at which children are beginning to self-regulate collectively and normatively—that is, in terms of the internalized voice of the cultural group as a whole. This age would fit well with the age at which children begin to understand pedagogy as generalized cultural knowledge for their benefit and begin to teach others as a result. They now begin to teach themselves from the perspective of those who have taught them. According to Winsler (2009), children's self-regulatory speech peaks during the preschool years and is mostly internalized by age five or six. In addition, the content and structure of private speech is similar to what they hear directed to them, suggesting that children are indeed appropriating such speech from others.

Some theorists have argued that what is called internalization is a mysterious process because no concrete mechanism has been identified. But Tomasello et al. (1993a) argue that internalization is nothing other than role-reversal imitation used in a flexible way: the child imitates others directing her behavior or, alternatively, imitates herself teaching others, with herself substituted as learner. I have emphasized that this kind of role-reversal imitation—in which individuals are able to freely substitute one agent for another in anything that they learn—enables children to self-govern their own actions from the perspective of others or the cultural group (Tomasello 2016). This process has enormous consequences for the rational-normative dimension of human cognition, as it enables young children not just to respond to the culture around them but also to carry the culture around in their head, using it to self-regulate their beliefs and actions. This process is thus central, in ways that will be elaborated later, to human normative rationality. This is essentially the shared intentionality interpretation of Vygotsky's notion of internalization.

Individual and Cultural Variation

The significance of instructed or pedagogical learning in human evolution cannot be overstated. Cumulative cultural evolution is only possible because all individuals of a particular generation mostly learn the same thing from their elders, so it is reliable and stable over time for all individuals, which sets the stage for any of them to potentially innovate. Obviously, when adults normatively expect children to learn, and they enforce those normative expectations, this creates precisely the kind of cultural ratchet that keeps cultural knowledge and practices stable over time until the novel innovation occurs. We should therefore expect that one or another form of adult instruction—in which adults normatively expect children to learn and children are sensitive to this expectation—is universal across cultures, and indeed it is (Kruger and Tomasello 1996). Nevertheless, there are many well-documented differences in how instruction operates in different cultures, varying from the explicit verbal instruction in the generic normative language of Western educational systems to the normative expectations embodied in the "guided participation" of children in more traditional small-scale societies (for example, Rogoff 1990, 2003). But these differences mainly concern differences of adult behavior, not child learning.

There are two well-documented cross-cultural differences in how children learn from adult instruction. First, in a series of studies Rogoff and colleagues showed that young children from small-scale Mayan cultures are more patient and attentive in attending to the actions of others as they engage in tasks than are young children from larger-scale industrialized cultures (for example, Correa-Chávez and Rogoff 2009; Silva et al. 2010; López et al. 2010). This presumably reflects the lesser importance of direct adult instruction and the greater importance of children learning through observation in these small-scale cultures. Second, Harris and Corriveau (2013) have reviewed evidence suggesting that children from some Asian cultures are more likely than children from North America to interact with adults with "respectful deference." This means that Asian children tend to conform to adult demonstrations and instruction more than do North American children, presumably reflecting a cultural context in which individuals with greater experience are trusted to an especially large degree.

Despite these cultural differences in learning styles, as we may call them, a key question is whether young children in different cultures are engaging in fundamentally different processes of cultural learning, or whether, in contrast, children everywhere are learning in the same basic way when they are in the same kinds of social-interactive circumstances and what differs across cultures is the kinds of social circumstances in which children learn. (And children come to expect the kinds of contexts in which they will be learning.) To date, we have little evidence to help settle this question, but the current hypothesis is that, with respect to the children themselves, the basic processes of cultural learning—including instructed learning—are the same across all cultures. That is because, again, these processes are what made human cultures possible in the first place.

Becoming Knowledgeable

Human individuals learn more from one another than do great apes by many orders of magnitude. And this is not just a nicety, but a necessity. Whereas other great apes live as they always have in the tropics, human beings, beginning many tens of thousands of years ago, have come to live in a variety of other places on earth, even in the Arctic. To survive and thrive, individuals must acquire during their ontogenies a great deal of local knowledge, including how to make and use the culture's material and symbolic artifacts. They cannot do this on their own; they need to either observe others or be taught by others. In modern civil societies, children acquire knowledge about a plethora of things with which they have no direct experience, from dinosaurs to Pluto, and they acquire skills such as literacy and numeracy that they could never invent on their own. Much of this comes to them via adult pedagogy, which basically serves up to them on a silver platter the knowledge and skills in a generalized form, in "objective" form, with no further processing needed.

Theoretical Explanations

There are no large-scale theoretical controversies over the psychology of human cultural learning. But there are a number of more local disputes. One issue is the relation of neonatal imitation to later cultural learning. Although it may be a necessary, stage-setting process, even rhesus monkeys, who do not imitate others at all in later life, engage in neonatal imitation, as do great apes, who socially learn from others later in life but not in humanlike ways. Obviously neonatal imitation is not sufficient for more complex forms of cultural learning, if all that comes later is general primate ontogeny. What is needed in addition are uniquely human skills of shared intentionality, such as perspective-taking and the ability to view things "objectively."

These unique cognitive skills of shared intentionality are explanatory in the debate over the degree of similarity or difference between human and great ape social learning as well. It is perfectly legitimate to stress the similarities between great ape social learning and human cultural learning, of which there are many; indeed, recent research has found even more (for example, Whiten et al. 2009). But at the same time nonhuman great apes do not show any evidence of cumulative cultural evolution or the ratchet effect, suggesting that there are important differences as well. Again, to explain the differences I would invoke the uniquely human processes of shared intentionality, including both the tendency of adults to teach and the tendency of children to conform (Tomasello 2011).

Another local dispute concerns the potential cross-cultural differences in human cultural learning. My view, as noted earlier, is that while there are fairly large differences in the contexts of cultural learning for children living in different cultural groups, as well as differences in the way that adults teach and expect children to learn (see, for example, Rogoff 2003), the basic processes of imitative and instructed learning are universal in human children. In fact, it is these universal processes of cultural learning that make the creation and maintenance of adult cultural practices—including those for interacting with children—possible in the first place (Tomasello 2011). The unifying theoretical proposal is thus that great ape social learning is transformed during human ontogeny into human cultural learning, with all the unique characteristics I have enumerated in this chapter.

To summarize this explanatory account, I offer Figure 5.2. The earliest emerging novel feature of uniquely human ontogeny is simply developmental timing: the most basic processes of social learning and imitation that are characteristic of great apes have migrated to an earlier age in human ontogeny. Specifically, processes of emulation learning and imitation first seen in chimpanzees at three years of age manifest in human ontogeny approximately one to two years earlier, just after children's first birthdays. This ontogenetic shift is consistent with the proposal that many of human infants' most distinctive social and communicative behaviors evolved, partly or wholly, in a cooperative breeding context in which infants competed with other infants for adult care and attention. This early development leads to young children imitating adult-like things precociously, as culture pulls them along to do things relatively competently before they really understand what they are doing (a point stressed repeatedly by Vygotsky).

The first uniquely human form of cultural learning is role-reversal imitation (first box in Figure 5.2). On one level, it merely seems like a cute variation of imitation in general, but it actually is a deeply important dimension of human collaboration; indeed, in Chapter 6 we will look more closely at how young children come to understand collabora-

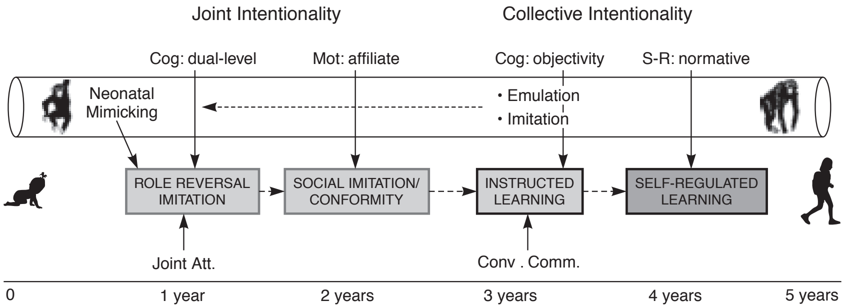

Figure 5.2 The ontogenetic emergence of young children's uniquely human skills of cultural learning. Abbreviations: Cog = cognitive; Conv. Comm. = conventional communication; Joint Att. = joint attentional activities; Mot = motivational capacity; S-R = executive self-regulation.

tion as a dual-level process comprising both a joint goal and individual roles. In any case, the ability to simulate and learn both roles in the collaboration while only playing one of them is extremely important to the process of cultural learning as it enables individuals to learn about conventional cultural practices as a whole from merely participating in one role. In addition, as we shall see later as well, many of the most important processes of children's social self-regulation depend on their being able to take the role of others as those others perceive and evaluate them. And so, although we have focused here simply on infants and toddlers reproducing physical actions directed at themselves by directing them back at their partner, role-reversal imitation in actuality reflects very deep processes of perspective-taking that underlie the acquisition of many conventional cultural practices.

Another novel feature of human cultural learning is the way that children's social learning and imitation focus much more than that of other apes on the actual actions involved; indeed, by the time they are three or four years old young children experience a need to conform to others in the social group in a way that great apes do not. They even override their own previous firsthand experience to do so (see the second box in Figure 5.2). In our evolutionary analysis (see Chapter 2), powerful conformity is characteristic mainly of the second evolutionary step of collective intentionality, which only emerges in ontogeny at three years of age. This presumably means that when two-year-olds conform with others they are conforming to individuals, whereas older children's conformity has the potential to be more group based. In any case, the outcome is that young children are conforming with others in powerful ways at an early age, possibly even before they understand the cultural group *qua* cultural group. This is similar to the case of language acquisition in which young children learn and use words and linguistic constructions with other individuals before they understand them as the social conventions of a cultural group.

The most important novel process of human cultural learning is pedagogy. Adults are motivated to teach children, and from the time they are three years of age children comprehend the generic nature of pedagogical content. Before three years of age, what children are learning are specific things that might generalize across people but do not constitute type-relevant generic facts about an objective world. After this age they understand that things they are being taught pedagogically are generalizable to other things of the same kind. Three-year-olds trust pedagogy—coming from an adult as representative of the culture—as much as they trust their own senses. Children then internalize the process (that is, they use role-reversal imitation to turn the process on themselves, taking the perspective of the instructor) at around four years of age (Winsler et al. 2000; Fernyhough and Fradley 2005). Whereas great apes and other animals clearly have an executive level of functioning with which they self-regulate their own individual actions, this kind of social, indeed normative, self-regulation is unique to humans.

My view of the nature of human cultural learning, as compared with the nature of primate social learning in general, thus focuses mainly on differences. Research over the past two decades has revealed more and more similarities in the basic processes of social learning and imitation across primates. But humans' unique social-cognitive skills create the possibility of role-reversal imitation, which is crucial for the creation of social conventions. And humans engage in social imitation, conformity, and overimitation in large part to affiliate with those in the group; adult pedagogy ensures that young children will learn what they need to learn to survive and thrive in their group. All these unique processes together account for the fact that whereas chimpanzees have behavioral traditions that may persist across generations, humans live in the midst of processes of cumulative cultural evolution that inexorably change, hopefully for the better, many of the practices and much of the knowledge of the cultural group as a whole.

Clearly, developing children are learning all day, every day from their cultures. The basic capacities for learning in this way—that is, in a way that so clearly differentiates human culture from great ape culture—are part and parcel of humans' biologically evolved capacities for cultural learning, as special cases of their biologically evolved capacities for shared intentionality more generally.

Cognitive Implications

I have argued in the previous two chapters that the way human children come to coordinate with others mentally, including via communication, leads to new forms of cognitive representation and inference, and that the acquisition of a natural language provides a conventional symbolic tool that supports especially powerful forms of mental coordination as well. In this chapter, we have focused on the processes by which children acquire large amounts and novel types of epistemic content about which they may coordinate. Some of this epistemic content is tagged as "objective." From the structural point of view, linguistically formulated propositions foster the idea that facts about the world are independent of individuals' motives and attitudes. In addition, from the point of view of content, children come to understand the cultural common ground of their group comprises many objective propositions. I have so far not elaborated on how children come to acquire an understanding of cultural common ground, but instructed learning almost certainly plays a key role. Studies show that by the time they are three years of age children understand that some of their own knowledge is shared with others in the group, and that some knowledge is generic and kind-relevant objective knowledge about types of entities and events in the world. Understanding pedagogy as conveying this type of knowledge is one of the key capacities of collective intentionality, emerging, along with related capacities for objectivity, at around three years of age.

Children's internalization of adult pedagogical interactions—using a process of role-reversal imitation—constitutes a form of normative self-regulation in which children begin to evaluate whether their decisions are good and their knowledge is valid, using as points of comparison the normative standards of rational action and knowledge learned via observation and instruction from their cultural group. This sets the stage for children to now put their heads together with a coequal peer in productive ways that transcend their own individual skills and knowledge.

In this case neither child culturally transmits anything to the other, but they still each end up with novel understandings that they would not have had without the interaction. These novel understandings are thus not transmitted but constructed—that is, they are socially co-constructed.

6

Cooperative Thinking

Much, if not most, of the creative work in which humans engage is not done individually, but rather collaboratively, as individuals put their heads together to solve novel problems. Infants, toddlers, and young preschoolers—the children we have been mostly discussing so far—are only capable of such mental coordination in very simple problem contexts, for example, in pulling in a board together. But by the time they are five or six years old, young children understand beliefs, and this means that they are now capable of putting their heads together with others in new ways by jointly attending to and coordinating their respective beliefs.

The process of jointly attending to and coordinating beliefs provides the impetus for a new cognitive activity: reason-giving. To argue for and justify their beliefs in the face of potential criticism, children relate to their partners the reason why they believe as they do, and they come to respect the reasons that others give for their beliefs, sometimes even changing their own beliefs as a result. Reasons and justifications serve to connect beliefs causally and logically and, in the end, to ground them in the culture's rational norms. Just as beliefs may be normatively evaluated as true or false, reasons may be normatively evaluated as valid or invalid based on their causal or logical connections to beliefs that we all share in cultural common ground. Although young children, perhaps especially in Western cultures, may sometimes engage in such cooperative thinking with adults, the prototypical situation is with coequal peers, because in this case it is especially clear that no one has the right answer ahead of time. As young children transition to school age, they become able to engage productively in collaborative problem-solving in which two or more coequal peers generate ideas and solutions to problems that none of them could have generated on their own.

In addition, a related process of cooperative thinking that also emerges at this time is coordinated decision-making. Young peers must engage in some serious thinking in order to coordinate with others when they are not physically together or their communication is otherwise inoperative. Classic coordination problems—for example, attempting to coordinate behavioral decisions in the absence of visual or communicative contact—require recursive thinking (in which I expect you to expect me to expect you to . . .), and it is again at the transition to school age that young children can solve such coordination problems. The ability to mentally coordinate with others in linguistic discourse leads to the construction not only of normative concepts such as beliefs and reasons (see Chapter 3) but also to a variety of other multiperspectival concepts, including logicomathematical concepts requiring the coordination and synthesis of (sometimes conflicting) perspectives.

What we are investigating in this chapter is thus children's ability to think together with peers to solve problems, to provide reasons to one another for their differing beliefs, to coordinate their behavioral decisions, and to construct multiperspectival concepts, which together constitute the capstone of uniquely human cognitive development in the preschool years. It is indeed children's ability to operate in this way—that is, to *co*-operate mentally with peers and others (and to internalize this)—that helps to convince adults that they have entered the "age of reason" and so are now ready for formal schooling and other forms of cultural instruction that turn them into rational and fully functioning members of the culture.

From Apes: Individual Thinking

One can certainly define thinking so that only humans are capable of it (for example, by requiring language). But in a broader view, many animal species are capable of thinking on a concrete level about instrumental problems by using their past experience to cognitively simulate (imagine) what might happen under various contingencies. Human infants are capable of this most basic form of thinking as well; then during the preschool years they develop a more conceptual form of thinking, involving perspectives and recursive inferences.

Great Ape Thinking

Great apes operate with the skills and motivations of individual intentionality. They have a plethora of cognitive skills enabling them to make individual decisions about how best to pursue their goals. They are instrumentally rational. In addition, they operate with basic "core knowledge" of the natural world, including, in the physical domain, a basic knowledge of space, objects, quantities, and causality, and in the social domain a basic understanding of intentional agency in the actions of others.

When they are confronted with a problem that they are not equipped to deal with immediately, great apes are capable of thinking. They categorize their experience into abstract iconic representations of entities and situations in the world. (The representation of whole situations is a precursor to humans' propositional representation.) Also, they are able to manipulate these representations mentally by making causal, intentional, and logical inferences. They can infer from cause to effect, or from effect to cause; and they can infer from intention and perception to action, or from action to intention and perception. Their inferences are thus organized into quasi-logical paradigms structured by the proto-conditional (if . . . then . . . interpreted solely with causal relations) and proto-negation (in terms of polar opposites, or contraries, such as presence-absence, noise-silence, successful-unsuccessful, and so forth). So, for example, if predators make noise, and there is no noise currently, then there is no predator currently. And finally, they are able to self-regulate their behavior by executive monitoring, enabling them not only to learn from their actions but to anticipate problems and mistakes ahead of time and so to "pre-correct" them. (For a fuller description with appropriate references, see Tomasello 2014.)

In terms of ontogeny, there are not many studies of infant and juvenile apes' problem solving. The best studied task from a developmental perspective is object permanence, and the general finding has been that various great ape species go through the first five stages at roughly the same ages as young children, with stage 6 being somewhat delayed (see Tomasello and Call 1997, chapter 2, for a review). And great ape youngsters also begin using tools in the same general age range as young children (see Tomasello and Call 1997, chapter 3, for a review). But these are just general age comparisons across studies. There is only one systematic comparative study of the problem solving of great ape youngsters in comparison with human youngsters, and that is the cross-sectional and longitudinal study of Wobber et al. (2013). In this study, chimpanzees, bonobos, and human children were given a variety of physical and social-cognitive tasks from ages two to four years. Because the tasks and methods of administration were more or less identical, we can get a reliable comparison between species. Because the two great ape species did not differ significantly, their results are reported together.

There were five tasks administered that could be called problem solving: object permanence (stage 6—requiring a mental simulation of object movement), spatial transposition (in which food was hidden under one of several cups and then either the cups or the platform were moved or rotated—also requiring a mental simulation of object movement), relative quantities (judging which of two piles had more pieces of food), and tool properties (judging which tool was the appropriate one for a problem without actually using any—requiring a mental simulation of possible solutions), and goal understanding (interpreting a human's unsuccessful attempts to gain access to a container to indicate the location of food—requiring a mental representation of the actor's goal). Figure 6.1 shows the average age of success of the great ape youngsters for each of the problem-solving tasks in this study. Three of the tasks were solved by the majority of youngsters at four years of age, and two of them were solved at three years of age.

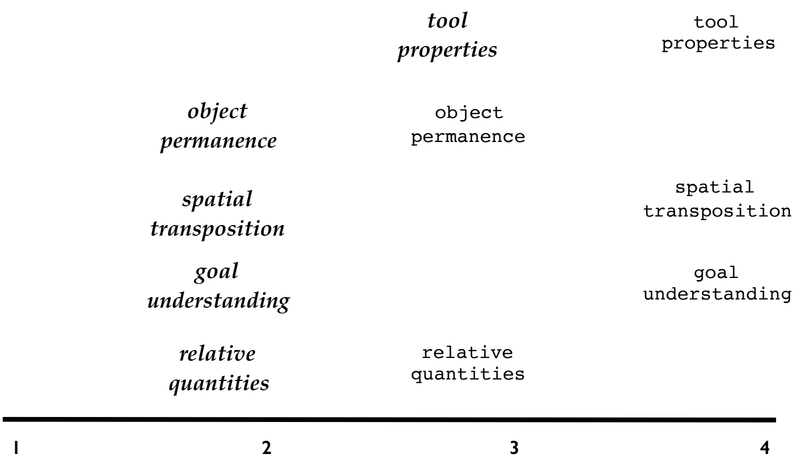

Figure 6.1 Average age of success (in years) in various types of problem-solving tasks for great apes (chimpanzees and bonobos) and human toddlers (*italics*) in study of Wobber et al. (2013).

Human Children

Figure 6.1 also shows the age at which human children in the Wobber et al. (2013) study solved the exact same tasks as the great apes under conditions designed to be as similar as possible. They solved four of them at two years of age and one of them at three years of age. In comparison with the great apes, children solved each and every task one to two years earlier. Thus, once again, we have evidence of a developmental pathway that seems to have shifted to an earlier age as humans diverged from other great apes.

In addition, there is evidence that young children also begin to think in some qualitatively new ways as a result of their emerging skills of joint and collective intentionality. When they are one and two years of age, these new skills manifest as new forms of thinking, mainly in the domain of communication. Thus, as argued in Chapter 4, as young children communicate with others they are attempting to align perspectives with them, and once they begin to use language they acquire the symbolic vehicles for different perspectives. In communicating with others, toddlers at this age also must make recursive inferences: "she intends that I know where the toy is." Further in this direction, as they are self-monitoring their attempts at communication for their comprehensibility by their listener, children for the first time begin to engage in a kind of social self-monitoring unknown to other primates. These kinds of recursive inferences and social self-monitoring only exist in the social and communicative interaction itself.

But then, between about three and four years of age young children begin to extend this new form of thinking more broadly. As outlined in Chapter 3, their cognitive representations are now not just perspectival, but "objective." This sets the stage for their ability to solve such tasks as false belief, appearance-reality, visual perspective-taking, and dual-naming. They also can begin to think in language, which gives their thinking propositional structure. This is also the age at which they begin to engage in a verbal self-regulation of their own acting and thinking, a kind of internalized self-monitoring in which the executive level can even take an "objective" perspective on things. This new kind of thinking does not have to take place only in social interactions; it begins to be internalized such that the child now has not just perspectival but dialogical or multiperspectival cognitive representations, and the content is propositional representations of both the social and the physical world.

But to complete the preschoolers' construction of a new kind of human rationality based on shared intentionality, we need a few more cognitive components. These come not from children's interactions with the world directly or from an authoritative adult—as is mainly the case with everything we have investigated so far—but rather from their interactions with other children of more or less their same age. Piaget (in several essays in his 1965 / 1995 work, for example) argued that when young children engage with adults, there is always an element of deference or respect. This is necessary for them to trust adults sufficiently as they receive all the cultural information being passed along to them. However, when the more coordinative dimension of cognition is the issue, of special importance are interactions with peers of equal status, to whom the child does not defer. This equal status enables them to engage in a true dialogue in which either individual's point of view may potentially prevail, based not on power but on reason. These kinds of interactions are necessary for fully internalized norms of rationality and thus for children's coming to a fully adult-like ability to engage in normative self-governance, as well as the ability to construct certain kinds of multiperspectival concepts. Children are becoming reasonable.

Collaborative Reasoning

Many of the joint attentional activities in which infants engage, beginning from soon after the nine-month revolution, are behavioral collaborations. Infant and adult form a shared goal, for example, to put away toys together or to stack blocks on top of one another together. The joint goal structures their joint attention, in the sense that each partner knows that the other is mostly focused on things relevant to their joint goal. Infants do this from at least fourteen months of age (Warneken and Tomasello 2007). But these are all interactions with adults, who scaffold and structure the interaction in various ways. When it comes to collaborating with peers, infants are not nearly so competent at this young age.

Collaborative Problem Solving and Dialogue

The most frequent collaborative activity for many mammalian species, including great apes, is the formation of coalitions and alliances for agonistic encounters with groupmates. The actual coordination of actions is minimal in such coalitions, as the basic idea is they are fighting against the same opponent in parallel. Something similar happens when chimpanzees encounter unfamiliar conspecifics on their border. Their group hunting of monkeys is also mainly opportunistic, with one individual beginning the chase and others then going to the remaining locations that give them the best chance to capture the monkey for themselves, without any communication to coordinate the group activity (for this interpretation, see Tomasello et al. 2005, and Tomasello 2014; for a different view, see Boesch 2005).

In experiments, chimpanzees can work together to solve concrete problems, such as pulling in a board requiring two pullers (Melis et al. 2006a; Chalmeau 1994). In such situations, they have shown that they know they need a partner to be successful; they not only wait for their partner to arrive, but they even will open a door to facilitate his arrival (for example, Melis et al. 2006b). These studies all involved adult and older juvenile chimpanzees. In two studies involving chimpanzee youngsters of around three to seven years of age working together in similar joint pulling tasks (Crawford 1937, 1941; Hirata 2007), youngster pairs failed completely on their own and had to be trained. Chimpanzees also can solve a collaborative task with two complementary roles (unlike the rope-pulling tasks, which have two identical roles), but they are poor at anticipating their partner's actions (Fletcher et al. 2012). The overall picture is thus that in the group activities of chimpanzees, the individuals are not working together as a "we" in the sense of having a joint goal and individual roles within it; rather, they are operating in what Tuomela (2007) calls "group behavior in I-mode."

True collaboration is difficult for human infants as well. Human infants who can collaborate reasonably well with an adult (as in, for example, Warneken et al. 2006) are not very skillful with a peer. (Recall also from Chapter 3 that they engage in little joint attentional interaction with peers; their interactions are much more "parallel play.") Brownell and Carriger (1990) observed pairs of eighteen-month-old infants working together on a fairly simple task in which one individual had to move the lever to put a reward in front of a hole, and the other had to retrieve it. The infants were sometimes successful, but then on the very next trial they could not reproduce their success; they did not seem to know what they were doing. By twenty-four months of age, and especially by thirty months of age, the children were much more skillful overall. Brownell et al. (2006) extended these findings using a different task, again focusing on one- and two-year-old children, and found that "one-year-olds' coordinated actions appeared more coincidental than cooperative whereas older children appeared to be more actively cooperating toward a shared goal" (803). This is despite the fact that in a visual habituation paradigm, even fourteen-month-olds differentiated between joint and individual goals (Henderson and Woodward 2011).

From a cognitive point of view, one especially important aspect of the process is children's understanding of the role of their partner, which increases dramatically from about three years of age. For example, Fletcher et al. (2012) presented pairs of three-year-old children with a task requiring two active and complementary roles. In one experimental condition, children were asked to play role B in a task with no previous experience. In another experimental condition, children played role B after they had previously played role A (with a different partner). The finding was that the children who had previously played role A were more proficient in role B than were the children who had never played role A. In this same study, chimpanzees did not learn from having played the reciprocal role at all. Seemingly, the children but not the apes were simulating the role and perspective of their partner as they collaborated. In a similar but more demanding study, Warneken et al. (2014) presented three- and five-year-olds with a task requiring them to survey the tool options available to a partner and to anticipate what she would do in order to collaborate with them effectively (given the tool they already had). The five-year-olds, but not the three-year-olds, performed skillfully in this very demanding task. (Chimpanzees performed very poorly in a similar task [unpublished data].) In general, young children take their partner's perspective during collaboration in a way that other apes do not—presumably because children are working with a joint goal and joint attention that makes the individual role and perspective of the partner especially salient.

An interesting question in this regard is why preschool children do not seem to get the point of competitive games such as most sports and board games (which typically come with instructions like "for age five and above"). Competitive games only make sense if (1) they are played within the context of cooperative rules, and (2) each partner plays the game rationally by trying to win. Schmidt et al. (2016b) had three- and five-year-olds play a competitive game with a partner who either broke the rules or played it irrationally (by sabotaging themselves). The finding was that five-year-olds protested against both types of violation in a flexible manner appropriate to the violation. By contrast, three-year-old children protested some breaches, but in a number of ways showed that they did not fully understand the two-level normative structure of cooperatively regulated competition. What is needed to participate competently in these kinds of games is skills of executive self-regulation that can coordinate (1) cooperating within the rules of the game and (2) competing with the partner. If this interpretation is correct, then most likely three-year-olds still lack the relevant skills of coordination on the executive level (a point that we will discuss more fully later).

But beyond these behavioral collaborations, a number of studies have focused on young children's collaborative problem solving and learning when facing more cognitively challenging situations, often requiring some kind of dialogic discussion. The main questions are these: How do individuals work together cognitively (including the nature of their dialogic interactions involving language)? And to what degree do they benefit cognitively from their collaborative interactions? The Piagetian hypothesis is that collaborative problem solving engages peers in an especially useful form of perspective-taking that goes beyond the simpler aligning of perspectives in cooperative communication, which they have been doing since late infancy. Collaborative problem solving on more cognitively based problems requires children to jointly attend to each other's thoughts or perspectives, for example, as expressed in a verbal statement. They alternate jointly attending to each other's linguistically expressed mental content (O'Madagain and Tomasello, forthcoming).

The vast majority of studies have been done with school-age children and adolescents. For example, in the classic study of Doise et al. (1976; see also Mugny and Doise 1978) two school-age children worked together on a conservation problem. Because conservation problems are in many ways perspective problems—children need to understand that even though the water appears higher in one glass, the other glass is wider—children ended up performing better in pairs than alone. And they maintained their new abilities for some time afterward. In reviewing much research with school-age children and adolescents, Kuhn (2015) came to the following conclusions: (1) productive peer collaborations during school age can promote cognitive development (especially in using new conceptual knowledge flexibly) better than adult instruction; (2) productive collaborations are those in which participants directly engage one another's differing perspectives; (3) it is crucial for the pair to develop a shared representation of the problem to which their differing perspectives are then anchored; and (4) argumentative discourse among peers—presumably because they are of equal status and competence—often ends up incorporating joint "meta-talk" about standards of evidence and argumentation in a way that direct instruction and dialogue with adults does not.

There is much less research on collaborative problem solving and learning with preschoolers, presumably because it is widely thought that this process is less important for them. Young preschoolers of three to four years of age tend to work on a problem more in parallel than collaboratively. But older preschoolers and children just beginning school—around five to seven years of age—are beginning to catch on. For example, in a study with six- and seven-year-olds, Fawcett and Garton (2005) found that children were better at a card-sorting task when they collaborated than when they worked alone. Pine and Messer (1998) found something similar with five- to seven-year-old children working on a balance beam task. And Azmitia (1988) found that five-year-old children working together on a block-building task gained more skills and also generalized these skills more readily to similar but different problems than did children working alone. Unfortunately, none of these studies with preschoolers investigated the process in enough detail to determine whether Kuhn's conclusions with older children also apply.

The most detailed analysis comes from a series of studies by Kruger and colleagues on how peers discuss and come to a consensus on a slightly different kind of problem: moral dilemmas. In a first study Kruger and Tomasello (1986) found that when pairs of seven-year-old girls discussed a moral dilemma, they engaged more with the perspective of their partner—for example, they mentioned the other's perspective or argument while formulating theirs—than did girls of a similar age discussing the same dilemma with their mothers. This documents the crucial role of peer versus adult interaction for collaborative thinking and learning. Investigating eight-year-old girls, Kruger (1992) found that the more a pair engaged with one another's perspective (and this was true both of peer pairs and child-adult pairs), the more their subsequent individual thinking on similar problems benefited. Analyzing these same transcripts further, Kruger (1993) found that of special benefit was a pair's ability to jointly discuss and assess a poor argument—that is, one that they ultimately rejected—which means that the benefit of peer discussions is not in suggesting good outcomes but in developing ways to engage one another's thinking in the process. This suggests that perhaps the process of collaborative problem solving and learning is similar in older children and children just beginning formal schooling: they benefit from jointly attending to and discussing one another's perspectives and arguments. Almost certainly this is not the case with younger preschoolers.

Reason-Giving and Justification

One of the new things that happen in children's collaborative decision-making, problem solving, and learning is that they give one another reasons for why they are thinking what they are thinking. They justify their perspective or line of thinking to their partner. Philosophers have long focused on the importance of reason-giving for all kinds of epistemic activities, from moral argumentation to scientific collaboration. The point is that in a true, coequal collaborative discussion, I do not want you to come around to my way of thinking because I am physically powerful or rhetorically persuasive, but rather because there are good reasons to take my perspective on the problem.

Mercier and Sperber (2011) proposed a novel theory of human reason-giving, grounded in human evolution. Their proposal is that as human societies grew larger, problems of trust became more prevalent. In a group where everyone knows everyone, and everyone encounters everyone on a regular basis, trust is maintained because an untrustworthy person would be identified and excluded quickly. But in larger groups this is difficult, so individuals had to start practicing "epistemic vigilance"—that is, being careful about what to believe. In this kind of social context, one could not expect others to accept a perspective or argument on trust. Individuals therefore started giving others reasons for why they should believe what they were telling them, typically pointing out facts that supported their view. Giving reasons in this way is a normative enterprise because it does not involve one individual attempting to overpower or coerce another into believing something, but rather, it invokes a third element—an impartial fact that does not depend on one's point of view—to adjudicate: "you do not have to take my word for it, just consider for yourself this reason."

There are two studies on how children comprehend and respond to reasons given to them. First, Mercier et al. (2014) found that four- and five-year-old children (and to a lesser degree three-year-old children) could identify when someone attempted to give them a poor reason for believing something (a circular argument, for example: the dog went this way because he went in this direction). Tellingly, they also found that children gave more credence to a proposal backed by a poor circular reason than to a proposal backed by no reason at all. Second, Schmidt et al. (2016b) had a puppet approach and request resources from children at three, five, and eight years of age. In all conditions the puppet gave a reason for requesting the resources, but in one case it was a personal reason ("I want it") that, in this context, was not really a good reason. In three other conditions the puppet gave a much better reason, one that fit at least partially a moral context: in one case it was need ("I haven't eaten in a long while, I'm very hungry, I need some"); in another case it was fairness ("You have some, and I have none; that's not fair"); and in a third case it was rules ("The rule says that you have to share"). The study found that eight-year-olds (but not the younger children) gave more items to the requesting puppet than to a neutral puppet only for the three good reasons, not for the selfish reason. The older age of reason appreciation in this study might be due to the fact that the puppet always gave a reason and then was compared to a puppet who gave no reason. As suggested by the study of Mercier et al. (2014), it might be that until this older age children think a poor reason is better than no reason at all.

In terms of producing reasons for others, Köymen et al. (2014b) had pairs of three- and five-year-old children making joint decisions about where to place toy animals and other objects in a toy zoo. The question was whether they could produce reasons flexibly depending on the knowledge they shared with their partner in common ground. The trick was that some of the toys represented things that the children knew about (and both knew they both knew about them) that are conventionally found in a zoo. Other items were things that children might have known about but are not conventionally found in a zoo. The five-year-old children, and to a lesser degree the three-year-old children, gave reasons differently in these two situations. For example, if the item to be placed was a polar bear, one child would simply point out the location of a cage with ice and a frozen pond, which was sufficient because they both assumed it was in their common ground that polar bears live on ice. But when the item was a toy piano, there was little common ground to rely on relevant to their decision about its placement. They could not just point out a location and expect their partner to accept it. They had to give a reason for the connection between the piano and, for example, a place next to a bench:

because people sit here, they could listen to a whole song. (For an experimental demonstration in which children's common ground was experimentally manipulated, see Köymen et al. 2016.) Giving reasons appropriate to one's common ground with a partner demonstrates at least some understanding of how reasons function: they justify a belief by connecting it to others that are already mutually accepted. And Köymen and Tomasello (2018) found that when each member of a pair of five-year-olds was given different information, from sources of different reliability, they were nevertheless able to successfully come to an appropriate conclusion, often by engaging in meta-talk about such things as the strength of evidence and the validity of reasons.

Throughout various essays, Piaget (1965) stressed the theme that without social interactants, especially peers, the child's thinking would be plagued by a kind of inertia toward her own parochial perspective (known as "childhood egocentrism"). When talking to themselves, children have a hard time being coherent and consistent, and they contradict themselves regularly; they need an interlocutor to keep them on track. With specific reference to children's collaborative problem solving, argumentation, and the giving of reasons, Kuhn (2015) said, "The comparative merit of the dialogic form is that it inserts the missing interlocutor . . . to remedy the weakness . . . [of] ignoring or dismissing opposing perspectives and restricting one's interpersonal exchanges to the echo chamber of one's own ideas" (12). While we humans can engage in some kinds of thinking on our own, the types that we consider rational and reasonable—the types that make sense—come out of our dialogic, perspective-shifting interactions with others. Such rational dialogue is fundamentally cooperative in nature because, at bottom, being reasonable means precisely being cooperative in one's epistemic interactions with others. All participants basically agree to yield to reason as impersonal arbiter, as it were, when that is appropriate.

Individual and Cultural Variation

There are not many studies of individual or cultural variation in young children's collaborative problem solving with peers, especially children younger than school age. The most relevant studies are those by Rogoff and colleagues comparing the group dynamics of children from mostly Mayan cultural backgrounds with children from mostly Western, middle-class backgrounds. A number of these studies have adults involved as well, but Mejia-Arauz et al. (2007) studied triads of children six to ten years of age as they solved a problem (making origami figures) together. They observed that the Mayan children behaved more often as an ensemble, whereas the Western middle-class children engaged with the materials more often dyadically or individually. This presumably reflects the differing social contexts within which children from these two cultural backgrounds engage with peers, with the Mayan children spending much more of their time in mixed-age peer groups. Nevertheless, although we do not have the kind of data we would need to come to a definitive conclusion, all indications are that young children in all cultures engage in at least some kind of collaborative problem solving with peers in which they provide reasons, of one kind or another, to support their point of view.

Coordinated Decision-Making

In infants' earliest collaborative interactions with both adults and peers, the joint goal often is established gradually as things move along. The partners coordinate their actions by coming to understand that they are both aiming at the same goal, and that consequently it is best for them to form a joint goal to pursue it together. And sometimes they form a joint goal by making together an explicit joint commitment. In both these cases, everything is out in the open: what the other is doing, and what he might be communicating. But decision theorists have also focused on other situations in which individuals must coordinate not just their actions but also their decisions, and not out in the open but without perceptual access or communication. The classic example is coordination problems in the game theory sense of the term (Schelling 1960). In this case, partners need to effect a "meeting of minds" without the support of the perceptual context or communication, which requires one or another form of coordinated thinking.

Coordination Games with Children and Chimpanzees

A well-known coordination game—and one that may have special significance in human evolution (Tomasello et al. 2012)—is the stag hunt. Stag hunt situations are those in which (1) individuals must collaborate with others to benefit, (2) the benefits of the collaboration are greater than those of any solo alternatives, and (3) all solo alternatives must be forsaken (risked) in order to collaborate. In the classic dilemma, I am hunting alone for hares when I spy a stag—which is much better food, but I cannot capture it alone. You are in exactly the same situation, so it is in both our interests to drop our pursuit of hares, collaborate to capture the stag, and share the spoils. The problem is that I cannot see or communicate with you, so I cannot be sure if you saw the stag or know that I saw the stag. And you are in exactly the same situation as me: you are not sure whether I saw the stag or know that you saw it also (and know that I know you know, and so forth). Because each of us only wants to go for the stag if the other does as well, the result could easily be paralysis.

Chimpanzees are not challenged by the stag hunt because they do not perceive it as a dilemma. In a recent experiment, Duguid et al. (2014) confronted pairs of chimpanzees with the stag hunt situation. Each was feeding on a low-value food (raisins) when a high-value food (pile of bananas) appeared some meters away. A spring-loaded, locking door on the raisins ensured that going for the bananas meant forsaking the raisins. What happened for almost all pairs on almost all trials was that one individual simply went for the bananas first, taking a significant risk. The other individual then just followed. This so-called leader-follower strategy worked fine as long as everything was out in the open. But when experimenters placed a barrier so that the apes could not see one another easily (they could do so only if they raised up their bodies to look over), their performance went down significantly. They still succeeded sometimes because both of the individuals just went for the bananas, hoping the other would follow. Chimpanzees never communicated before they forsook their raisins—even though they could have by making noise or gesturing over the barrier—even though it would have reduced their risk significantly. Two other studies have found a similar lack of communication between apes in collaboration situations in which it would have been beneficial to do so (Melis et al. 2009; Bullinger et al. 2014).

Four-year-old children in this same study behaved like the chimpanzees when everything was out in the open. The leader-follower strategy is a simple one; given that the follower usually does follow, everything works fine. But when there was a barrier, the children did something that the chimpanzees did not do: they communicated with one another. They were able to do this both vocally and with gestures by raising up above the barrier. This communication enabled them to maintain their same level of success as without the barrier. A study by Wyman et al. (2013) suggested that children were communicating because they did indeed perceive the dilemma (and so helped the partner make her decision by advertising their decision). In a task in which children could not see their adult partner operating her side of an apparatus, four-year-old children saw the stag arrive and then looked over at the adult (programmed to behave in specific ways). In one condition the child saw the adult looking directly at the stag, so she knew he knew about it. But did he know that she knew about it too, which he would need to in order to take the risk? And then he would have to know that the child saw him seeing it, too. In this situation, many children hesitated and did not go. In the other condition, this necessary recursive understanding—we both know that we both have seen it, and so forth—was effected in a simple way. The adult looked at the stag and then looked to the child excitedly, making eye contact. With this "knowing look" the adult communicated that he saw the stag and knew that the child did also, and knew that she knew he had seen it, and so forth. With this common-ground understanding of mutual knowledge, most children went for it.

The difference between chimpanzees and children in these situations is stark. But another study made it even starker. Duguid et al. (forthcoming) presented pairs of chimpanzees and pairs of four-year-old children with the simplest coordination game imaginable. Each of the subjects learned on their own that a particular type of box could be opened (and a reward extracted) only if two buttons—one on each side of the box—were pressed more or less at the same time (there could be a slight delay). In the test, two partners each came into the room on one side of a row of four of these boxes, each having access to one of the buttons on each box. To be successful, all the pair had to do was choose the same box at roughly the same time. Everything was out in the open, and communication was possible. Nevertheless, the chimpanzees had a terrible time coordinating. After enough trials, a given pair might settle on one particular box during every trial and thereby become successful. But when experimenters paired two individuals from different successful pairs, they took just as long to settle on a particular box with their new partner. What they learned was to settle on one particular box. In contrast, the young children coordinated more quickly by several orders of magnitude, and they chose various boxes with their first partner. When they got a new partner, they then coordinated almost immediately, presumably because they understood that the particular box chosen did not matter—what mattered was simply that they coordinated on the same box. They saw the coordination problem and solved it.

Three other experiments with young children modeled more closely classic coordination problems in that they eliminated the possibility of visual access or communication. A classic Schelling problem goes something like, "We agreed to meet in Paris tomorrow at noon, but we did not specify where, and we have no way of communicating with each other." It turns out that adults solve these problems fairly easily—for example, by converging on a solution like the Eiffel Tower. Presumably, they are reasoning thus: Not only is the Eiffel Tower salient for my partner, but she knows it is salient for me as well, and she knows that I will think it is salient for her (and so forth). Schelling (1960) talked about these as focal point solutions, with the key factor being some kind of mutual salience. Grüneisen et al. (2015a) presented pairs of children with just such a "pure coordination" problem. Again, the situation was that they both had to choose the same box, but in this case they could not see one another or communicate. Three of the boxes had a similar picture on the outside, but the fourth had a unique picture on it. If the partners could assume that this unique picture was mutually salient to them, they could settle on it without communication or visual access. Five- and eight-year-old children, but not three-year-old children, succeeded in doing this. (This outcome occurred more often than chance level, and more often than in a control condition in which they were simply choosing a box on their own outside of a coordination problem.) In a second study, five-year-old children solved a similar coordination problem by conforming to how others before them had acted; indeed, such conformity is the way that adults most often coordinate with others in anonymous cultural settings (Grüneisen et al. 2015b).

Finally, Grüneisen et al. (2015c) found evidence that young children in such coordination situations are indeed engaging in some kind of recursive mind-reading. One six-year-old child was presented with a row of four boxes; three had a picture of two gummy bears on it, whereas the fourth had a picture of four gummy bears on it. The pictures reflected the contents of the box. The child was told that she would be coordinating with a partner who would come in later, so she should choose a box now. But just before the child chose, the experimenter told her that he had mixed up the contents of the boxes, so the one with the picture of four gummy bears really only contained two, and a different box now contained the four. Because the goal was to coordinate, the child had to appreciate that the box with the picture of the four gummy bears would be the only possible box that could be mutually salient to her and her partner, so the vast majority of children chose this box—even though it contained fewer gummy bears. They understood that to get anything they needed to coordinate. But the real twist in this study was that the partner was actually in the hall watching the proceedings on a TV monitor. So she knew that the child in the room thought that she had a false belief about where the four gummy bears were located (which she in fact did not, because she had been watching on the monitor). Nevertheless, these children were able to coordinate by now choosing the box with the picture of four gummy bears. They understood a second-order false belief—she falsely believes that I have a false belief—so they solved the coordination problem. (Again, this occurred more often than chance, and more often than in a control condition where children chose boxes without a partner.)

The close interrelation among coordination, communication, and recursive mind-reading very likely has, at least in part, an evolutionary explanation (Tomasello et al. 2012; Tomasello 2014). Coordinating with others on shared goals in the context of collaborative foraging, as sketched out in Chapter 2, was very likely the adaptive challenge leading to humans' unique forms of cooperative communication and recursive mind-reading. In individual ontogeny, the earliest communicative acts are attempts to align attention with others, and the first acts of mind-reading occur within joint attentional interactions (see Chapter 3 and Chapter 4). Here we have scaled up to a situation in which children must align their decision-making with that of a peer partner, which they normally would do by communicating. But when the normal means of communication are blocked, a child can still coordinate her thinking with a partner by recognizing, recursively, how the partner is thinking about how she is thinking about his thinking, and so forth.

Multiperspectival Concepts

Young children can think in complex ways without language—for example, in coordinating with others or solving complex sensory-motor tasks. But much of children's most sophisticated thinking occurs in linguistic format. As they master more and more linguistic concepts and constructions, they are able to think in more and more adult-like ways. But at the same time we must be wary of giving children credit for thinking in adult-like ways just because they are using language in ways that appear adult-like. Often they fool us by using an expression that appears adult-like, but with further probing it reveals itself to be quite different or in some way more limited.

At four to six years of age, young children begin to master ways of talking and thinking that incorporate multiple perspectives in one thought. In linguistic constructions, for example, they can relate or coordinate two completely different aspects of the situation. For example, if we are talking about where a toy is, a three- or four-year-old child becomes able to say things like "I think it's in the box." The proposition *it's in the box* is a symbolization of the fact-like understanding of things that even chimpanzees are capable of. But then, the child also symbolizes the propositional attitude she is taking toward this proposition: *I think* highlights her uncertainty. Three- and four-year-old children can express a range of propositional attitudes in such grammatical constructions, using a variety of epistemic verbs such as *think, believe, know, guess, remember,* and so forth. They can also express other types of propositional attitudes with verbs such as *hope, wish,* and *wonder.*

Diessel and Tomasello (2001) looked closely at the first propositional attitude constructions produced by seven English-speaking children aged one to five years, and found that the earliest such constructions were very formulaic. For example, the child only said "I think *X*," and never talked about someone else thinking *X* or the child not thinking *X* or the like. So they were not really referring to an act of thinking about *X,* nor did their utterances have the embedded structure of a proposition enveloped within a propositional attitude. An utterance such as "I think mommy's home" was, to the child, more equivalent to "Maybe mommy's home." It was only by four to five years of age that children showed the kind of flexibility and facility with these constructions that demonstrated an understanding of how to relate a subjective perspective (for example, *I think, I don't know,* or *She believes)* with the "objective" perspective of a proposition (for example, *Mommy's home*).

In some cases, some single words even require a mastery of coordinated perspectives to use them in fully adult-like ways. For example, English-speaking adults distinguish between Mary *believing* something and Mary *knowing* something. The basis for this distinction is not anything in Mary. It is not how certain she is, how well she is able to justify herself, or anything else. I say that Mary believes something when I know, *from my* *perspective,* that she might potentially be wrong. When I say that Mary knows something, I am affirming that her understanding of the situation, *from my "objective" perspective,* is correct. There are other seemingly small and innocuous verbs for which something similar is going on; for example, when we say that something *seems* to be the case or *appears* to be the case, we are highlighting the possibility that it is not the case from an "objective" perspective.

There are other small but powerful words, so-called discourse particles, that incorporate within one word multiple perspectives related in complex ways. We can examine just three examples from English. I would say something like "*Actually,* she's at home" when my listener thinks she's somewhere else. I would say something like "*Supposedly,* she's at home" in order to highlight that the general expectation is that she is at home but I am not sure. And I would say something like "She's at home *after all*" in a situation in which we originally thought she was not at home but have now discovered that she is. Children can sometimes use such words before they fully understand them, but by late preschool they seem to grasp their import. For example, Schmerse et al. (2014) investigated German children's understanding of the discourse particle *doch,* one of whose uses is similar to *after all,* by experimentally manipulating the situation such that an adult-like understanding would lead to finding a toy, whereas anything less would lead to failure. They found that five-year-old children were mostly successful, even though they were still not fully adult-like in their understanding.

At the same age, young children also begin to master a variety of concepts relating to the physical world that also, for fully adult-like understanding, require the coordination of perspectives. One example is class inclusion, which basically indexes the child's understanding of the hierarchical organization of linguistic concepts. Thus, it is well-known that young children have a great deal of difficulty understanding that the object in front of them may accurately be referred to as either a flower or a rose. When they are facing a whole table full of different kinds of flowers and are asked, "Are there more flowers or roses?" children before about five or six years of age struggle. They cannot see one object as both a flower and a rose at the same time. Importantly, it is not the case that mastering these linguistic concepts occurs on a blank-slate child. When young chimpanzees are given different colored and shaped blocks to sort through spontaneously, they quite often classify them in ways similar to how a human would do it (for example, Poti and Langer 2001). But from this basic beginning, children learn how the linguistic concepts they are acquiring specifically relate to one another, sometimes requiring them to view the same thing from two or more conceptual perspectives at the same time.

Another important example is the concept of number. Great apes have many skills in judging quantities, absolute quantities if the numerosity is small (perhaps one to four items), and relative quantities if the numerosity is large. But in learning how to count in language, human children come to understand the concept of number in the context of a number system. To understand the concept of number in an adult-like way, the child needs to coordinate the classificatory or cardinal aspect of number (what is similar among all sets of n things) and the seriated or ordinal aspect of number (the fact that n is larger than $n-1$ but at the same time smaller than $n+1$; that is to say, the numbers form an ordered series). The test for adult-like understanding is classically a Piagetian test of number conservation, in which children understand that the number of items in a set stays the same no matter how they are spatially rearranged (for example, spread out or tightly spaced). Children do not pass number conservation tasks until around five or six years of age, perhaps because these tasks require the child to coordinate the cardinal and ordinal aspects simultaneously.

Other conservation concepts involve such things as liquid quantities, weight, and volume, all of which remain as invariants despite surface changes in spatial arrangement. An adult-like performance requires understanding that although the water level is higher in one of the glasses, that glass is skinnier. Each of these concepts has its own particular properties, and children are exposed to each of them in different ways, so they are mastered at somewhat different ages. But the fact is that children do not have a full understanding of any conservation concepts—all requiring, in one way or another, the coordination of discrepant perspectives—before about four or five years of age. Even when they are given extra training, adult-like mastery of the concept emerges only just a little bit earlier.

It is true that children sometimes use language in a way that suggests they understand these concepts at an earlier age; but when this comprehension is experimentally probed, there is seldom understanding before age five. I have singled out the particular concepts that I have because they all involve coordinating different perspectives into one concept. But the particularities matter. The physical concepts involve coordinating such things as different hierarchical levels in a system of concepts or different ways of viewing a set of items in terms of their classificatory and ordering relations. The multiperspectival concepts in the social domain—including everything from *belief* to whatever is encoded by the word *supposedly*—involve a coordinating of perspectives that sometimes are complementary (they are two compatible ways of looking at the same thing) but sometimes are conflicting (as in the fact that a false belief conflicts with an objective perspective). I have certainly not given a full account of the development of these complex concepts, which involve maturational components (from both ape and uniquely human sources), learning components (as adults either directly or indirectly give children needed information), and, in most cases, a linguistic form of representation. All I have tried to establish is that concepts and constructions requiring a complex coordination of different ways of viewing things emerge only at the very end of the preschool period, as all educators of young children implicitly know.

Individual and Cultural Variation

Little research has been done on children's ability to coordinate with one another to formulate joint decisions, so little is known about either individual or cultural variability in these skills. With regard to propositional attitudes and other multiperspectival social concepts, as might be expected almost all the research investigates beliefs. As we discussed in Chapter 3, there is a good bit of research showing the role of language in children's coming to understand beliefs and false beliefs. One interesting other piece of data is that in many languages what requires a full propositional attitude construction in English is actually accomplished with small endings on words, usually the verb, called evidential markers or certainty markers. In some languages, such markers are quite frequent or even obligatory, such that every time one wishes to express a statement one must choose an ending indicating that one knows it for certain, or one knows it only from hearsay, or one is not sure, and so forth. Matsui et al. (2009) found that the use of these markers (which are quite frequent in the speech of Japanese parents to children) facilitated Japanese children's assessment of the truth value of different adult statements in a false-belief task.

With regard to multiperspectival concepts in the physical domain, there is a long tradition of research on various conservation concepts and how they emerge at somewhat later ages in various non-Western cultures. The reasons for this are not known, but it is possible that these concepts are not as frequent in the discourse between adults and children in societies where formal education is less important. With regard to the concept of number specifically, it is well-known that in some cultures where mathematics is not particularly needed or relevant, the culture only possesses number words for the smallest numbers (the rest being designated by something like "many"). Indeed, there is some evidence that in at least one culture working with numbers is so foreign that even adults appear not to understand them in ways that go beyond the basic kinds of quantity comparisons that even very young children make (Frank et al. 2008).

The important point for current purposes is that something is happening in children's development at about the time that adults across many different cultures judge them to be ready to take on important tasks or to undertake formal schooling. This something would seem to be, in part, the ability to coordinate different perspectives as explicitly expressed in linguistic symbols and constructions—that is, to coordinate them in a way that integrates them and makes their relation clear. Doing this obviously involves executive functioning. But we must not reify executive functioning as a distinct domain-general skill. It is much more likely that a part of gaining control of any set of concepts is relating them and coordinating them to one another in the appropriate ways. Nevertheless, even nonverbal assessments of children's skills of cognitive self-regulation (involving such things as persisting through failures, resisting distractions, and inhibiting no longer effective strategies) find a significant increase between the ages of three and six years of age. As children gain mastery over the conceptual material provided them by their culture, they are better able to coordinate this material and assess it from different perspectives.

Becoming Reasonable

We have characterized children's cooperative thinking with peers, beginning just as they are reaching school age, as the capstone of early thinking abilities. Children have been putting their heads together with others for some time prior to this in acts of joint attention and linguistic communication, but that was mostly with adults, who could lead things in a direction, and mostly in concrete behavioral tasks. What children are doing now is putting their heads together with coequal peers, with no one leading, to assess beliefs, decisions, and even reasons in order to come up with the best way that "we" should think about things or do things. Capstone of preschool thinking aside, there is still much cognitive development to come after the emergence of these skills. School-age children acquire an immense amount of knowledge and an immense number of culturally specific skills, including advanced literacy and numeracy. But this knowledge and these skills would hold little power if children were not already able to coordinate multiple perspectives on things, to provide norm-based reasons for their beliefs and decisions, and to think cooperatively with their peers in solving problems and making decisions.

Theoretical Explanations

In modern cognitive science, the dominant metaphor for the process of thinking is computation. How would we build a machine—a computing machine—that could perform all the cognitive feats we see humans performing? In the current context, we might also ask how we would build a computational model to perform the cognitive feats we see great apes and human children performing. We could then compare the computational structure of human thinking to that of great ape thinking and so identify its unique aspects.

But if we now ask why human and great ape thinking differ in just the ways they do, computation-based theories are impotent; they have no resources for even formulating an evolutionary hypothesis. And the same could be said about ontogeny. We might be able to provide a computational answer to the question of how the thinking of an infant differs from that of a six-year-old, but we could not explain how this difference came about unless we simply say it is innate in the genetic blueprint and that is the end of the story (in fact, this is the preferred explanatory strategy for many computational theorists such as Fodor [1983]). But even leaving aside criticisms of strong nativism from an ontogenetic perspective, this explanatory proposal just kicks us back to a version of the evolutionary question: How did the human genetic blueprint get to be the way that it is, such that it now differs in systematic ways from that of other great apes? We need something more than computation.

My contention is that any answer to the fundamental question of the origins of uniquely human thinking will have to invoke something like the evolution and ontogeny of shared intentionality theory in the context of a cooperative social ecology. There are theories of the evolution of human cognition that instead invoke humans' especially challenging feeding ecology, focusing on the fact that humans' special foraging ecology and their use of tools could have provided the key selection pressures (for example, Rosati 2017). But chimpanzees have complex foraging ecologies and use tools as well, so under this theory we might expect a merely quantitative difference in cognitive skills focused on something like spatial and technical intelligence. But humans have some qualitatively different cognitive skills as well such as the ability to distinguish subjective perspectives or beliefs from the objective situation; the ability to communicate by inviting others to jointly attend to referents, using conventional means to do so; the ability to teach generalizable cultural knowledge and to learn from such teaching; and the ability to think cooperatively with others, justifying one's thoughts and beliefs to others with reasons. It is hard to see how an ecological theory could explain the origin of these fundamentally social-cognitive processes, and that is without even considering such things as cultural institutions and moral judgments, which are social phenomena through and through.

And so I have attempted in this chapter to describe and explain the early ontogeny of children's uniquely human thinking abilities. At each step of the way, the explanation has involved uniquely human social cognition in the form of skills of either joint or collective intentionality. These skills are constructed by children based on the maturation of their biologically evolved capacities as they are exercised, and executively regulated, in social interaction with others. As depicted in Figure 6.2, the first step of uniquely human thinking is to add a perspectival dimension to great ape cognitive representations (the first box). This transformation emerges as a result of the maturation of the dual-level structure of joint intentionality (at around the first birthday), enabling infants to engage with others in joint attentional activities requiring them to take the perspective of their partner. As toddlers begin engaging in cooperative communication with others, mainly through the use of the pointing gesture, effective coordination requires them to align perspectives with others and to think recursively by embedding their and their partner's intentional states within one another (for example, "He *intends* for me to *know X*"—the second box). So already by two years of age human children are thinking in ways that are qualitatively different from other apes: their cognitive representations and inferences are socially structured in species-unique ways.

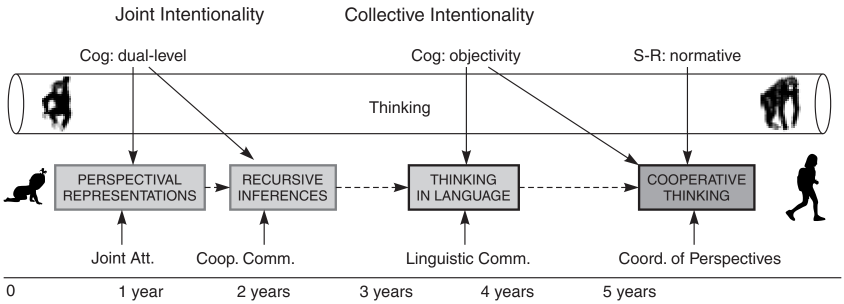

Figure 6.2 The ontogenetic emergence of young children's uniquely human skills of cooperative thinking. Abbreviations: Cog = cognitive; Coop. Comm. = cooperative communication; Coord. of Perspectives = coordination of perspectives; Joint Att. = joint attentional activities; Linguistic Comm. = linguistic communication; S-R = executive self-regulation.

From that point on, much of uniquely human thinking takes place in the medium of a conventional language (third box in Figure 6.2). This has many implications, but at the very least it means that children's thinking is being structured by the way that their forebears in the culture came to symbolize their experience. This is both in terms of the way that individual words carve up and perspectivize experience and the way that grammatical constructions partition experience into objective propositions and subjective propositional attitudes, perspectivizing the situation or event from the point of view of one of the participants. This structuring enables young children to begin engaging with one another in conversation and discourse, thus inaugurating the process of joint attention to mental contents, in which the child and her conversational partner jointly attend to the propositional content of what each of them has to say, expressing their individual attitudes about it as appropriate (O'Madagain and Tomasello, forthcoming). They now coordinate perspectives not on external entities and situations but on one another's conventionally expressed perspectives. And in the case of collaborative problem solving, they come to a joint evaluation about those perspectives or beliefs on the basis of shared rational norms, perhaps invoking the "objective" perspective that by this time they both share and know that they share.

Five- to seven-year-old children (final box) are now in a position to mentally coordinate with peer partners by engaging with them in coordinated decision-making and collaborative problem solving. In this context, "mentally coordinate" means many things. In a coordination problem, it means embedding perspectives within one another recursively (I expect you to expect me to expect you to expect me . . .). In the case of collaborative problem solving, much is determined by the specific content of the problem; in a conservation problem, children must see a perspective on, say, height as compensated by a perspective on, say, width. In coming to understand number, coordination means understanding the numerosity of a group of entities as a certain set size that simultaneously lies within an ordered series of set sizes. In a false-belief task, coordinating means resolving the apparent discrepancy between where someone thinks an object is and where it really is. In the appearance-reality task, coordinating means (in the classic tasks) resolving visual appearance with actual function. In reason-giving dialogical discourse, the kinds of coordinations are unlimited, again depending on the causal and logical structure of the problem at hand.

Coordinated, cooperative thinking of this kind—both as the child interacts with a peer and as she internalizes this interaction and thereby connects her beliefs to one another via reasons—may be thought of as the capstone of cognitive development in the preschool period. Processes of internalization enable children at some point to reflect on and to evaluate their own thinking, and to construct multiperspectival concepts that require a coordination or integration of perspectives. The overall process depends on all the uniquely human cognitive developments that have preceded it: joint attention and perspective-taking, cooperative and linguistic communication, and much causal and intentional knowledge passed on by the culture. These skills are then all marshaled for the tasks of cooperative decision-making and problem solving with peers who are no more competent or knowledgeable than oneself. These tasks require some serious skills of executive self-regulation, and indeed some new skills of social self-regulation as well. Whereas three-year-olds self-regulate their thinking socially to some degree, by the end of the preschool period the self-regulating agent has become enculturated and internalized so that now the child is coordinating and evaluating her own thinking from the perspective of "we" as the "objective" perspective of the group. The objective perspective of the group is embodied in the group's norms of rationality, so we may now speak of normative self-governance.

To reiterate the constructivist position once more: it is manifestly not the case that if a three-year-old child were suddenly stranded alone on a desert island, she would, at six years old, on her own come to multiperspectival concepts and reflective evaluations and normative self-governance of her own thinking. Certainly there are maturational capacities that enable these skills, but there is also a developmental process involving sociocultural interactions. Following Vygotsky, there is first an interindividual social process—involving one or another form of shared intentionality focused on one or another form of mental content—and this process is then internalized into intraindividual cognitive activities involving perspectival or even multiperspectival concepts, recursive and reflective inferences, and executive oversight of everything via processes of normative self-governance.

Cognitive Implications

Six- to seven-year-old children have entered, to use the somewhat old-fashioned phrase, the "age of reason." In many (certainly not all) situations, children of this age not only think, but they know what they are thinking, and even what and how they are expected to think from a normatively rational point of view. And they can often provide valid reasons for their thinking and beliefs. An adult or even a peer can thus reason with a six- or seven-year old and expect them to respond in a reasonable way in return. This enables children of this age for the first time to put their heads together with a peer to consider things and solve problems in ways that would be impossible on their own. They are now in a position, at least in a nascent way, to enter fully into the process of the collaborative creation of novel cultural products and practices.

As I have argued here, this new level of cognitive competence is the culmination of many different ontogenetic strands. As these strands come together to enable children to engage with others in cooperative thinking, their individual thinking becomes socialized or enculturated. They work with mutual expectations, with thoughts embedded in thoughts, with reasons for thinking in a particular way, with perspectives on perspectives, and with an "objective" or normatively rational point of view. This all results in a kind of interconnected web of beliefs, in which different propositionally structured thoughts are logically related to others in the context of the group's rational norms. This web is created during dialogic interactions with others involving perspective-shifting discourse, especially as involved in collaborative problem solving, coordinated decision-making, and the giving of reasons, both to others and to oneself.

III

The Ontogeny of Uniquely Human Sociality

> Mutual respect grows out of exchanges among individuals who consider one another as equals. . . . Obligation thus engendered . . . is distinct in essence from intellectual submission to [adult] authority or to coercive beliefs.
>
> Jean Piaget
>
> "Problems of the Social Psychology of Childhood" (1960)

The shift to an ultra-cooperative lifestyle during human evolution transformed the nature of human social relationships. Whereas great ape social relations are based mainly on competition and dominance, with a dash of cooperation, early humans began forming with cooperative partners a joint agent "we," comprising "you" and "me" (perspectivally defined), relating to one another as equally deserving, mutually respectful, second-personal agents. Later, this all scaled up to group-minded cooperative relationships with all of one's compatriots in the cultural group. At some point in this process, early humans, unlike apes, came to understand that others were evaluating them as cooperative partners, and indeed they came to evaluate themselves as well, leading to a new sense of moral identity that normatively self-regulated all their social decision-making.

From early on children can form with others a shared agent, "we," underpinned by uniquely human sociomoral motives and attitudes. Thus, infants collaborate with others in simple ways. Later, as three-year-olds, they make joint commitments to collaborate, which they feel responsible for upholding (and trust that their partner does, too). Infants treat others with sympathy, and as three-year-olds with respect such that they feel obligated to treat others as they deserve to be treated—that is, fairly. When they are not treated fairly and with respect, children resent it, and they normatively protest in an attempt to hold the partner accountable. Three-year-old children also follow social norms and later feel entitled to enforce those norms on others. By six years of age, children begin to executively self-regulate their own motives and actions normatively, as grounded and justified by the group's moral standards, and they feel guilty if they fail to do so appropriately. Overall, from the point of view of great ape competition and dominance, these unique sociomoral motives and attitudes (commitment, responsibility, trust, fairness, respect, accountability, entitlement, guilt, etc.) mean that the decision-making agent gives weight to the goals, values, and expectations of others, and normatively expects them to do the same.

The unique motives and attitudes of shared intentionality thus enable humans, but not other apes, to relate to one another in some new ways cooperatively, even morally. But these motives and attitudes do not come into being full-blown. They come into being through a developmental process, extended over time, in which maturation, experience, and executive self-regulation all play constitutive roles.

7

Collaboration

Uniquely human cognition originates, as we have seen, in the nine-month revolution when infants begin to interact with others in joint intentional activities. The phrase *joint attention* emphasizes the unique cognitive dimension of these activities as a kind of "meshing of minds," which naturally includes the partners' differing perspectives on their joint attentional focus. But joint intentional activities also have a unique social-motivational dimension, as a kind of "meshing of goals or intentions." Children create with a partner a joint agent "we" that pursues a joint goal, which naturally includes that each partner has her own individual role to play. Whereas the group actions of apes are all about individuals achieving their individual ends in group contexts—they are using one another as social tools—in their early joint intentional activities, children and their partners decide to do something together. In forming this partnership, each individual voluntarily makes herself cooperatively dependent on the other.

These early joint intentional activities—first with adults, who scaffold the collaboration, and later with peers—spawn some new dimensions of social relatedness. If we as collaborative partners are equally necessary for our joint success, and if we could switch roles and still be successful, and if we both adhere to the same criteria in playing a role, then we must be somehow equivalent or equal as partners. This recognition of self-other equivalence generates a mutual respect and sense of equality among (potential) collaborative partners. Further, when it is necessary to assure my partner before we begin that he can trust me—and to get a similar assurance from him in return—the two of us can make a joint commitment to collaborate. In a simple exchange such as "Let's *X*" followed by "OK," we both openly pledge to play our role in accordance with the role standards that we both know in common ground are necessary for joint success; moreover, we each entitle the other to call us to account if we do not. We thus enter into a web of normative relations in which each collaborative partner is accountable to the other for treating her with appropriate respect by responsibly following mutually understood (and implicitly agreed to) normative standards.

Following the lead of contractualist moral philosophers, then, our working hypothesis is that the evolutionary and ontogenetic roots of human morality lie in cooperative activities for mutual benefit: "The primal scene of morality is not one in which I do something to you or you do something to me, but one in which we do something together" (Korsgaard 1996, 275). Participation in joint intentional activities results in individuals who treat their partners as equals, with mutual respect, because joint intentional activities are structured by the joint agent "we," which creates a new kind of social relationship between "I" and "you" (perspectivally defined) as constituents of that "we." That is to say, participation in joint intentional activities creates the conditions for what moral philosophers call second-personal relationships, based on respect, commitment, accountability/responsibility, and fairness (Darwall 2006). Second-personal agents, and only second-personal agents (so not, for example, beloved pets or six-month-old infants), have the standing to enter into the kinds of joint commitments that make each partner responsible for the fate of the other. These new second-personal relationships in collaborative activities set children up to construct, later in ontogeny, senses of respect, commitment, and fairness to all in the cultural group or moral community (see Chapter 9).

Once again in this case we find age three as a kind of watershed. Although infants sometimes "collaborate" with adults (in a sense that may differ significantly across cultures), it is only after the second birthday that toddlers begin to collaborate meaningfully with peers so that by age three they have begun to understand them as second-personal agents. Then, after age three, children begin collaborating with peers in some new ways, especially by making joint commitments to collaborate and by protesting when their partner does not honor that commitment. The relationship between partners has now become normative; each feels obligated to honor her commitment by responsibly playing her role and by accepting her partner's criticism as legitimate if she does not.

Our goal in this chapter is thus to describe and explain the species-unique ways in which young children come to work together collaboratively with others, both adults and peers, in pursuit of mutual benefits and as accompanied by the various sociomoral emotions and attitudes that, in a Darwinian world, make cooperation of this kind possible.

From Apes: Acting in Parallel with Others

Great apes' social lives are most immediately and urgently structured by competition for food, mates, and other resources, which engenders a dominance structure within the group. Great apes sometimes collaborate with one another as well, but, tellingly, the most common context is for purposes of competition, as they form coalitions with one another to win fights and other dominance contests. Their "friends" are those with whom they groom and sometimes even share food, with the strategic goal of cultivating an ally with whom they can team up to defeat others. As Mueller and Mitani (2005) have said, "Competition . . . frequently represents the driving force behind chimpanzee cooperation" (278). Chimpanzees and other apes thus live their lives embedded in more or less constant competition: they are constantly attempting to outcompete others by outfighting them, outsmarting them, or outfriending them. But beyond this cooperation for competition, the most interesting context for current purposes is chimpanzees' group hunting because it could be seen, conceivably, as a cooperative activity for mutual benefit.

Chimpanzee Group Hunting

As described in Chapter 2 and Chapter 6, in many but not all chimpanzee and bonobo populations individuals hunt together in a small group for monkeys or other small mammals (the vast majority of both field and experimental data are with chimpanzees). The basic idea is that because monkeys are so quick and agile in the trees, the apes must surround one to capture it. In formulating its plan of action, each individual hunter takes into account not only the actions of the monkey but also the actions, and even intentions, of the other hunters. The process is thus similar to that which occurs in social carnivores such as lions and wolves, but it may have some special qualities as well.

Experiments have shown that chimpanzees facing collaborative problems understand that they need a partner to be successful; indeed, they will even open a door to enable a needed partner to join them in a task

(Melis et al. 2006b). Chimpanzees will also give tools to individuals who need those tools to perform an action necessary for them both to access a reward (Melis and Tomasello 2013). Melis et al. (2006b) also found that after a small amount of experience with one another, chimpanzees knew which individuals were good partners for them—those with whom they had had past collaborative success—and they chose those partners in preference to others. (It is unlikely that partner choice of this type happens in the wild, however; hunting in the wild is mostly opportunistic as effected by preconstituted traveling parties. There is thus no partner choice in the wild and thus little chance for cheaters to be socially excluded.) But all these observations are still consistent with an interpretation in which great ape collaborators are basically using their partners, in sophisticated ways, as social tools. The data to be reviewed in the sections that follow, in the form of studies comparing apes and children in collaborative tasks, will make this interpretation the most likely one: chimpanzee group hunting is not best conceived as a cooperative activity for mutual benefit, if we are focused on how the chimpanzees themselves view it. They act in parallel when their individual motives happen to coincide.

The question thus arises: how do chimpanzee collaborators relate to one another? In both the wild and some experiments, choosing to collaborate involves at least some risks (as there are individual alternatives that could be pursued instead), so one might then think that some kind of trust among partners is required. In my analysis, chimpanzees acting in groups to acquire food are working with a kind of strategic trust (Tomasello 2016). The notion of strategic trust is something like reliance on the laws of nature: we trust that a bridge will not collapse as we traverse it or that our dog will swim to shore if he jumps into the lake. The chimpanzees and bonobos acting in groups to acquire food understand that each of the others is attempting to capture the monkey, and they trust that they will continue doing this. They rely on the fact that the others will continue pursuing their own self-interest (see Engelmann et al. 2015). The point is thus that although chimpanzee collaboration appears on the surface to be similar to the human version, in reality—in terms of the psychological processes involved—it is less like working together mutualistically and more like individuals using one another to achieve their individual ends. Overall, perhaps with some exceptions, we may say that chimpanzees view others mostly instrumentally: as social obstacles in competition, or as social instruments in collaboration.

We know little to nothing about the age at which chimpanzees become capable of collaborating with others in complex tasks such as group hunting. In the wild, adults dominate the group hunting, and it takes some time for juveniles to get into the game. In experiments, because the basic requirements of the collaborative tasks have been challenging, chimpanzees have seldom been tested below about four years of age. The two exceptions, as noted in Chapter 6, are two studies in which chimpanzee youngsters faced a relatively simple parallel pulling problem with a peer (Crawford 1937; Hirata 2007). In these studies, youngsters of around three to seven years of age failed completely on their own and had to be trained by humans. Chimpanzees thus do not seem capable of collaborating effectively with a peer, even on fairly simple problems, until the juvenile period.

Human Children

Human toddlers clearly do not have the cognitive abilities to act in groups strategically in the complex ways that adult chimpanzees do. But they do begin to collaborate in some simple yet unique ways from early in development; indeed, they do so at a younger age than chimpanzees. In Chapter 6 we looked at the ways in which young children collaborate with a peer to solve a simple problem, and the finding was that they do so effectively and consistently from around two to three years of age. This is in contrast to the chimpanzee youngsters that have been tested up to seven years of age (as noted earlier), all of whom failed to coordinate with a peer partner to solve a problem. We thus have, once again, human capacities and skills—in this case for peer collaboration—that seem to emerge earlier in human than in ape ontogeny by several years.

Dual-Level Collaboration

When chimpanzees surround and capture a monkey, the individuals are operating in what we have called, after Tuomela (2007), "group behavior in I-mode": they are using one another as social tools. When one- to three-year-old infants and toddlers interact collaboratively with an adult, they are doing something different. They act together as a joint agent toward a joint goal, which means, in this context, that they each have their own individual role. Because toddler and adult both take the perspective of the other, and can reverse roles as needed, a new social relationship emerges. "I" relate to "you," with these designations being understood deictically—that is, depending on which perspective is being adopted. The reciprocally defined I-you relation is the foundation for so-called second-personal social relationships, involving two second-personal agents who relate to one another cooperatively, with mutual respect, as equals.

One- and two-year-old toddlers are not yet second-personal agents, nor do they perceive or treat others in that way. But they are working on it. One- and two-year-old toddlers are in the process of constructing with adult partners a sense of I-you-we, a sense of other individuals as equally deserving cooperative partners (who see me the same way). By three to six years of age children have, to a large extent, completed the process. They relate to collaborative peer partners as second-personal agents with whom one may make normatively binding joint commitments and to whom one may normatively protest in case of a breach.

A Sense of "We"

A basic fact is that human children are more motivated to interact with others in collaborative activities than are great apes. Melis et al. (2006b) found that chimpanzees would open a door for a needed collaborative partner, but when no partner was needed (because the food could be retrieved by the subject alone) they almost never opened the door; they only collaborated when they were forced to by instrumental considerations. In an explicitly comparative experiment, Rekers et al. (2011) gave chimpanzees and human children the option to obtain food for themselves by pulling the rope alone or to obtain food for both themselves and a peer partner by pulling together with that partner (the rewards for the subject and the partner were the same in both cases). Whereas the chimpanzees were indifferent to these options (because the food was the same in both), thirty-six-month-old children were much more likely to prefer the collaborative option over the solo option. When Bullinger et al. (2011a) doubled the amount of food for the collaborative option, the chimpanzees choose that option almost all the time, thus confirming that their sole motivation was indeed the food.

In another comparative experiment, Warneken et al. (2006) tested both young human-raised chimpanzees and eighteen-month-old human infants in a series of four collaborative tasks (for a similar study with fourteen-month-old infants, see Warneken and Tomasello 2007). Two of the tasks were instrumental toward goals, and two were simply collaborative games. Whereas the chimpanzees only engaged with the instrumental tasks, the children engaged with both types of tasks equally enthusiastically. Moreover, when the activity was completed—whether it was instrumental or a game—the children often attempted to set the task up to do it again, just for fun, but the chimpanzees never did that. It is also noteworthy that children are so trusting of a cooperative motive in others that they engage collaboratively with almost any adult, familiar or novel (as demonstrated in many experimental settings); further, just the thought that they are collaborating (when they are fooled into thinking they are) makes children work harder and persist longer in a task (Butler and Walton 2013). In contrast, to induce chimpanzees to collaborate with one another in experiments it is necessary to prescreen for partners who are generally tolerant of one another and who actively avoid aggression in close quarters (Melis et al. 2006c).

But beyond simply preferring collaborative interactions, young children collaborate with others in some qualitatively unique ways as well. Most especially, they form with their partner a joint agent "we" in order to pursue a joint goal, and maintaining this "we" is part of their continuing motivation. Thus, when eighteen-month-olds were collaborating with an adult in the Warneken et al. (2006) study, if the adult simply stopped interacting (experimentally controlled), the infants made active attempts to re-engage him by doing such things as beckoning and pointing. In contrast, the human-raised chimpanzees never—not once—attempted to re-engage their partner; instead they strived to solve the problem alone. One possibility is that the children, but not the chimpanzees, had created with their partner a joint agent "we" whose breakdown they sought to repair.

Support for this interpretation comes from three other findings. First, in the social games (which the chimpanzees mostly ignored), the children attempted to re-engage their recalcitrant partner just as often as in the instrumental tasks. Their re-engagement attempts were not aimed at reactivating a social tool toward an instrumental end but at reinstating the cooperative engagement. Second, in a follow-up study, Warneken et al. (2012) found that when there was a reason for the adult disengagement (for example, he was called away), twenty-four-month-old toddlers waited patiently for his return. In contrast, if the adult ceased cooperating for no discernable reason, toddlers continued attempts at re-engagement. Toddlers were thus sensitive to the adult's intentional state: if he was called away, he likely retained the joint goal; if he quit for no reason, he had likely lost it. And third, in this same experiment, toddlers attempted to re-engage their partner even when the activity was one they knew they could perform successfully on their own. Again, the toddlers viewed their partner as more than a social tool; they waited for him or attempted to re-engage him not to enlist his help in attaining an instrumental goal but to try to reconstitute their lost "we."

The nature of the communicative acts that children used to re-engage their partner in both Warneken et al. experiments is telling as well. The toddlers were not *demanding* that the adult return to the joint activity—in which case they would have whined or vocalized insistently—but rather they were *inviting* the adult back into the activity by doing such gentle things as beckoning or pointing. As noted in Chapter 4, requests of this type are fundamentally cooperative in that they recognize that the recipient has a free choice in the matter; they simply suggest or offer one choice. Indeed, attempting to force re-engagement would be inconsistent with the goal of reconstituting their mutually cooperative "we."

"I" and "You"

As young children interact collaboratively with others as a "we," they come to understand and relate to them differently. Most importantly, collaboration implies a certain level of equality among partners. If you are coercing me, then it is not collaboration but domination or enslavement. If I am pretending to fully participate but really letting you do all of the work, then it is not collaboration but exploitation. Collaboration does not mean doing exactly the same work or same amount of work; collaboration means working together, *ceteris paribus,* on a more or less equal footing. As they collaborate with others in their daily activities and games, one- and two-year-old toddlers gradually come to appreciate this equality in the situation, and indeed they come to appreciate others as equivalent to themselves in general.

There are three aspects of children's developing collaborative interactions that foster an understanding of self-other equivalence. First is the fact that in interdependent collaboration both partners are necessary agentive forces in producing the jointly desired outcome—and either could just as easily derail the process. Thus, during the one- to three-year-age period toddlers begin to recognize that not only do they need their collaborative partner for success (which chimpanzees already recognize) but their partner also needs them. This transforms an asymmetrical social tool understanding of the process into something more symmetrical and mutual. There are no directly relevant studies, to my knowledge, to demonstrate toddlers' understanding of this symmetry. But several children in the study by Warneken et al. (2006) teased the adult on several occasions by starting to play their role and then withdrawing and smiling or laughing coyly; they seemed to understand their partner's need for their contribution. Chimpanzees were never observed doing this. The idea is thus that as young children are learning to collaborate, they are beginning to view collaborative partners in general, including themselves, as agents with equal causal and agentive power in the interaction.

The second aspect of early collaborative interactions that foster an understanding of self-other equivalence is children's growing recognition that the roles in a joint intentional activity are reversible—indeed, they are agent independent. In principle, either partner could perform either role; they are interchangeable. Thus, as noted in Chapter 5, Carpenter et al. (2005) found that when an adult tapped on the arm of an eighteen-month-old infant, quite often the infant responded by tapping the adult's arm in return (not her own arm, which would be exact copying); they reversed roles. Similarly, if the adult held out a plate on which the child could place a toy, quite often a few moments later the infant held out the plate for the adult, looking to her expectantly—again they exchanged roles, in this case with mediating objects. When Tomasello and Carpenter (2005a) gave similar tasks to young human-raised chimpanzees, they did not reverse roles in this same way. The cognitive basis for this role reversal is the ability of young children to simulate the role and perspectives of the partner during collaboration (Fletcher et al. 2012). Young children from one to three years of age are gradually coming to cognitively construct a bird's-eye view of the collaborative interaction in which the roles are interchangeable among partners; thus, in a straightforward sense, the partners are equivalent in the process.

Third, when young children engage with a partner repeatedly in a particular collaborative activity structured by joint intentionality—as they are wont to do—they come to construct with that partner a common-ground understanding of the ideal way that each role must be played for joint success. That is, as they begin a familiar joint activity, the child and her partner implicitly construct subgoals for each of them based on their past experience together, the ideal way that "we" want "me" to play my role and "you" to play your role. For instance, if we are going to build a tower together, then we both know in our personal common ground that you need to hand me the blocks and hold the base steady while I place the blocks (or perhaps the reverse). Thus, in one study eighteen-month-old children collaborated with a puppet in placing blocks into boxes in a particular way; when another puppet came along later and placed the blocks a different way, the toddlers intervened to help her play her role the right way (Schmidt et al., forthcoming). These mutually understood role ideals, as we may call them, are thus impartial in the sense that they apply to whoever plays a particular role: whether it is my mother, my peer, or a puppet, to build a block tower one of us must do *X*, and the other must do *Y*. Impartiality in the application of role ideals assumes partners of equal status. Plausibly, role ideals in collaborative activities are precursors to the more general normative standards of the cultural group at large, which will so thoroughly structure older children's lives.

Here, then, is the claim: participation in joint intentional collaboration leads young children to understand others as, in some sense, equivalent or equal to themselves. "You and I" represents the *relationship* of coequal partners. The effects of this way of viewing things on children's interpersonal relations are momentous. Nagel (1970) argues that the recognition of others as agents or persons equivalent to oneself—so that the self is seen as just one agent or person among many—provides a reason for considering the concerns of others as equivalent to one's own; it is thus the cognitive basis for a sense of fairness. He describes the bird's-eye view and the reversibility of roles as, "You see the present situation as a specimen of a more general scheme, in which the characters can be exchanged" (83). His description of the most basic moral argument a victim can present to a perpetrator is, "How would you like it if someone did that to you?" (82)—that is, if the roles were reversed. So I would argue that the reason that great apes do not treat others "fairly" (see Chapter 8) is that they do not participate in joint intentional collaboration, so they do not form a "we" comprising "I" and "you," and they do not exchange roles or understand impartial role ideals. As a result, they do not construct a sense self-other equivalence with a partner.

Second-Personal Agency and Mutual Respect

In terms of ontogeny, the claim is that young children's understanding of self-other equivalence comes into being through their participation in joint intentional activities, mainly during this early period between one and three years of age. But, importantly, the recognition of self-other equivalence is not by itself a moral motivation or act; it is simply the recognition of an inescapable fact that characterizes the human condition. We might ignore this insight in our actual behavioral decision-making, and indeed we might even wish it were not true. It does not matter—a fact is a fact. The recognition of self-other equivalence is thus not in any way sufficient for making a fair or just decision in one's interpersonal relations with others; it is simply the structure of the way that humans understand the social world in which they live.

But the understanding of self-other equivalence is a critical cognitive component structuring young children's species-unique forms of socio-moral interaction with others—and this has decisive effects, in its own way, on moral decision-making. Most basically, an understanding of self-other equivalence is a necessary precondition for individuals to bestow upon one another the standing of second-personal agents. For individuals to relate to one another as second-personal agents they must have a basically cooperative relationship and, at least in the ongoing interactive context, respect one another as equals. Two men engaged in a fistfight are not engaged with one another second-personally, whereas two men engaged in a boxing match—in which they agree to certain cooperative rules and to treat one another with respect—are. I have argued that second-personal relationships arose in human evolution as part and parcel of joint intentional collaboration: individuals forming a joint agent "we" are *ipso facto* in a cooperative spirit and respect their partner as equivalent to the self (Tomasello 2016). Ontogenetically, as we have just established, children construct a sense of self-other equivalence in their collaborative interactions with others in the one- to three-year age period, which enables them to treat others as second-personal agents.

Because of this equivalence, second-personal agents are entitled to make normative claims on their partner—you must play your part as we both know you should—and are at the same time obligated to respond to the normative claims that their partner makes on them. Making a promise or commitment is a prototypical second-personal act. Second-personal agents understand and respect that a promise or commitment creates on the part of the promisor an obligation to do what she has promised. The promisee, for his part, is now entitled to expect the promisor to do what she promised or committed to, and he is consequently entitled to protest legitimately if she does not. The promisor herself will agree that the protest is legitimate because she agrees that she has broken the agreement on which the partner was depending. All this assumes an attitude of mutual respect. Second-personal agents thus recognize one another as having the requisite competence and knowledge to, for example, enter into a promissory relationship, and they recognize one another as equal in this respect; either could be the promisor or promisee, and the normative implications would be the same in either case. Second-personal agents—which, obviously, would not include other animal species or young human infants—do not just respect the power of the other individual (the way that a child might respect a bully's size and strength) but accord her "recognition respect" (Darwall 1977), meaning that they recognize her as an individual with the competence and status to enter into second-personal interactions and relationships.

One- to three-year-old toddlers are not yet second-personal agents in this sense, nor are they capable of recognizing others as such. But they have started down that path. By three years of age young children already recognize that other individuals are cooperative agents with whom one can form a "we" and create a coequal partnership of "I" and "you." This partnership is second-personal in the sense that it involves a kind of mutual respect for the cooperative partner as equivalent to the self. What is missing is the normative dimension, comprising an understanding of the ways that second-personal agents should treat and expect to be treated by one another. That will come only after three years of age when children are first able to make a joint commitment with a partner, as we shall see in the upcoming section. Indeed, at the outset this joint commitment will be more or less implicit. The normative dimension will become more and more elaborate and explicit, and more and more sensitive to culture-specific norms in the several years that follow.

Individual and Cultural Variation

There have been few studies of the collaborative skills and motivations of children with autism spectrum disorder, although researchers have reported in this group a diminished motivation for peer interaction and play in general. In addition, in the only experimental study, when preschool children with autism were induced to collaborate with an adult partner (in the four tasks of Warneken et al. 2006), their ability to do so was diminished relative to that of typically developing control children, and they attempted to re-engage a recalcitrant partner less often (Liebal et al. 2008). And so, although the data are sparse, there is reason to suspect that autism has a significant effect on children's collaborative skills and motivations, suggesting a significant maturational component.

There are also few studies of infants' and toddlers' collaborative skills and motivations across cultures. Callaghan et al. (2011) had twenty- to twenty-five-month-old toddlers from three very different cultural contexts (two of them small-scale and nonliterate) interact with an adult in several of Warneken et al.'s (2006) collaboration tasks. When the adult stopped interacting for no reason, infants in all three cultures attempted to reengage the recalcitrant partner in the same basic ways, at the same basic frequency, and at the same basic ages. Schäfer et al. (in preparation) also found basic similarities in five- and eight-year-old children from two different cultural contexts (one of them a Baaka pygmy cultural group of hunter-gatherers) in the ways they operated an apparatus together to gain mutual rewards (though the two groups shared the rewards differently).

Nevertheless, it is a common observation among ethnographers that young children in many small-scale cultures spend much more time in peer groups, often involving a mix of ages, than do children from Western, industrialized societies. As a possible effect of this different form of peer interaction and socialization, Mejia-Arauz et al. (2007) found that triads of school-age children from different cultural backgrounds (Mexican Mayan and European American) collaborated in a construction task differently. In particular, the Mayan children worked together as an ensemble of three much more frequently than did the American children, who more often acted as individuals or in dyads. We do not know if there are differences among children in these different cultures in the preschool years, but one can imagine that more unsupervised peer interaction at early ages might lead to enhanced collaborative skills and motivations in school-age children. In that regard, Endedijk et al. (2015) found that Dutch preschoolers who had had more peer experience earlier in their lives were more skillful collaborators with peers in a variety of collaboration tasks.

A related point is that in Western, industrialized cultures, there would seem to be much more collaboration between toddlers and adults than in most traditional cultures—especially in play and games—as adults in these cultures get down on the floor and play with children in a way that adults in many traditional cultures do not (Gaskins 2006). Adults are clearly not "equal" partners, but in the context of the collaborative activity they act as equals. That is to say, when rolling a ball back and forth partners are on an essentially equal footing with respect to the game—even if not in other ways—so it is still a kind of equal partnership in a context-bracketed sort of way. An interesting question for future research is whether Western adults scaffolding collaboration with young children—even if they are not coequal partners outside the collaboration—facilitates the children's development of collaborative skills and motivations more or less than extensive peer interactions with coequal partners, as in traditional societies, even if these interactions are less adult-like and sophisticated.

Joint Commitment

If joint agency toward a joint goal—as enacted even by toddlers (with adult partners)—is a kind of implicit agreement, a joint commitment is a more-or-less explicit agreement. Making such an explicit agreement requires a certain level of cooperative communication and social-cognitive sophistication as well as a sense of second-personal agency, so in ontogeny we do not often see explicit joint commitments among peers until close to school age. It might also be that joint commitments are most appropriate when one or both partners' participation or appropriate performance is uncertain or risky, and three-year-olds do not typically perceive the situation in this way. In any case, as we shall now see, even three-year-olds comprehend a joint commitment when an adult proposes one to which the child agrees or an adult orchestrates one between children, and they treat such commitments with appropriate respect.

Joint Commitment

When one has other things one could be doing, deciding to collaborate with others may be risky. But once one has decided to collaborate, one wants to be chosen by a partner, possibly with some assurances. As noted in Chapter 6, in an experimentally constructed stag hunt game, virtually all pairs of chimpanzees began their collaboration with a leader-follower strategy, in which one individual just bolted for the "stag"—thereby taking on all the risk—and just hoped that the partner would follow (Bullinger et al. 2011b). In contrast, four-year-old children sometimes did the same thing, but when the risks were increased the children started communicating, typically with attention-getting gestures and informative verbal utterances announcing the arrival of the stag (Duguid et al. 2014). Even better for both partners would have been a communicative response from the partner, perhaps even a commitment, in return. Because the best option for each partner would be to obtain such a commitment from the other at the outset, the result would be a joint commitment to collaborate.

For social theorists focused on normativity, joint commitments represent nothing less than the "social atoms" of uniquely human social interaction (Gilbert 2003, 2014). Joint commitments are basic and essential because they explicitly acknowledge our mutual interdependence in the upcoming collaborative activity and seek to manage it. They assume that each party is a second-personal agent who can be trusted both to do her part conscientiously and to treat her partner with appropriate respect. We may call this "normative trust" because a breach represents betrayal of the partner and their agreement. Joint commitments are created when one individual makes some kind of explicit communicative offer to another that "we" do *X* together, and that other accepts. Joint commitments are initiated and accepted via second-personal address—in essence, addressing the partner as an agent who knows what it means to accept responsibility—with each partner explicitly inviting the other to make plans, even risky plans, around the fact that he will do *X,* and to trust that he will persist in pursuing *X* until both of them are satisfied with the result (Friedrich and Southwood 2011). Crucially, joint commitments can only be terminated by some kind of joint agreement as well: one partner cannot unilaterally decide she is no longer committed; rather, she must ask permission of the other to end the commitment, and the other must accept (Gilbert 2011). Joint commitments are joint all the way down.

With linguistic creatures, joint commitments are typically initiated by something like, "Let's *X,*" and accepted with "OK." (They are ended with something like, "Sorry, I have to *Y* now. OK?" with the acknowledgment: "OK.") In a study with very young children, Gräfenhain et al. (2009, study 1) had an adult begin a collaborative activity with two- and three-year-olds in one of two ways. For some children, the adult established a joint commitment by suggesting "Let's *X,*" and only proceeded to collaborate if the child explicitly accepted (typically with "OK"). For others, the collaborative interaction was begun by the adult waiting for the child to begin doing something and then joining in unbidden. In both cases, at some point the adult abruptly stopped interacting. Three-year-olds who were party to the joint commitment were much more likely than the other children to try to reengage the recalcitrant partner. These children seemingly reasoned that if "we" have a joint commitment, then "you" ought to continue as long as needed. The two-year-olds, in contrast, did not behave any differently when there was or was not a joint commitment.

And three-year-olds know what a joint commitment means for their own behavior as well. Thus, Hamann et al. (2012) had two- and three-year-olds commit with a peer to a joint task, but then, unexpectedly, one child got access to her reward early. For her partner to benefit as well, this child had to continue to collaborate even though there was no further reward possible for her. Nevertheless, most three-year-olds (but again not two-year-olds) eagerly assisted their unlucky partner so that both ended up with a reward—and more often than if the partner just asked for help in a similar situation without any prior collaboration or commitment. In stark contrast, when pairs of chimpanzees were tested in this same experimental situation, as soon as the first one got her reward she abandoned the other and went off on her own to consume it (Greenberg et al. 2010). The three-year-olds were therefore fulfilling what Tuomela (2007) calls the "commitment condition" that committed partners persist until both have received their just deserts.

Joint commitments thus make partners responsible to one another. Each of them feels that each is responsible for the other's fate in the situation. In this spirit, Gräfenhain et al. (2013) helped pairs of three-year-old peers make a joint commitment to work on a puzzle together. (The adult got them to agree with each other that they would collaborate.) Having done so, they then responded to experimentally induced perturbations in that context with such behaviors as waiting for their partner when she was delayed, repairing damage done by their partner, refraining from tattling on their partner, or performing their partner's role for her when she was unable to do it herself. (That is, they did these things more often than did pairs of children who simply played in parallel for the same amount of time.) When young children make a joint commitment with a peer, they help and support that peer much more strongly, and in a wider variety of ways, than when they are merely playing side by side.

In the same vein but offering even stronger evidence, Gräfenhain et al. (2009, study 2) had a child and an adult make a joint commitment to play a game together. Then another adult enticed the child away to a new, more attractive game. In response, two-year-olds simply dropped everything and took off for the new game. But three-year-olds understood their joint commitment; before switching to the new game (if they did in fact switch), they hesitated, looked to the adult, and often did something overt to "take leave" such as handing over the tool used in the game or even verbally apologizing—much more than they did in the exact same situation with no prior joint commitment. The children recognized that they had a joint commitment; because breaking it would harm and disrespect their partner, they had a responsibility to her to acknowledge that they were breaking it and that they regretted it.

Three-year-olds, but again not two-year-olds, recognize that a joint commitment can be broken only if both parties agree. Kachel et al. (forthcoming) had three-year-olds make a joint commitment with a puppet to collaborate, and then, after a brief time, the puppet left. Later the child reaped the spoils, and the puppet then returned and asked to join in again and share. If the puppet had asked permission to break the joint commitment before leaving, children were happy to share. But if the puppet had not asked permission to break the joint commitment (but had simply abandoned the collaboration), children shared less. Taking leave preserved the puppet's identity as a collaborative partner whereas simply abandoning the cooperation branded her as a defector.

It is noteworthy that the youngest age at which anyone has found an effect of joint commitments on children's behavior is three years; using identical methods several studies have found no effect of joint commitments in two-year-olds. Before three years of age, toddlers will encourage recalcitrant partners to rejoin a collaborative activity, but there is not necessarily any recognition of a normative commitment in either direction. Toddlers may want and expect their partner to continue the cooperation, but for three-year-olds a joint commitment normatively binds both partners to perform the actions to which they have committed unless they agree to terminate the commitment. We can think of joint commitments, then, as representing a kind of second-personal normativity. As their capacity for collective intentionality matures, children at around three years of age are able to think of the partnership created by a joint commitment as a shared agency, capable not only of collaborating but also of self-regulating the collaboration.

Second-Personal Protest

The content of the joint commitment is that each partner play her collaborative role diligently and in the mutually understood ideal way until both have benefited. But what happens if one partner does not? The answer is that she gets sanctioned, and, of crucial importance, it comes from "us." The essence of joint commitments is that "we" agree not only to act together but also to sanction together whichever of us does not fulfill her role-specific ideal because a defector is showing a lack of respect for her partner and their partnership. This gives the sanctioning legitimacy: we agree that defection by either of us *deserves* sanctions. Such second-personal protest thus carries a socially normative force, coming from "us" and our agreement, and so acts as a self-regulatory device to keep the joint activity on track despite individual temptations to defect. The normative force is both the positive force of equal respect that each partner feels for the other—my respected partner deserves my diligence—but also the negative force of legitimate sanctions, deserved sanctions, for reneging. To reduce their risk, then, each partner to a joint commitment gives to the other the "representative authority" of "us" to initiate sanctioning when, by the common-ground standards implicit in the joint commitment, it is deserved.

In a recent experiment, Kachel et al. (2017) orchestrated a joint commitment to collaborate between two three-year-olds (an adult got them to agree with each other that they would collaborate). Then, in one condition, one of them seemed to intentionally not play her role in the mutually known way (her deviant behavior was experimentally induced). The other child then objected. Importantly, she did not object by physically confronting the partner or demanding compliance, but rather by simply pointing out the deviance, often resentfully, and leaving it up to the wayward partner to voluntarily self-correct. The language the aggrieved child used was often normative: "It doesn't work like that!" Children did not protest if the partner was seemingly ignorant of how the apparatus worked (in which case they often taught her) or if the apparatus accidentally broke. Similar protesting was seen by Warneken et al. (2011), who set up a situation in which two individuals collaborated to pull in a board with one pile of food in the middle. In a previous study it had been found that chimpanzees dealt with this situation based primarily on dominance: if the subordinate attempted to take the food, the dominant attacked her, and if the dominant attempted to take the food, the subordinate just let her (Melis et al. 2006a, 2006b). But the three-year-olds in this study did neither of these things. Rather, if a greedy child attempted to take more than half the sweets, she was met with protest. The aggrieved child expressed resentment toward the greedy child's actions, for example, by squawking "Hey!" or "Katie!"

The children in these studies are not just protesting that the partner is not doing what they want her to do; they are protesting that she is not doing what they both know she should do. Their common-ground understanding of what they jointly committed to do hangs in the air above them, as it were, as an impartial arbiter to which either of them, by second-personal protest, may refer the other. Failure to live up to the commitment demonstrates that the violator takes her own interests to be more important than her partner's, and failure to recognize the legitimacy of the protest demonstrates that she does not value their joint commitment or their partnership going forward. Adam Smith (1759) says that the aim of second-personal protest is "to make [one's partner] sensible, that the person whom he injured did not deserve to be treated in that manner" (95–96). Second-personal protest is thus a cooperative and respectful response to the offender's disrespectful actions; it does not seek to punish the partner directly, only to inform him of the injury and her resentment ("Hey!"), assuming him to be someone who knows better than to do this (that is, to treat others as less than equals) and assuming that he is competent and motivated to rectify the situation appropriately. The offended partner is making a second-personal demand for respect, and the partner, if he wishes to remain in the cooperative fold, must respond respectfully by recognizing its legitimacy.

Second-personal protest may thus be seen as an explicit expression of a cooperative partner's demand to be treated as an equally deserving individual, a second-personal agent who is party to a joint commitment. It is typically performed by the partner who is aggrieved, but it assumes that the offender will, of her own free will, recognize the validity of the claim and ameliorate the situation because, ultimately, it is coming from "us." I protest directly to you—with resentful second-personal address demanding respect—but it is coming from our "we." Recognizing the legitimacy of the protest, the derelict partner does not try to avoid sanctioning but rather joins her partner in judging herself as deserving of it, perhaps even feeling guilty (see Chapter 10). Joint commitments thus create a sense of responsibility to a second-personal partner. "We" collaborate to self-regulate each of us as individual partners.

Promising

There is no clear-cut distinction between commitments and promises, but the studies of children's joint commitments all take place within the context of a collaborative activity. Indeed, in some cases there is no verbal agreement at all. It is thus possible that a good part of the sense of obligation in these studies is generated by the children's understanding of the interdependence of the collaborative activity and the "harm" that defection would cause the partner. In contrast, promises are commitments that are made to individuals but in the context of larger societal interests in people keeping their commitments. The commitment one makes when promising is more of a "public" act in which one puts on the line one's cooperative identity with the group at large. (For example, consider wedding vows publically performed in front of all one's friends and relatives.)

Although there are a number of studies of older children's understanding of promising, there are few studies with preschoolers. Kanngiesser et al. (2017) engaged three- and five-year-olds in two experiments. In the first experiment, children were the recipient of a promise from a partner. When the partner failed to perform the promised action, five-year-old children (and to a lesser degree three-year-old children) protested normatively—not just that they did not like it but that one should not do that—often referring to the promise in their objection. In a second experiment, children were induced to promise to keep doing something boring after an adult had left the room (that is, the adult asked them to promise, and they agreed), and they were then tempted to break their promise. Again, both three- and five-year-old children showed some understanding of promising, in this case by continuing at the boring task longer if they had promised to do so (again, especially the five-year-olds). Even outside of collaborative interactions, then, by the end of the preschool period young children feel a normative obligation to keep their promises, and they expect others to keep theirs as well.

Individual and Cultural Variation

There has been very little cross-cultural research on young children's joint commitments, second-personal protest, or promising. What little research there has been in non-Western cultures (for example, Heyman et al. 2015, with Chinese children) has also found an understanding of promising in the late preschool period. But there are almost no cross-cultural studies of different cultures with a single methodology that would allow detailed comparisons.

Becoming Second-Personal

Chimpanzees can accomplish some things by acting in parallel with others; for example, they can prevail in a conflict by fighting side by side with conspecifics, or they can acquire meat by chasing a monkey side by side with conspecifics. But human children, from a fairly young age, are able to form with others a joint goal to act together cooperatively, each with her own role, and with the joint expectation that they will share the spoils in the end.

As children are collaborating with others during ontogeny, they are at the same time coming to relate to them in new ways. To describe these species-unique ways in a single term, we have borrowed the philosophical concept of the second-personal (for example, Darwall 2006): individuals relate to one another face to face in a cooperative spirit, treating and expecting to be treated with respect as equally deserving partners. Children develop as second-personal agents—and recognize others as such—during the two- to three-year age period, at which point they and their partners now have the standing to form with one another joint commitments in which "we" normatively self-regulate both "you" and "I," entitling either of us to call the other out for noncooperation. As compared with great ape social relations, which are based mainly on dominance with just a sprinkle of cooperation, human children's development of social relations based on equality, respect, and collaborative self-regulation represents a momentous transformation, culminating in a normative sense of joint commitment with collaborative partners at around three years of age. They are gradually becoming moral creatures.

Theoretical Explanations

The central theoretical issue in the ontogeny of children's skills and motivations for collaboration is, most basically, the respective roles of maturation and experience in the developmental pathway. My view is that

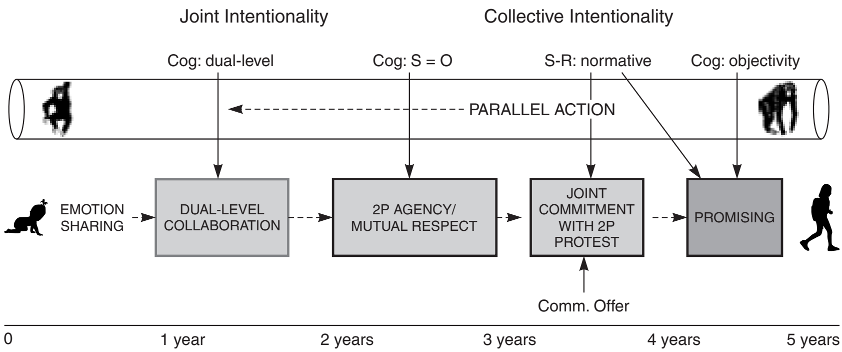

Figure 7.1 The ontogenetic emergence of young children's uniquely human collaboration. Abbreviations: Cog = cognitive; Comm. Offer = communicative offer; S=O = self-other equivalence; S-R = executive self-regulation; 2P = second-personal.

maturation and experience play somewhat different roles at different steps in the process. Figure 7.1 provides a graphical summary.

As with joint attention, the development of uniquely human collaboration begins with infants' emotion sharing with others (the first box in Figure 7.1). The explanation for this uniquely human form of emotional engagement is, presumably, as close to pure maturation as it gets; it is difficult to even imagine how such a motivation would be taught or learned. We have hypothesized that emotion sharing evolved in the context of cooperative childcare (as something over and above general mammalian attachment) as a way for infants to affiliate and bond in especially strong ways with those whose care they need. One could still imagine, however, that individual infants and their caregivers might work out their own special interactive routines, and these might lead to individual differences in the particular ways they might share emotions (for example, more vocal or visual).

From there, maturation of the capacity for dual-level engagement structures young children's collaborative interactions with others (the second box in Figure 7.1), such that they now understand that the two of them are aimed together at a joint goal, with each having her own individual role. It is again difficult to imagine that children's unique motivation and ability to collaborate by forming a joint goal are things they are taught or learn in any significant way. These are almost certainly natural developments based on the maturation of their capacities for joint intentionality. Children with autism have deficits in collaboration: they do not attempt to re-engage recalcitrant partners in the manner of typically developing children. Moreover, eighteen-month-old toddlers from small-scale, traditional cultures collaborate with adults in the same way as toddlers from Western, industrialized cultures, including inviting recalcitrant partners to reengage, despite the fact that ethnographic observations suggest that these children have had little experience collaborating with adults. The plasticity of the early phases of the developmental pathway for uniquely human collaboration would seem to be limited.

But if we focus on the new kinds of social relationships that collaborative activities open up for young children, their individual experiences are crucial. Infants and toddlers must actually interact with a partner as a "we" before they can construct the basic second-personal relation between "I" and "you." On the basis of those interactions, by three years of age children have come to appreciate others, including peers, as equally deserving second-personal agents (third box in Figure 7.1). Informal evidence for this proposal is that at the end of this age period young children are collaborating with peers on a daily basis and in more adult-like ways. Moreover, at the end of this age period, young children initiate collaborative interactions with others (both adults and peers) via second-personal address in a communicative offer (bottom of the figure) that does not demand collaboration or even request it directly, but rather invites others to agree to collaborate. This is respectful address, offering cooperation to a coequal partner.

As we shall see in Chapter 8, at three years of age young children also start dividing the spoils of a collaborative effort with their partner fairly and mostly equally (whereas they do not do this outside of collaboration). In all these aspects of their engagement with others, young children approaching their third birthdays seem to be thinking in terms of a self-other equivalence (S=O at top of Figure 7.1), so they naturally show respect for their partners as equally deserving second-personal agents. Presumably, a child developing on a desert island with no social interactions with others whatsoever would not automatically, at three years of age, view others as equally deserving second-personal agents.

Although they do not often form joint commitments with peers spontaneously, three-year-old children do recognize the effects of a joint commitment when someone (such as in an experiment) orchestrates one for them (fourth box in Figure 7.1). Thus, three-year-olds—and, importantly, not two-year-olds—show various signs of joint commitment such as persisting until the partner gets her goal, inviting a partner back even when she is not needed for reaching a goal, "taking leave" when desiring to break a joint commitment, and sharing more fairly with a returning partner who previously took leave. Further, three years of age is the youngest age at which children have been observed to engage in second-personal protest when someone breaks a joint commitment. Second-personal protest not only is respectful toward a second-personal partner but is normative—in the sense that it is not expressing my personal dislike of your behavior, but rather my resentment that you are not doing what we agreed you should be doing (if you consider me an equally deserving partner). Such behavior marks a watershed in the ontogeny of human sociality because this is when, for the first time, children's interactions with others take on a markedly normative character—what we have referred to, at this level, as second-personal normativity.

Again, although it is difficult to imagine that this kind of relating to others is trained, or taught, or socialized by adults in any direct way, it is nevertheless likely that the child must actually engage in collaborative interactions with others to develop these special sociomoral motivations and attitudes. The metaphor is thus once again one of construction or co-construction. Children's emerging normative orientation at three years of age—which we will again see in the next two chapters with regard to fairness in sharing resources and in a tendency to enforce social norms—is made possible, first of all, by the maturation of children's capacities for collective intentionality. These capacities manifest themselves in children's respect for the supraindividual social structures in which they participate, including joint commitments with other individuals and (as we shall see in Chapter 9) collective commitments to the social norms of the group. Three-year-olds understand that their joint commitments obligate them normatively to behave in certain ways, and when they do not, they (but not two-year-olds; see Chapter 10) feel guilty. In this hypothesis, the sense of obligation is basically the internalization of an interpersonal commitment (given an agent who already has a sense of instrumental pressure to do what is needed to attain goals), and guilt is likewise the internalization of an interpersonal process of second-personal protest (given an agent who already engages in executive regulation). The child growing up on a desert island would not develop this sense of obligation or guilt because she would have none of the requisite social interactions to internalize.

As already noted in Chapter 2, all these normative phenomena evidence a species-unique form of social self-regulation: we > me self-regulation. We > me self-regulation gives the normative force of second-personal protest legitimacy in the child's own eyes, and thus transforms their relations with others from merely cooperative into genuinely moral. As compared with other apes, this is something totally new. Young children not only engage with others in collaborative activities, they, in a sense, *collaborate with others to self-regulate those very activities*—a kind of second-order collaboration. Internalized, the individual on her own can then normatively self-regulate her interactions and relationships to others through feelings of obligation and responsibility to her partner (and guilt). This "cooperativization of self-regulation" is of the essence of humans' normative sociality and morality. Given the maturation of capacities for collective intentionality, the crucial role of social experience (as structured by those capacities) is clear. A child who never had the chance to form a "we" with a partner, and never experienced any kind of second-personal protest from a partner, would not all of a sudden normatively self-regulate. They must participate in collaboration and experience second-personal protest in order to internalize it. Nevertheless, it is important that even in this case we are not talking about explicit adult instruction but the individual's experience and internalization of uniquely human social interactions.

With regard to the role of different types of experience in the development of uniquely human collaboration and its attendant sociomoral motivations and attitudes (and resulting social relationships), we might formulate three relatively specific hypotheses.

The first hypothesis would be that adult teaching and scaffolding are critical to the process. However, for all the reasons discussed previously, I do not believe that this hypothesis is true at any step in this developmental pathway. Rather, the process is more a natural one (maturationally guided learning) than a cultural one (adult socialization and instruction). But given that it is a natural process, it is still possible that certain types of social interaction facilitate children in constructing the necessary skills and attitudes.

A second hypothesis would be that it is interaction and collaboration with coequal peers that is of critical importance because (following Piaget) to become an autonomous moral agent children need interactions with others of equal competence, knowledge, and status, with whom they work out cooperative arrangements on their own. However, in many of the studies reviewed in this chapter, children at three years of age are collaborating in sophisticated ways with peers in experimental situations, despite the fact that they have had little experience in peer collaboration before this age. I thus do not believe that this hypothesis is especially plausible before three years of age, although it likely does apply to development at later ages, as we will discuss later.

The third hypothesis might be a more plausible claim that young children's maturational preparedness for collaborating with others structures their early social interactions with adults. Thus, when an infant is playing a game together with an adult, the adult's greater powers and competence are not especially relevant to the game itself. Of course, the adult can turn authoritative at any time, but within the context of the game, the child perceives them as equals. Later, after three years of age, children's interactions with peers become crucial because they are no longer collaborating only in the safe environs of a game but are working out collaborative arrangements in real-life interactive situations with real-life consequences. Perhaps collaborating with adults before three years of age—not being taught by them, but collaborating with them naturally—is a kind of zone of proximal development for later collaborative interactions with peers.

The best test of these hypotheses would come from cross-cultural comparisons. As alluded to earlier, although there are few quantitative data available, ethnographic observations suggest that one- to three-year-old children in Western, industrialized societies engage in more collaborative activities with adults than do children in more traditional societies, whereas children in more traditional societies have more and more varied experiences with peers at these early ages. The test would be to measure all kinds of social-interactive and collaborative activities, with various kinds of social partners in the one- to three-year age range across multiple cultural contexts. The outcome of interest would be children's collaborative skills—and their various sociomoral motivations and attitudes, from joint commitments to second-personal protests—in the three- to six-year age range. One could, of course, use the same basic design to measure children's experiences at three to six years and outcomes at six years of age and older.

My overall hypothesis is thus that the process is one of construction or social co-construction. As capacities for joint intentionality mature, young children's engagement with others takes on a new structure, the dual-level structure. As they interact with others in dual-level collaboration, they naturally come to relate to them in some new ways with some new sociomoral attitudes, especially a sense of self-other equivalence, leading to a sense of mutual respect between partners. As their capacities for collective intentionality mature, young children become normative creatures. They now are capable of forming with other second-personal agents a joint commitment (and engaging in its associated processes of second-personal protest), leading to still other uniquely human sociomoral attitudes, especially a sense of commitment or responsibility to partners, and resentment for partners who do not treat them in this same way. A child deprived of social experience would not develop these sociomoral attitudes at either of these levels. The developmental pathway is structured and innervated by the maturation of capacities for shared intentionality, but the most immediate causal factors are the child's social experiences as structured by these capacities and her attempts to executively self-regulate her interactions with others normatively through the internalization of these unique social experiences.

Social and Moral Implications

In all human societies, collaborative activities for mutual benefit are ubiquitous. And most of humans' most impressive cognitive achievements—from complex technologies to formal symbol systems to societal institutions—are only possible because individuals are both capable and motivated to coordinate their thoughts and actions with others collaboratively.

But beyond these cognitive consequences, collaborative activities for mutual benefit are also the birthplace of uniquely human sociality and morality. Mutualistic collaborative activities have within them the seeds of all the sociomoral motivations and attitudes that most clearly distinguish human sociality from that of other apes. In collaborating with other individuals—initially adults and later peers—young children create a new social order in which "we" is constituted by the two second-personal agents "I" and "you," reciprocally defined. As compared with the great ape social order based mainly on competition and dominance, this new social order represents a radically new way of relating to others—namely, with mutual trust, respect, and commitment. Traversing the developmental pathway from dual-level collaboration to joint commitment is thus foundational for basically all uniquely human sociality and morality.

I would argue that these new ways of relating to others are not just strategic—aimed at burnishing one's reputation in ways that bring benefits—but genuinely moral (Tomasello 2016). Of course, human individuals are concerned with their reputations and with not being taken advantage of by others, and these strategic motives are definitely a part of the picture, especially for adult human beings. But what we have considered here are only children up to age three or so, who have just begun interacting with others as independent sociomoral agents and who, by all accounts, are not yet worrying about what others think of them (see Chapter 10). And yet from age three they are making and keeping joint commitments with others and engaging in respectful second-personal protest to normatively self-regulate those joint commitments. Children at three years of age are starting to become genuinely moral beings.

8

Prosociality

Humans do not just cooperate together, they even sacrifice for one another. Individuals sacrifice by donating organs and blood to the sick, by volunteering to fight fires for the community, and by risking their lives in wars for their cultural group. And they perform many less heroic acts of helping and sharing—opening doors for others and sharing their food—on a daily basis. Indeed, one simple but powerful way to see the pattern is simply to "follow the food." When foraging parties of other primates encounter food, the first one to touch it is almost always the one—the only one—to eat it. In human foraging parties and social groups—from hunter-gatherers to modern industrialized societies—extensive and complex transfers of food among multiple individuals is the norm (Gurven 2004).

The evolutionary origin of sympathy and self-sacrifice across the animal kingdom is undoubtedly the parent–offspring relationship. In mammals, the social bonding hormone oxytocin has evolved to motivate mothers' nursing, protecting, and caring for offspring, and in some cases fathers' participation in the process as well. In some species, this sense of sympathy for offspring becomes generalized to other kin by normal processes of kin selection. In a few species it becomes generalized to non-kin "friends" as well, based on general principles of interdependence: it makes sense to help those on whom one depends. In humans in particular, the emergence of obligate collaborative foraging and later cultural organization created new forms of interdependence that served to generalize the sense of sympathy even further to collaborative partners and in-group compatriots (see Chapter 2).

Human children's prosocial behavior thus very likely has strong maturational bases, as the most basic acts of prosociality—helping and sharing with non-kin—are common to all great apes in some circumstances. But in addition to being much more frequent and pervasive, the human version also has some special properties. Children's proclivities for doing such things as helping others paternalistically (that is, helping not with what others want but with what they need) and providing extra help to those who have previously been harmed in other ways suggest a tendency to take the role or perspective of the other. Following Roughley (2015), we call such acts "Smithian" (after Adam Smith) because they seem to derive from humans' unique ability to put themselves in the place of the other imaginatively. Children also appear to help and share based on intrinsic motivations that are impervious to normal processes of external reinforcement, again suggesting an important role for maturation.

But then, after age three, things take a normative turn. Children do not just help and share out of sympathy but also out of a sense of obligation. For example, after age three children begin to distribute resources, at least in collaborative contexts, with a sense of fairness. Acts of fairness are based on a sense of obligation to treat equally deserving others—that is, other second-personal agents—with mutual respect. This way of operating is made possible both by a sense of self-other equivalence—derived from collaborative interactions, and supporting a sense of fairness (see Chapter 7)—and the ability to incorporate social perspectives and normative standards into the self-regulatory process, engendering a sense of obligation.

Our topic in this chapter, then, is the developmental pathway constituting children's prosocial tendencies: from helping and sharing with others based on a sense of sympathy, to fairness toward others based on a sense of obligation. As all parents know, from the beginning children have a robust urge to satisfy their own needs and interests to the neglect of everyone else. But at the same time they are developing prosocial tendencies that put the needs of others, at least in some contexts, either ahead of their own or on an equal footing with their own.

From Apes: Basic Sympathy

Feeling sympathy for, and so helping, those with whom one lives interdependently is a natural part of primate social life, within limits. If the helping is reciprocal, that makes it even more evolutionarily stable.

Great Ape Helping and Sharing

As noted in Chapter 7, great apes compete with groupmates for resources all day every day. For example, in the case of chimpanzee foraging, the typical situation is that a handful of individuals travel until they find a fruiting tree. Each individual then scrambles up the tree on its own, procures some fruit on its own, and seeks maximum spacing from others to eat. Such scramble competition, in which the winner is the one who gets there first, is often complemented by contest competition, in which the winner is the one who wins the fight or dominance contest, as when a dominant in the tree takes what it wants while nearby subordinates defer.

But great apes do help one another and share with one another in some contexts. As noted in Chapter 7, the main context is coalitionary support in dominance contests. Great ape individuals often rely on their kin to side with them in fights; in addition, they cultivate "friends," often through coalitionary support but also through other affiliative behaviors such as grooming and food sharing. Grooming in chimpanzees is preferentially directed to coalition partners, and individuals who have been preferentially groomed by a partner preferentially groom that partner (Gomes et al. 2009). In addition, male chimpanzees preferentially "share" food with their coalition partners (that is, they may tolerate their taking food). Add to this the finding that individuals who groom one another also share food with one another preferentially, and the result is a relatively tight set of reciprocal relations among grooming, food sharing, and coalitionary support. But the evolutionary logic is still competition: in a world of constant competition it pays to have good and powerful friends. Mueller and Mitani (2005) summarize the situation for chimpanzees:

> The most prevalent forms of cooperation among chimpanzees, however, are rooted in male contest competition. Chimpanzee males maintain short-term coalitions and long-term alliances to improve their dominance status within communities and defend their territories cooperatively against foreign males. Other prominent cooperative activities, such as grooming and meat sharing, relate strategically to these goals. Females are far less social than males, and they do not cooperate as extensively. Nevertheless, the most conspicuous examples of female cooperation also involve contest competition, as females sometimes cooperate to kill the infants of rivals. (317)

A number of recent experimental studies have documented chimpanzees' tendency to help others in instrumental contexts. For example, Warneken and Tomasello (2006) found that three human-raised chimpanzees fetched an out-of-reach object for a human caretaker who was reaching for it, but they did not fetch objects for which the human had no use (see also Yamamoto and Tanaka 2009). Because human-raised chimpanzees helping their human caretakers might be a special case, Warneken et al. (2007) presented chimpanzees living in a semi-natural setting with opportunities to help an unfamiliar human. The chimpanzees helped him as well, even paying an energetic cost to do so (by climbing a few meters high to fetch a desired object). Beyond helping humans, Warneken et al. (2007, study 2) found that chimpanzees also helped a conspecific by opening a door to give her access to food (more than they opened the door in two control conditions; see also Melis et al. 2011; Greenberg et al. 2010). A key in all of these studies was that chimpanzee helpers perceived that they had no opportunity to get the food themselves; their helping did not cost them any resources.

Schmelz et al. (2017) found that when chimpanzees observed a conspecific taking a risk to provide them with access to food, they rewarded that individual by later acting prosocially toward her. This is the only solid experimental demonstration of reciprocal sharing in great apes. Nevertheless, Tomasello (2016) argued that such behavioral patterns of reciprocity in apes—including those among grooming, coalitionary support, and food sharing in wild apes—are not based on any kind of tit-for-tat "agreement" to reciprocate (so-called calculated reciprocity). Rather, they are based on the fact that individuals sympathize and develop an emotional bond with those who help them—that is, with those on whom they depend—so each helps the other because each sympathizes with the other independently. There is not an agreement—which might imply a normative sense of "we"—but only sympathy in both directions.

Great apes are not great at sharing food. As noted previously, they are highly competitive over food, and, like many mammals, they have evolved a system of dominance for resolving food competition. In situations in which competition is minimized—a group of apes is provided with leafy tree branches (a low-value food) tied together so they must eat in proximity—there can be relatively peaceful "passive sharing" in which one individual allows others to take some leaves from her (de Waal 1989).

After a successful group hunt for more highly desirable meat, the captor allows others to take pieces of the carcass, but only because they are harassing him, with those who harass the most vigorously getting the most meat (Gilby 2006). This is called tolerated taking or sharing under pressure, because the captor is not offering up the meat freely; if he were to fight to prevent the taking, he would end up losing all of the meat to others in the fray.

In an experimental paradigm, Silk et al. (2005) and Jensen et al. (2006) gave chimpanzees the option of pulling one rope that delivered food on a board only to themselves or pulling a different rope that delivered that same amount of food both to themselves and to a conspecific (that is, the choice was between 1–0 and 1–1). Although there was no cost for being generous, chimpanzees pulled the two ropes indiscriminately, seeming not to care what their partner received; they were only concentrating on getting food for themselves. Hare and Kwetuenda (2010) found that a bonobo provided with food in one room would voluntarily open a door and allow another to come in and feed with her. But Bullinger et al. (2013) found that bonobos (as well as chimpanzees) also would open the door quite frequently with no food available, suggesting that the motivation was not so much to share food as to have company.

Another interesting and telling situation is food sharing between mothers and their youngsters. When a chimpanzee mother has food, she rarely offers it to her offspring. If her offspring is begging and harassing, she mostly just gives up the poorest part of the food. Ueno and Matsuzawa (2004) found that chimpanzee mothers outright rejected about half of their infants' begging requests, and in the other half allowed them to take mostly the skin, peel, or husk. Völter et al. (2015) found that in situations in which only the child could reach some food, orangutan mothers systematically waited for the child to obtain the food (often manipulating their bodies to facilitate acquisition), which they then took from her. This is in sharp contrast to human parents, who, in all societies, actively provision their offspring with food up through adolescence (Gurven 2004).

Overall, food sharing is not something that comes easily and naturally to great apes. Nevertheless, they are doing something at least somewhat prosocial with their kin and friends if the cost is not too high. And there is evidence that this prosocial behavior is underlain by the emotion of sympathy. Thus, in studies of wild chimpanzees, Crockford et al. (2013)

found that during a grooming bout the chimpanzee doing the grooming (as well as the one receiving the grooming) shows an increase in the mammalian bonding hormone oxytocin, and Wittig et al. (2014) found similarly that the chimpanzee who gives up food during a food-sharing episode (that is, tolerated taking) also shows an increase in oxytocin. This would seem to constitute at least indirect evidence that chimpanzees and other great apes feel sympathy for those whom they are helping.

The age at which great apes first help and share with others is not known because no infants or youngsters have ever been tested systematically. But in some experiments those who helped others were as young as three to four years of age (see especially Warneken and Tomasello 2006).

Human Children

Human infants and toddlers are not involved in the kinds of competitive interactions characteristic of great apes, and they do not actively cultivate friends. But during human evolution, great apes' sympathy for kin and friends evolved into humans' sympathy for a wide variety of others, initially for collaborative partners and then for everyone in the social group. Modern infants have inherited both versions. Perhaps the purest case of sympathy in contemporary human infants is when they comfort others in distress, typically by approaching, paying special attention to, and sometimes even touching a distressed person. A variety of observational and experimental studies have established that infants as young as one year of age will approach and console other crying infants as well as adults showing some kind of emotional upset (Nichols et al. 2009; for a review, see Eisenberg et al. 2006). And as we shall soon see, other manifestations of sympathy in the form of instrumental helping and the active sharing of resources also emerge in human infants between one and two years of age.

Systematic age comparisons between apes and infants are thus not possible in this domain, as the social contexts within which the two species express their species-appropriate sympathy are different, and great ape youngsters have not been tested in most human infant paradigms. Nevertheless, it is notable that human infants' comforting behaviors emerge quite early, soon after the first birthday. Informal observations of great apes suggest that it is unlikely that they are comforting, helping, or sharing at this inordinately early age.

Smithian Helping and Sharing

Human infants are not independent agents. Most of their interactions with the world are mediated by mothers or other adults. It is therefore surprising, from an evolutionary point of view, that they have such a strong tendency toward prosocial behavior. If they are not cultivating friends or reciprocity or reputation, what are they doing (evolutionarily)? Presumably, evolutionarily, the answer lies in their need to establish cooperative social relationships with the adults who care for them, although of course this is not their proximate motivation. Their proximate motivation is presumably sympathy for the person needing help.

Helping

Human infants begin actively helping others with their instrumental problems from at least fourteen months of age (Warneken and Tomasello 2007). They discriminate helpers from hinderers in perceptual displays from even younger than that (for example, Kuhlmeier et al. 2003; Hamlin et al. 2007). In a direct comparison between human-raised juvenile chimpanzees and human infants of eighteen months of age, Warneken and Tomasello (2006) found a great degree of similarity. Both species helped a human adult reach out-of-reach objects (although only the infants helped the adult with more complex problems such as stacking books or opening a cabinet). In another direct comparison, Warneken et al. (2007) found that both chimpanzees and human eighteen-month-olds were insensitive to potential rewards from the helpee, and both even paid modest energetic costs to do the helping.

Over and above these general similarities to great ape instrumental helping, human infants also help in some ways that apes do not. One difference is that infants as young as twelve months of age will help adults and peers achieve their goals by providing them with useful information using the pointing gesture, which great apes do not do (see Chapter 4). Another difference is that two- and three-year-old children will help a peer more in the midst of a collaborative activity than in the midst of other activities (Hamann et al. 2012), whereas the activity context makes no difference to great apes (Greenberg et al. 2010). Human toddlers at about 30 months will also pay a very high cost to help others (sharing one of their favorite possessions; Svetlova et al. 2010), whereas this kind of high-cost sharing is unlikely in other great apes. Toddlers also help other toddlers with their instrumental problems (Hepach et al. 2017a), and, importantly, they distinguish a person in genuine need from other persons with whom they might interact positively in other ways (Köster et al. 2016).

In addition to these mainly quantitative differences, there are three other well-established phenomena of children's helping that suggest a qualitative difference of process as well. The first is that human infants' helping is intrinsically motivated. Thus, infants spontaneously help others just as readily when they are alone with the helpee as when their mother is watching them, or even encouraging them, to help (Warneken and Tomasello 2013a). Moreover, even stronger in this direction, infants will help someone who does not even know he is being helped (and no one else is watching either; Warneken 2013; Hepach et al. 2017b). Further, employing the famous overjustification paradigm, when twenty-month-olds are given external rewards for helping, if the rewards are then stopped, their helping actually decreases relative to children who were never rewarded, suggesting that external rewards undermine their intrinsic motivation (Warneken and Tomasello 2008; but see Dahl et al. 2017, for a study with somewhat different results for younger infants at thirteen to fifteen months of age). Social praise, in this study, did not diminish children's motivation, but it did not increase it either. And finally, most powerfully, using direct physiological measures of emotional arousal—pupil dilation and body posture—Hepach et al. (2012, 2017b) found that young children are equally satisfied both when they help someone in need and when they see that person being helped by a third party (and more satisfied in both of these cases than when the person is not being helped at all), suggesting that their motivation is not to provide help themselves (for a reputational boost) but only that the other person be helped. Although great apes have not been tested in any of the paradigms cited here, these studies show that human infants' helping behavior is intrinsically motivated, and is not much affected by externally administered rewards and punishments.

The second important phenomenon is paternalistic helping. Human adults are especially motivated to help others who are in dire physical straits. For example, take the proverbial stranger lying injured in the street. Humans will be urgently concerned for his physical well-being—so much so that even if he pleads with us to retrieve his bicycle from the street first, we will ignore his wishes and focus on stopping his bleeding. We will not be so much concerned with fulfilling his wishes as with helping him physically (see Nagel 1986). Several studies of young children find such paternalistic helping emerges from a fairly young age (for example, Martin and Olson 2013). In a comparative study with chimpanzees and human toddlers, Hepach et al. (forthcoming) had a trained conspecific reach for one of two tools. In the key condition, he reached for a tool that the subject knew was not the one he actually needed. Chimpanzees followed the reacher's reaching action and fetched him that one; human toddlers, in contrast, ignored an adult's reaching and fetched him the tool he actually needed. Further evidence along these lines is provided by Hepach et al. (2013). They had an adult express distress about something that had just happened. Young children did not help the adult when his distress was unjustified by the circumstances (for example, he was crying about something trivial), but only when his distress seemed justified by a clear cause. This finding suggests, again, that it is not the personal desires of others that children and adults are attempting to accommodate—although they may do this in some cases—but rather the well-being of the helpee.

A third important phenomenon is sympathy for a person that extends beyond the immediate context of need. Thus, Vaish et al. (2009) had eighteen-month-old infants watch while one puppet "harmed" another (for example, tearing up his picture). The infants felt sympathy for the victim in the situation (as indicated by their facial expressions), and, importantly, this sympathy extended into a subsequent unrelated situation in which the victim needed help: they helped the previous victim more than a neutral person. In a similar experiment with chimpanzees, Liebal et al. (2014) found no such "extended sympathy." This species difference suggests the possibility of a qualitatively different form of sympathy in humans that goes beyond merely helping an agent with her instrumental problem to actually empathizing with her, in the sense of taking her affective perspective and putting oneself "in her shoes." Roughley (2015) calls this "Smithian empathy" and gives as examples (following Smith 1759) the way in which we feel bad for a dead or mentally incapacitated person—even though they themselves are not feeling bad; presumably this feeling is based on how we would feel if we (in our current aware state) were in their situation. The paternalistic helping studies we have discussed may be interpreted in a similar way: I fetch him not what he wants but what I would want if I, given my current knowledge, were in his shoes. Perspective-taking and self-projection are things that apes do not do because, presumably, they do not possess the necessary cognitive skills of joint attention and perspective-taking.

The hypothesis, then, is that whereas children's instrumental helping shares many features with that of the great apes, it also has some unique features, and these are due mainly to uniquely human adaptations for cooperation and shared intentionality. Thus, for many of the reasons outlined by Baumard et al. (2013), an intrinsic motivation to help and cooperate might be an evolutionary advantage (for example, it would not display the kind of hesitation of decision that a more strategically motivated version might display). Helping others paternalistically not with what they want but with what they need, especially in terms of their physical well-being, is consistent with an evolutionary analysis in terms of interdependence, in which the most important thing is that those individuals on whom one depends remain in good shape. And the kind of perspectivally based Smithian empathy that young children display, and apes do not, presumably reflects an ontogenetic interaction between children's sense of sympathy for those in need and their emerging perspective-taking abilities.

The subsequent development of children's helping behavior, after age three, is characterized by two main features. First, it becomes more selective. For example, Vaish et al. (2010) found that when three-year-old children were given the choice of helping one of two actors, they selectively avoided helping the one whom they had previously observed being antisocial (as compared to a neutral actor), whereas they did not preferentially help a prosocial actor. Thus, preschool children are moving beyond infants' more or less indiscriminate helping and starting to take into account whether it would be wise to help this particular individual. Along these same lines, Plötner et al. (2015b) found that when five-year-old children saw someone needing help, they did so much more readily if they were the only one present than if there were others who could possibly help (that is, they showed an adult-like bystander effect). Again, preschool children are moving beyond infants' indiscriminate helping, starting to take into account whether it might be safer to let someone else take the risk. It would also make sense for preschool children to start helping others who helped them first (as they do with sharing; see the next subsection), but Warneken and Tomasello (2013b) did not find this effect (although the analytic problem was that they helped very frequently, near ceiling, even without someone helping them first).

The second feature of helping behavior in children after three years of age is the role of social norms. Infants are helping out of sympathy, and this applies to older children and adults as well. But in every act of helping there are also costs and risks. Based on various considerations, different cultures have developed different sets of social norms specifying when and in what circumstances an individual should help another (and when not). For example, in Western cultures, if I ask you to pass me the salt at the dinner table, you pretty much have to comply; but if I ask you at the dinner table to drive to the store and purchase some salt for me, you may demur, and no one would think less of you. The point is that infants and toddlers help in pretty much any situation they can, if it is not overly costly. Older children are starting to take into account what is expected of them by others before determining whether to help.

Sharing

Helping only costs a few ergs of energy, but sharing costs resources. In situations of sharing, therefore, children's natural, internally motivated tendency to help others is mitigated by their selfish desire for the resources. We thus look here at infants' and toddlers' generosity with resources (in the next section we look at older children's division of resources governed by a sense of fairness). The hypothesis is that whereas children's sharing has some features in common with that of great apes, it has many unique features, and these are due, as in the case of helping, mainly to uniquely human psychological mechanisms for taking the affective perspective of the other (Smithian empathy).

Human infants give away objects and food quite freely, but that may be because they do not really value them. Toddlers and preschoolers, who do value toys and food, are often quite selfish with them. But that is mainly when they already possess them (that is, they show an "endowment effect"). Thus, in a situation in which the child already possessed some toys or food and an adult had none, Brownell et al. (2013a) found that eighteen-month-olds shared only some of their things and only somewhat frequently, mostly in response to verbal prompting. Twenty-four-month-olds shared more often and more freely (sharing both food and toys with equal frequency and with less prompting needed; see also Dunfield et al. 2011). In a series of tasks in which somewhat older children were given the opportunity to divide a set of resources between themselves and an adult partner, Rochat et al. (2009) observed that three-year-olds gave about one-third of the items to the partner, whereas five-year-olds gave them almost one-half.

In situations in which they do not possess the toys or food ahead of time, even infants and toddlers share with others relatively freely. Thus, Ulber et al. (2015) had pairs of eighteen- and twenty-four-month-olds enter a room together and encounter a bowl of small, attractive toys (a situation somewhat reminiscent of chimpanzee foraging). In this situation, they almost always divided up the toys in a relatively peaceful manner, without squabbling or hording by either child; and about half the time they divided them equally. Sharing in the sense of not trying to dominate all the resources for oneself comes naturally to toddlers. Interestingly, Ulber et al. (2016) found that three-year-old children's motivation to share is not sensitive to—indeed, is diminished by—concrete rewards, which suggests that it, too, like helping, is intrinsically motivated. As in the similar helping study by Warneken and Tomasello (2008), social praise did not diminish children's internal motivation, but neither did it increase it. Another interesting finding is that of Brownell et al. (2013a) that individual differences in children's sharing behavior are related to individual differences in their ownership understanding: one cannot really share something unless one has a sense that it is one's to share as one likes.

Brownell et al. (2009) designed a task to be as similar as possible to the tasks Silk et al. (2005) and Jensen et al. (2006) had given to chimpanzees: a child had to choose between one resource for only herself versus one for herself and one for a partner (1–0 versus 1–1). What they found was that eighteen-month-olds, like the chimpanzees, chose indiscriminately. But twenty-five-month-olds more often chose to benefit both themselves and the partner (especially when that partner expressed a desire for the resource). House et al. (2012) administered a similar test to children from three to eight years old, and compared it to the chimpanzee data from Silk et al. (2005), finding that the children were much more prosocial than were the chimpanzees.

As in the case of helping, the subsequent development of children's sharing behavior after age three is characterized by two main features. First, it becomes more selective. For example, Warneken and Tomasello (2013b) found that three-year-old but not two-year-old children will share more resources with a person who has previously shared with them than someone who has not. Further, Olson and Spelke (2008) found that three-year-olds are more likely to divide resources to especially benefit friends, people who have shared with them previously, and people who have shared with others previously. Moore (2009) looked more in-depth at how the nature of the recipient affects five- to six-year-old children's sharing and found that "young children prefer equitable division of resources with friends, treat non-friends less well, and make prosocial moves with strangers when the cost to self is not high" (944). Svetlova and Brownell (forthcoming) found that when three- and five-year-old children were given the choice of sharing with either a needy puppet or a neutral puppet, they chose to share with the needy puppet. Thus, unlike great apes, young children's sharing is also (like their helping) based on affective perspective-taking of the needs of the recipient.

The second feature of children's sharing behavior after three years of age is that it becomes sensitive to social norms. Thus, in cross-cultural studies preschool children's sharing behavior is fairly similar across cultures, but sometime around middle childhood children start to diverge in the direction of their particular culture's social norms. Experimental verification of this age and process comes from a recent study by House and Tomasello (2018), who gave a prosocial task to Western children across a wide age range (that is, a choice between 1–0 versus 1–1, in which a partner gets one also). They found that children became gradually more prosocial over age into the school years, but, most importantly, school-age children were much more sensitive than preschoolers to information about social norms. Thus, when before their choice they saw other children (on a video) say things such as "This is the right one to choose" or "This is the one that most children choose," older, but not younger, children went with the norm. Related to this finding, school-age children tend to share more with in-group than with out-group peers (Fehr et al. 2008), suggesting a sensitivity to social norms, which prototypically apply only to in-group compatriots. (See also McAuliffe et al. [in press] on the influence of social norms on sharing among four- to nine-year-old children.)

Individual and Cultural Variation

Children with autism spectrum disorder help others with their instrumental problems (Liebal et al. 2008). And their sharing of toys and resources is not something that has been reported as being markedly different. But of central concern here are those aspects of helping and sharing that are uniquely human. To our knowledge, there are no studies of autistic children's intrinsic motivation to help or their tendencies toward paternalistic helping. The one suggestive study is that of Hobson et al. (2009; on which Vaish et al. 2009 was based) in which children with autism were not as good as learning disabled control children at "affective perspective-taking" when a victim had been harmed but had not expressed any outward signs of distress. This provides at least a hint of support for biological bases for uniquely human helping.

In terms of cultural variation, or lack thereof, Callaghan et al. (2011) found that in three very different cultural contexts (two being traditional, small-scale nonliterate cultures), human infants began helping others at almost exactly the same age, more or less eighteen months of age. This is despite the fact that mothers in these different cultures have very different attitudes about the degree to which it is desirable or expected that children this young help others. But at older ages, cultural differences begin to emerge. Thus, Rochat et al. (2009) found cultural differences in the tendency of three to five-year-old children to divide resources between themselves and a partner, with children from more collectivist cultures sharing more freely than those from more individualistic cultures. House et al. (2013) studied children from three to fourteen years of age across six diverse cultural contexts and found that when sharing with others was noncostly, children in all societies became more generous over age, but when sharing with others was costly, children became less generous over age, with cultural differences (based on differences in cultural norms) emerging later in school age.

In terms of individual differences within Western industrialized cultures, Brownell et al. (2013b) documented that a number of variables in children's social environments are associated with individual differences in their sharing behavior. But, of course, such correlations could be indicating relationships in the opposite direction: when children begin to show a tendency to help, parents treat them differently. Or they could be reflecting the operation of some third factor.

Fairness

Being fair is not the same thing as being nice. If I am extra nice to one person by giving her extra resources, that nevertheless might be unfair to others. But if the recipient needs the resources more, or is somehow responsible for more of the resources being available (for example, she did more work), then perhaps it might be fair after all. The judgment of fairness is thus always grounded in some judgment of equality—equal resources per person, or per unit of need, or per unit of work effort, or whatever—with the self being treated, impartially, as equivalent to others (in terms of deservingness). A sense of fairness naturally comes with a sense of obligation: everyone including oneself should get what they deserve. A sense of fairness thus competes, in some circumstances, with both selfish and generous motives.

Great Apes Do Not Have a Sense of Fairness

Great apes sometimes share resources with others, as noted earlier, and friends preferentially share with one another. But they are not sharing with others with a sense of fairness, as demonstrated by two main sets of experimental results. The first set of results came from the ultimatum game, in which a proposer proposes a split of resources with a responder. The responder can accept the proposal, in which case they each keep their allocation, or reject it and no one gets anything. Adult human responders routinely reject low offers—say, two or three out of a total of ten—even though it means that they get nothing. The most likely explanation for this "irrational" behavior is that the responder thinks that the offer is unfair. She is not going to go along with it—she is not going to be taken advantage of in this way—even if rejection costs her resources. Modified versions of the ultimatum game have been given in nonverbal form to chimpanzees in two studies (Jensen et al. 2007; Proctor et al. 2013), and to bonobos in one study (Kaiser et al. 2012). In all three studies the key result was identical: subjects virtually never rejected any non-zero offers. Presumably they accepted everything because they were not focused on the fairness of the offer, but only on whether it would bring them food. Wittig et al. (2013) gave a very similar, nonverbal mini-ultimatum game to pairs of five-year-old human children, and, unlike chimpanzees, they quite often rejected unfair offers (when the proposer had the opportunity to be fair).

The other set of studies involved social comparison. The phenomenon is that humans are happy to receive *X* number of resources unless they see others getting more, in which case they are unhappy. Presumably, again, the explanation for their unhappiness is a sense of being treated unfairly. Brosnan et al. (2005, 2010) reported two studies claiming that chimpanzees will reject food given to them by humans (which they otherwise would accept) if they see another chimpanzee getting better food for the same or less effort. But when appropriate control conditions are run, this effect goes away. The necessary control conditions are those in which the chimpanzee just expects better food in the same context, which makes the offered food less appealing (Bräuer et al. 2006, 2009). This experimental paradigm thus does not show social comparison in chimpanzees, only food comparison. Support for this interpretation comes also from a study by Brosnan et al. (2015) who compared a condition in which chimpanzees were given a less desirable food than they were expecting (food comparison condition) to a condition in which they were given a less desirable food than was given to a groupmate (inequity condition). Chimpanzees behaved identically in the two conditions (for similar negative results, see Hopper et al. 2013). And more recently, using a procedure in which food was distributed to two chimpanzees either by an experimenter or a machine, Engelmann et al. (2017) found that the "anger" of chimpanzees in this situation is not about an inequity in what they receive; rather, they are angry at the experimenter (but not the machine) because he has not given the food they are expecting in the situation. Overall, then, there is no reliable evidence that great apes engage in any kind of social comparison in assessing how resources are divided. (The same is true of the better-known case of capuchin monkeys; see Tomasello 2016, for a review.)

Melis et al. (2016) also observed a stark difference between humans and apes in something like fairness in a situation in which simultaneous sharing was not possible. In this study, pairs of chimpanzees and three- and five-year-old children were confronted with an apparatus that required both of them to pull a rope (together, either left or right) for a single reward. The trick was that while either subject could potentially benefit on a given trial, only one actually did, depending on which way the rope was pulled (left benefiting one of them, right benefiting the other). The solution for keeping the rewards coming across trials was, of course, to take turns pulling left and right across trials. The majority of children at both ages alighted relatively quickly on this turn-taking solution (and once they discovered it they never abandoned it), whereas the chimpanzees never took turns reliably at all (in two experimental regimes).

Based on such evidence, the only reasonable conclusion (following Tomasello 2016) is that dividing resources with a sense of fairness is just not something that nonhuman great apes do.

Three-Year-Old Children Share the Spoils of Collaboration Fairly

If children are given some resources and told that they can divide them with others in any way that they want (dictator game), they do not do so in an equal fashion until well into school age, and not always then (for a review, see Ibbotson 2014). But the dictator game is a poor test for measuring a sense of fairness (see Kurzban et al. 2015). By telling the child that she can do with the resources whatever she wants, the adult implicitly sanctions selfishness. Moreover, it is well-known that all humans experience an endowment effect such that objects already in their possession are seen as more valuable than others (for example, Kahneman et al. 1991), thus making any sharing especially costly.

McAuliffe et al. (2017) reviewed studies using another task to investigate young children's sense of fairness in distributing resources. The basic task (as used by, for example, Blake and McAuliffe 2011; McAuliffe et al. 2015) is that an adult sets up a potential distribution between the child and some other child on an apparatus. The child can either accept the distribution or reject it (into an inaccessible trash can) so that no one gets anything. The basic finding is that children normally accept unequal distributions—especially if they are getting more than the partner—well into school age. But the problem here is that the cost for rejecting unfair distributions is extremely high: rejection means that neither child gets anything and the resources are completely wasted. So perhaps this is not the best way to measure children's emerging sense of fairness either.

What is needed is a situation in which (1) the child does not have to give up resources already in her possession, and (2) the child can correct an unequal distribution to make it equal, rather than just trashing everything. An especially good situation—one that seems quite natural from an evolutionary point of view—is collaborating to produce resources, which must then be divided among the collaborators. Collaboration might evoke a sense of fairness because, as argued in Chapter 7, it evokes a sense of mutual respect among partners, and in some cases is structured by a joint commitment and its normative force. And, initially at least, neither partner "owns" the resources.

In several studies pairs of chimpanzees and human children have been presented with a simple collaborative task in which to acquire resources both partners have to pull simultaneously on the two ends of a rope connected to a platform. In a study investigating pairs of chimpanzees, Melis et al. (2006b) found that when there were two piles of food, one on each end of the platform, the pairs were often successful. However, when there was only one pile of food in the middle of the platform, on the first trial the dominant individual simply took all the food. This naturally demotivated the subordinate for future collaborative efforts, so cooperation fell apart over trials. In stark contrast, in a study designed by Warneken et al. (2011) to be as comparable as possible to this one, three-year-old children were not bothered by the food being in a single pile in the middle of the board; they collaborated successfully over many trials no matter how the food was laid out. The children knew that, no matter what, in the end they could always work out a mutually satisfactory division of resources—which they almost always did, most often by dividing them equally. Importantly, if one child took more than half of the four candies, the partner often protested (as noted in Chapter 7), whereas if the partner took only her share, there was almost never protest. The protest was thus not about getting more but about getting an equal share. And, tellingly, when there was protest about taking more than half, the greedy child almost always relented; she knew she was not being fair.

Arguably, young children were more or less egalitarian in this study because they did not have to give up anything in their possession, only refrain from hogging unowned resources. But this might conceivably have been done simply out of fear of conflict with the partner. Hamann et al. (2011) made things more interesting for children. In their study, pairs of two- and three-year-olds always ended up in a situation in which one of them had three rewards (the lucky child) and the other had only one (the unlucky child): to create an equal distribution, the lucky child would have to sacrifice. What differed across three experimental conditions was what led to the asymmetrical distribution. In one condition, the unequal distribution resulted from participants simply walking into the room and finding three versus one reward at each end of a platform—the lucky child almost never shared with the partner. In a second condition, each child pulled her own separate rope, resulting in the same asymmetrical rewards—the lucky child shared sometimes. But in a final condition, the asymmetrical rewards resulted from an equal collaborative effort of the two children pulling together. In this case, the lucky three-year-olds (but not two-year-olds) shared with the unlucky child to create an equal 2:2 split almost 80 percent of the time! Presumably, they felt that if they both had worked equally to produce the rewards, they both deserved them equally. When the same experiment was run with chimpanzees, they hardly shared at all, even when all they had to do was not block the other from accessing the extra reward; whether there was collaboration made no difference. The important finding is that three-year-olds (but not two-year-olds or apes) will actually sacrifice resources in order to balance things with a collaborative partner; in the vernacular, they are averse in this situation even to advantageous inequity. (For a similar finding as children make third-party judgments, see Ng et al. 2011.)

The obvious interpretation is that in the context of a joint intentional activity young children feel that they and their partner both deserve an equal share of the spoils: we obtained them together, so we share them together. It could be argued that these children were only blindingly following a sharing rule that they learned from their parents. But if that were the case, they should have divided the rewards with the other child equally in all three conditions—unless, implausibly, the rule they were taught was to share resources only after collaboration. More plausibly, the act of collaboration engendered a sense of "we" that led children to see their partner as equally deserving of the spoils. It was this sense of equal deservingness that made the three-year-olds—but not the two-year-olds—feel that they ought to hand over a resource already in their possession, which they would not otherwise do.

Bolstering this view from the other direction, as it were, are studies involving free riders. When chimpanzees work to produce a reward and either a free rider or a collaborator approaches and requests to share in the spoils, they do not discriminate (Melis et al. 2011). In sharp contrast, five-year-old children systematically share with the collaborator but exclude the free rider (Melis et al. 2015). This finding supports the interpretation of children's behavior in terms of a sense of "we": we collaborators deserve the spoils (equally), but they (noncollaborators) do not.

Some sense of deservingness—as opposed to, say, a simple expectation or preference (as in the infant studies of Geraci and Surian 2011, and Schmidt and Sommerville 2011)—is crucial for the development of a morally grounded sense of fairness. The reason is that divvying up the spoils in a fair manner is only partly about the resources themselves; it is more directly about the resources one receives as compared with those received by others. Again, the issue is at bottom one of social comparison. The result that produced dissatisfaction in both the Warneken et al. (2011) and Hamann et al. (2011) collaboration studies was not the amount received but the amount received relative to what the other received. In an even more direct test of this social comparison hypothesis, Ulber and Tomasello (2017) had pairs of three- and four-year-old children and pairs of chimpanzees collaborate (or not); one partner then received more, or less, or the same as the other. The result was that in the context of collaboration the children, but not the chimpanzees, were motivated to correct the inequality, whether it advantaged them or their partner. They did not do this in a nonsocial control condition (lacking a partner or a collaboration) in which rewards simply appeared in front of the child and on the other side of the apparatus.

Children's sense of fairness is thus not about the absolute amount of resources received; it is about everyone, including the self, being treated with the respect they deserve (Honneth 1995). In the context of mutualistic collaboration, we both deserve the same amount, so an unequal distribution shows a lack of respect for whoever received less. This is why collaborating children are not just disappointed to receive less than others but positively resentful, and this shows up clearly in their second-personal (resentful) protest. And it is also not fair if I receive more than you because I ought to show you the respect you deserve as well; I feel obliged to share fairly (even giving up resources to do so) because I genuinely see you as an equally deserving partner. Collaborators do not just prefer that we share the spoils equally but feel that we owe it to one another—as mutually respectful second-personal agents—to share equally.

In terms of age, the study of Hamann et al. (2011) had a clear finding: three-year-olds, but not two-year-olds, gave up resources in order to equalize with their collaborative partner in a fair manner. This age for a normative turn in dividing resources is thus consistent with the normative turn established in the previous chapter for children's making and respecting joint commitments. But it must be emphasized that the normative turn at this early age is restricted to the context of collaboration, where no individual owns the resources ahead of time and any cost associated with sacrificing resources is compensated by the apparent benefit of seeing the equally deserving partner getting her just desserts. The collaborative context would thus seem to be especially powerful for children in mitigating their selfish impulses. Overall, we may say that for three-year-old children and beyond, fairness is the respectful way that second-personal agents treat their (potential) collaborative partners. Again, we may categorize this way of treating collaborative partners as a kind of second-personal normativity.

Distributive and Procedural Fairness

Fairness in dividing resources with a collaborative partner makes even three-year-old children different from other apes. But this is, of course, a rather limited sense of fairness. Tomasello (2016) proposed that in human evolution collective intentionality arose as a kind of group-mindedness in which all members of one's cultural group were seen as, in essence, partners in the collaborative activity of group life. And so we might expect that as children become more group-minded after three years of age, they might begin to distribute resources fairly among group members in general in many different situations.

Evidence for this proposal comes from a number of different studies. Olson and Spelke (2008) found that even three-year-olds show a bias toward equality in distributing resources among third parties. But equality when the self is not involved is easy; the test case is when the child herself is involved. In this case it seems that only school-age children reliably sacrifice to equalize outside of a collaborative context. Fehr et al. (2008) found that children from the age of seven or eight years preferred an equal sharing of windfall resources between themselves and another child, and indeed they even sacrificed resources themselves to make sure that there was an equal division. *Importantly, this was only if the partner was an in-group member.* Studies by Blake and McAuliffe (2011), Smith et al. (2013), and McAuliffe et al. (2015) have also found that school-age children feel that everyone in the group deserves an equal share, even if this means that they themselves must sacrifice resources. Shaw and Olson (2012) provided an especially stringent test. They gave children resources to distribute among third parties such that after equal distribution there was one left over. In many cases children just entering school were so dismayed by the possibility of an unequal distribution that they threw away the extra resource rather than show favoritism. In one of the very few sharing studies involving multiple children, Paulus et al. (2013) found that five-year-olds encouraged a "wealthy" member of a triad to share with a "poor" member of the triad; when the child herself was the "wealthy" member, she herself sacrificed to achieve something approaching equality among the three of them.

The finding, then, is that children at the transition to school age feel that, all things being equal, everyone in the group deserves an equal distribution of resources. But sometimes this is not possible. In such cases, one solution is to find a fair procedure for allocating resources, for example, by casting lots, drawing straws, rolling dice, or playing rock-paper-scissors. Grocke et al. (2015) had five-year-old triads confront three unequal reward packages and then agree on a procedure to allocate them among themselves. To allocate the rewards, they needed to use a "wheel of fortune." Children who played with a fair wheel (where each child had an equal chance of obtaining each reward package) were mostly accepting of the outcome and the procedure, no matter how much they themselves received. In contrast, children who played with an unfair wheel (biased at the outset) often changed the rules of the game *in medias res,* and in a later interview said it was an unfair procedure. (For a similar study with similar results in six- to eight-year-olds in a third-party paradigm, see Shaw and Olson 2014.) The conclusion was that even preschool-age children are already sensitive not only to distributive fairness but to procedural fairness as well.

The basic idea of procedural fairness is that the rules or procedures should be formulated impartially—that is, without knowing ahead of time how particular individuals will be affected (under a "veil of ignorance"; Rawls 1971). So long as individuals know that the process is treating them fairly, they are satisfied with any outcome. As further support for this view, Grocke et al. (2018) put young children in a situation in which they received an unfair outcome, but they either did or did not participate in the decision-making process specifying the distributive procedure. The finding was that no matter what resources they actually received, so long as they were able to participate in the decision-making process, they judged it to be a fair process. The negative side of this phenomenon, as it were, is represented by the study of Vogelsang and Tomasello (2016). After a puppet gave three- and five-year-old children five candies out of their pile of ten, when it was their turn the children reciprocated with something close to five most of the time. But when the puppet took five out of a common pile and left the child with five, children did not reciprocate to the same degree, even though the division was exactly the same in the two cases. One interpretation is that giving represents an act of respect for the other person as an equally deserving partner, whereas taking represents an active disrespect for one's partner.

Once again, the most natural interpretation is that children's attitudes and evaluations in such situations are not driven by the resources themselves. The determinative issue is that they do not want to get less than others because this shows them disrespect—they are being treated as less than equal—whereas they do not mind getting less than others if they feel that they have been treated with respect, as equal to others. The issue is not the resources themselves; the issue is being treated as one deserves to be treated: with equal respect.

Individual and Cultural Variation

A number of experimental studies have found cultural differences in the way that children choose to distribute resources. As was noted earlier in our discussion of prosociality, Rochat et al. (2009) and House et al. (2013) found cultural differences in how children chose to divide a set of windfall resources between themselves and various other individuals.

Blake et al. (2015) set out to investigate a sense of fairness, or equity, more directly. They used the very demanding task previously used by Blake and McAuliffe (2011) and McAuliffe et al. (2015) in which children had to either accept or reject experimenter-proposed divisions between themselves and another child. Rejection meant that no one got anything, and the resources were wasted in the trashcan. Using this task, they found that young children in all cultures rejected disadvantageous divisions that favored the other child at similar rates well into middle childhood. But at around eight years of age children from the Western, industrialized cultures, but not children from the other cultures, began rejecting even advantageous divisions that favored themselves. However, Corbit et al. (2017) extended the findings of Hamann et al. (2011) that collaboration in young children—in this case from one Western industrialized culture and one small-scale rural culture—prompts a more fair division of resources, even if children have to give up resources in their possession. Zeidler et al. (2016) found significant cross-cultural differences in school-age children's willingness to take turns accessing a monopolizable resource, with children from two small-scale cultures almost never establishing a clear turn-taking regime while children from a Western, industrialized culture did so readily.

The key to understanding these cultural differences in distributing resources is the ontogenetic pattern. Younger preschool children from different cultures (who actually are not well represented in any studies) differ little in their sense of fairness—which, we may hypothesize, is confined to collaborative contexts broadly defined—because they are all operating with a natural, second-personal morality involving respect for second-personal agents. But later, especially during school age, children begin subscribing to the social norms that their culture has worked out for distributing resources in fair ways among everyone (see Chapter 9).

Becoming Cooperative

Social animals are, basically by definition, cooperative: individuals of the same species are able to live together in peace. But great apes, in addition, actively help one another and sometimes share resources with one another if the costs are not too great, so they develop something like "friendships." Human children's early helping and sharing are very similar, except that they add an element of perspective-taking. But then, in addition, based on their understanding of others as in many ways equivalent to themselves (self-other equivalence), at around three years of age children develop a normative sense of fairness in their dealings with those others, in which they treat them as equally important as themselves. Welcome to the human—and definitely not the great ape—social world.

Theoretical Explanations

The central theoretical issue in the study of children's prosocial behavior is the role of adult socialization and teaching. On two points, almost everyone agrees. First, everyone agrees that socialization and teaching cannot create cooperative individuals out of nothing. Attempting to socialize a lizard into cooperativeness will not work; indeed, the way to make an animal species more cooperative is to selectively breed the most cooperative individuals with one another to affect genetic change (also known as domestication; Hare and Tomasello 2005). It is uncontestable that human infants naturally develop at least some cooperative tendencies. Second, everyone agrees that the prosocial behavior of children approaching school age, as well as that of school-age children themselves, is strongly influenced by adult socialization, teaching, and social norms. There is much that older children need to learn to become good cooperators in society, and most of what they learn comes from adults.

The central question is thus about the role of adult socialization and teaching in the development of prosocial behavior during infancy and the early preschool years. Focusing especially on helping and sharing, Warneken and Tomasello (2009a, 2009b) argue that socialization plays only a minor role during this early period; young children are mostly becoming prosocial naturally, based on maturation and their own individual learning. They cite three main lines of evidence (all of which were discussed earlier, with citations): (1) great apes engage in instrumental helping, and a bit of sharing, without any adult socialization or teaching; (2) in cultures in which parents do not seem to socialize or encourage prosocial behavior in infants and toddlers (they wait until the child is ready), infants and toddlers nevertheless already engage in prosocial behavior; and (3) some experiments seem to show that young children engage in prosocial behavior regardless of whether parents or other adults encourage or reward them, and indeed material rewards seem to discourage prosociality. Suggestively, we might add that paternalistic helping, in which children assist others in getting not what they want but what they need (which chimpanzees do not do), and children helping their collaborative partners especially enthusiastically (which chimpanzees do not do) are generally consistent with an evolutionary account in which there has been natural selection for human prosocial behavior in the context of interdependent collaboration and partner choice. (Also, paternalistic helping and enthusiastic helping during collaboration would not seem to be the kinds of things that adults actively teach.)

Brownell (2016) takes a somewhat different view. Relying on correlational studies and two experimental studies, she argues that socialization plays an important role in the development of children's prosocial behavior from the beginning. But a correlation between children's prosocial behavior and parents encouraging children's helping could indicate a number of different causal relations. In particular, in many domains parents do not begin encouraging behavior until the child starts showing some signs of doing it, so the causal arrow might actually be in the direction from children's prosocial behavior to parents' encouragement. Experimentally, Dahl et al. (2017) found that infants whose parents encouraged them to help during an experimental session helped more. But this only applied to half the sample. In a continuous sample from thirteen to eighteen months of age, only the younger half showed the effect (and older infants in the two studies of Warneken and Tomasello (2008, 2013a) showed no effect). Also, Barragan and Dweck (2014) were able to elicit higher levels of helping from two-year-olds when they engaged them in reciprocal prosocial games. But in this study, as in the Dahl et al. study, what we see is an increase in the frequency of an already established behavior; indeed, children in the control groups of both studies helped reasonably often as well. Socialization may influence early prosocial behavior to some degree, but it does not create it.

It is perhaps relevant, in this regard, that researchers have not found a strong correlation between individual differences in helping and sharing behavior (Dunfield et al. 2011). This would require socialization theorists to hypothesize that parents are not rewarding or encouraging different forms of prosocial behavior in a consistent manner across the different types. It is unknown whether other ways of measuring things might still find a relation, or whether, instead, these two behaviors have independent evolutionary foundations, both built on sympathy but somehow in different ways (see Warneken and Tomasello 2009a, 2009b). Paulus (2014) considered various explanations to account for early helping and sharing and their lack of correlation, and found that none is completely adequate to account for all the data. But, interestingly, the various mechanisms he considers—emotion sharing, goal alignment, social interaction, social normative—can all be seen as emanating in one way or another from young children's early skills and motivations of shared intentionality.

To reiterate, none of this is to take away from the profound influence of culture and socialization processes on older children's helping and sharing; it is only to give them an evolutionary foundation and ontogenetic starting point. I have cited here significant cultural differences that occur in children's sharing behavior to some degree already in late preschool but especially beginning in middle childhood. And I have cited studies identifying specific socialization processes that can have an effect on children's helping and sharing, again to some degree already in preschool but especially beginning in middle childhood. I have also made some reference to things we will cover in more detail in the next chapter, including children's learning of social norms that define the right and wrong ways of helping and sharing in different ways in different cultures. My proposal is thus that young children's helping and sharing have strong maturational bases from one to three years of age—based in skills and motivations of joint intentionality—and then become much more sensitive to cultural and socialization influences as ontogeny proceeds. This is reflected in the relatively light shading of the first box in Figure 8.1, which basically shows a transformation of great ape sympathy and helping into the human Smithian version, based on uniquely human capacities for taking the other's perspectives.

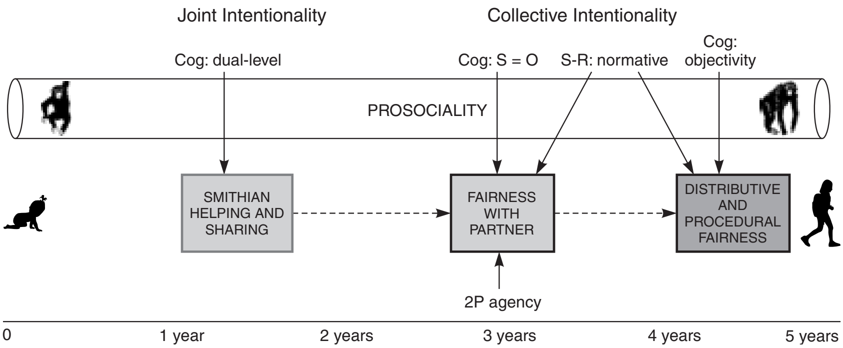

Figure 8.1 The ontogenetic emergence of young children's uniquely human prosociality. Abbreviations: Cog = cognitive; S=O = self-other equivalence; S-R = executive self-regulation; 2P = second-personal.

Turning now to children's emerging sense of fairness (Figure 8.1, second box), there is already theoretical controversy in this case in simply describing the developmental pathway. Blake, McAuliffe, and colleagues have claimed that children do not show a full sense of fairness—including sacrificing resources in order to equalize with others—until something like eight years of age. But, as already noted, this is based on children's behavior in a particular experimental paradigm in which rejecting unfairness is extremely costly and in some sense irrational (because the child has to destroy resources to prevent unfairness). By contrast, Tomasello and colleagues have found that when three-year-olds get fewer of the spoils from a collaboration than their partner, they protest (aversion to disadvantageous inequity). Also, crucially, when they get more of the spoils of a collaboration than their partner, children of this same age share the excess in order to equalize (aversion to advantageous inequity). And many studies have found that three-year-olds show a strong tendency to divide windfall resources among third parties in an equal fashion when their own selfish motives are not intruding in the decision (equality bias). It is perfectly possible that there is no conflict at all among these various findings: children simply behave differently when the contingencies of the social situation are different, involving such things as strength of selfish motives, aversion to wasting resources, and collaboration. Thus, further research is needed to sort out the various factors and their strength at different ages. But my minimal claim is that collaboration is the natural home of a sense of fairness—second-personal fairness (as a precursor to group-minded fairness and justice)—and that children already are fair in this context at three years of age.

In terms of the role of socialization specifically, there is a widespread assumption that children's sense of fairness is somehow taught or socialized. Social norms are often invoked, in this context, as crucial to the process. Once again, my claim is not that this process does not occur—it manifestly does—but rather that it is not what is happening with three-year-olds. Recall that in the Hamann et al. (2011) study, when pairs of three-year-olds simply found two piles of resources, the lucky child almost never shared fairly; however, when the children generated resources collaboratively, the lucky child shared them fairly most of the time, giving up resources already in her possession to do so. To repeat this point, it seems highly unlikely that adults are socializing children to share or not depending on whether resources are generated collaboratively or not. This does not mean that I am positing "pure" maturation as an explanation (whatever that might mean); rather, I am saying children's earliest sense of fairness results from the maturation of their capacities for joint intentionality as exercised in collaborative activities with others. Through their collaborative experiences, they come to see their partners as equally deserving second-personal agents. This is based cognitively on a sense of self-other equivalence (S=O in Figure 8.1) and motivationally on a normative sense of obligation, acting as a self-regulative standard, to treat others as they deserve to be treated (S-R: *normative* in Figure 8.1). These are not things that are socialized but rather things that are individually learned, or constructed, within the context of humans' unique forms of joint intentional activity.

The process of construction, or social co-construction, in this case is one that aims at resolving competing values on the executive level. More concretely, we might say it this way: infants and toddlers naturally want things for themselves, but at the same time they also want to be generous to others. When they are already in possession of something, their selfish impulses usually win out. When they observe a peer wanting something, if they themselves do not want it, they are more helpful and generous. Young children oscillate with the situation, and they often face a peer who oscillates with the situation as well. Their sense of fairness—in which they feel obligated to transfer resources in their possession to a peer so as to equalize—first emerges in contexts of collaboration in which they and a partner have generated resources together. This is perhaps because the collaborative context leads children to see their partner as equally deserving and to see that she has equivalent claims on the spoils (self-other equivalence). Together, this all creates a conflict. In parallel with the cognitive domain, we propose that the child constructs a sense of fairness when her contradictory impulses for selfishness and generosity arise toward the same set of goods, while at the same time she realizes that her partner is experiencing the same conflict. A coordination of values and eventual co-constructed resolution can only take place on the executive level, and it seems to take place initially and most naturally in a context in which the equality of partners is especially salient.

Overall, then, my proposal is that children's earliest sympathy and prosocial behavior develop relatively naturally, and their later sense of fairness at three years of age is constructed, or co-constructed, in their collaborative interactions with others. We thus see a developmental pathway with an initially quite strong maturational component for prosociality, which then develops into one structured and innervated by the maturation of basic capacities for shared intentionality. Integral to the later pathway are social, especially collaborative, experiences, which serve to establish the self-other equivalence and mutual respect (among second-personal agents) on which the notion of fairness is based.

Social and Moral Implications

Sympathy for others is the *sine qua non* of human morality. Human individuals who do not care about others—who merely interact with others strategically and use them as social tools—are typically referred to as sociopaths, and they are unwanted in human society and in fact subsist at only very low frequencies. During infancy and toddlerhood young children already have sympathy for others in need, and they gradually learn to express this in ways appropriate to the social and cultural contexts into which they are born. Of course, children's prosocial motives must compete with their selfish motives, and this conflict is the basis of many moral conflicts. But the fact that children experience such conflicts means precisely that they are becoming moral beings.

Central to any sense of morality is also a sense of fairness. In adult life, fairness grounded in mutual respect is foundational for the most basic aspects of an open society. Indeed, John Rawls's (1971) influential normative theory of the ideal society is dubbed "justice as fairness." And indeed, consistent with our developmental findings that children's earliest sense of fairness emerges within their collaborative activities, Rawls defines society itself as "a cooperative venture for mutual advantage." To scale up from fairness in collaborative activities to justice in society at large, children will need to begin thinking in more group-minded ways, not just in terms of joint commitments to individuals but also in terms of collective commitments to the society's social norms.

— 9 —

Social Norms

Collaborating and acting prosocially with a partner eventually scaled up in human evolution to participating in the larger cooperative enterprise known as culture. Although most primates live in social groups and are sometimes hostile to outsiders, the psychology involved has mainly to do with the familiarity, or lack thereof, of other individuals. In contrast, as modern humans first emerged there arose a distinct sense of in-group versus out-group as such—based on similarity. In-group members are those who look, act, and talk like me even if I do not know them personally, whereas out-group members are individuals from another group who look, act, and talk differently from "us." And early modern humans favored in-group over out-group members in many ways: liking them more, helping them more, and trusting them more.

To maintain cooperation within their distinct cultural groups, humans have evolved a unique form of social control in which the group as a whole expresses its collective expectations for individual behavior. These collective expectations are known as social norms, and individuals are normatively expected both to conform to them and to enforce such conformity on others. Norm enforcement is thus based on a group-minded sense of how the group best functions: "this" is how we in the group do or do not act, and nonconformists are a threat to the group's cohesion and smooth functioning. Whereas the normativity of joint commitments is created by individuals on the spot and is just as easily dissolved, the normativity of social norms derives from individuals' collective commitment to the group. These social norms—representing the ways that "we" do things—exist before the individual is born, and the individual, under normal circumstances, has no power to dissolve or change them.

Human infants and toddlers know nothing of the cultural group or its social norms. They live in a world of social interactions and relationships with other individuals. When an adult enforces a social norm on an infant or toddler, the infant or toddler understands it as a directive coming from an individual. They typically follow such directives as a matter of prudence, conformity, and respect for the adult. They only come to understand these directives as something larger—coming from the group or even from some objective source—gradually over the first three to five years of life, as their skills and motivations of collective intentionality develop. The first solid evidence for such group-minded understanding emerges at around the third birthday when young children start to enforce social norms on others. In enforcing social norms on others—often with generic normative language such as "One must do it like this" or "That's not right"—three-year-olds display an understanding that these norms express objective standards for how things should be done (by "us"). This understanding manifests itself even more clearly when, at around five years of age, children begin creating their own social norms with peers in the context of play.

With this new group-mindedness, children approaching school-age begin to develop a sense of justice: the "just" way that the social group should treat individuals, including the way individuals as members of the group should treat one another. Thus, children demonstrate a sense of retributive (or commutative) justice in their understanding of the appropriate punishment for transgressing particular norms (making the punishment fit the crime). They demonstrate a sense of distributive justice in their understanding of the appropriate way that resources should be divided among individuals in a group, given the prevailing social norms of personal property and ownership. From this age, children's sensibilities with respect to these and many other issues of justice are structured—for good or ill—by a strong sense of in-group versus out-group status.

The upshot is that young children from three to five years of age are beginning to develop a second sense of "we." In addition to feeling solidarity with an interdependent collaborative partner, they are also beginning to feel solidarity with in-group members, typically identified as those who resemble them in behavior and appearance. "We" are those in our cultural group. Interestingly, these two types of social solidarity were already recognized by Durkheim (1893) in his famous distinction between organic solidarity (based on collaborative interdependence) and mechanical solidarity (based on similarity), and they also find their way into the two basic principles of group formation in modern social psychology: interpersonal interdependence (based on joint work) and shared identity (based on similarity and group membership) (for example, Lickel et al. 2007). Enforcing and creating social norms—including for the just way of distributing punishments and resources—emanate both from the desire to treat other individuals fairly and from the desire to facilitate the group's smooth functioning.

In this chapter, then, we look at children's emerging group-mindedness. It begins at around three years of age and transforms joint commitments into collective commitments, second-personal protest into the enforcing of social norms, and a sense of fairness toward individuals into a sense of justice to all in the group.

From Apes: Group Life

Most mammals, and almost all primates, live in social groups. Many of these social groups are territorial in one way or another: individuals protect the members of their group and the resources on which they all depend. This is a basic process of social life for the individuals of such social species. But humans have evolved some further motives and attitudes toward their social group, both toward the individuals within their group and the group as such.

Great Ape Social Groups

Great apes live in social groups of varying kinds, but humans' closest great ape relatives, chimpanzees and bonobos, live in highly complex social groups typically comprising several dozen individuals of both genders (so-called multi-male, multi-female groups). Interactions between neighboring groups are almost totally hostile for chimpanzees, whereas for bonobos interactions with foreigners are more peaceful. Chimpanzees (mostly males) actively "patrol" the borders of their territory, attacking unrecognized individuals (mostly males) that they encounter there, in some cases killing them (Goodall 1986). Wrangham and Glowacki (2012) even make an explicit comparison between intergroup aggression in chimpanzees and intergroup aggression—or warfare—in humans.

It is clear that chimpanzees, and very likely bonobos, have a sense of who is and is not in their group. But this is most likely based on simple familiarity with those in the group, complemented by a fear of strangers. There are no data, to my knowledge, on the age at which chimpanzee and bonobo youngsters can discriminate individuals in and out of their group. Presumably it takes them some years to learn each individual group member (especially in fission-fusion social systems, such as those of chimpanzees and bonobos).

Human Children's Developing Group-Mindedness

Despite the many similarities between chimpanzee and bonobo group life and human group life, human beings in addition display a seemingly unique set of emotions and attitudes most often characterized as an in-group / out-group psychology. In-group favoritism accompanied by out-group prejudice is one of the most well-documented phenomena in all of contemporary social psychology (for example, Fiske 2010). Humans' group-minded attitudes apply to groups as such, and they are loyal to their group as such, based not just on familiarity or unfamiliarity but on group membership as determined by conformity in behavioral practices and physical appearance. This represents a new kind of group-mindedness, and indeed the tendency of humans to selectively help, cooperate, and trust those who behave like them and look like them is so strong that it has led some theorists to posit homophily—the tendency to affiliate, favor, and bond with similar others—as the psychological basis of human culture (Haun and Over 2014).

Late in the first year of life, many human infants are wary of strangers, and they are more likely to imitate someone who speaks their language, perhaps based on familiarity (Buttelmann et al. 2013). Preschool children prefer someone who speaks their language (and with their same accent; Kinzler et al. 2009), and they are more likely to trust that person (Kinzler et al. 2011). When preschool children dance together to the same music in a group, they subsequently help and cooperate with one another more than with other children (Kirschner and Tomasello 2010).

But beyond familiarity and joint action, by the end of the preschool period young children can base their in-group / out-group judgments on the thinnest of veneers. In the so-called minimal groups paradigm, young children are randomly assigned to groups and given, for example, similar colored T-shirts along with a collective label such as *the green group.* The point is to have children judge group status solely on the basis of superficial appearance (with familiarity controlled). In this paradigm, school-age children are influenced in various ways by their minimal group status; for example, they show more sympathy and helping toward individuals labeled as in-group than those labeled as out-group (Rhodes and Chalik 2013), and they expect and favor loyalty to the group from their in-group compatriots, whereas they expect and favor disloyalty to the group in out-group individuals (Killen et al. 2013; for a review, see Dunham et al. 2008). What is important for our current perspective is that late preschool and school-age children understand that people may voluntarily form a group so long as they have shared intentions (and know in common ground that they have shared intentions) to do so (Noyes and Dunham 2017).*

There are only a few minimal-group studies with preschoolers. Engelmann et al. (2013) found that preschool children care more about how they are evaluated by members of their minimally established in-group than by out-group members. Misch et al. (2014) found that five-year-olds understand that members of a minimally established in-group should be loyal to one another. In an especially telling experiment, Over et al. (2016) observed that five-year-old children belonging to a minimally established group felt a need to apologize and make amends for violations by an in-group (but not for an out-group) member. Finally, in a large-scale study, Plötner et al. (2015a) found that five-year-olds', but not three-year-olds', behavior was affected similarly by minimal group membership, such that they showed more helping, resource allocation, liking, affiliation, and trust to in-group than to out-group members. This study suggests that it is only sometime after three years that children understand minimally established groups in which members are identified only by similar clothing or labeling, though it leaves open the possibility of younger children making in-group / out-group distinctions based on such things as similarity of novel behavioral practices. Finally, Engelmann et al. (2018) found that five-year-olds actively attempt to influence how onlookers judge their minimally established group itself, independent of any attempts to influence how those onlookers judge them as individuals.

* It should be noted that Powell and Spelke (2013) found that seven-month-old infants looked longer at a computer display in which similar shapes with faces (grouped together spatially) did not behave alike, as expected (which the infants did not do for similar shapes without faces). So there may be some perceptual precursors to group-mindedness in infancy.

For our current purposes, the key point is this: from three to five years of age, young children become ever more group-minded as their capacities for collective intentionality mature. Early in this period, toddlers may be physically in the company of other toddlers, but they do not understand the social group as such. Two-year-olds do not spontaneously organize themselves in group activities, and they do not address the group as a group. Likewise, toddlers may encounter group-level conventions, norms, or institutions, but they do not understand them as such. The most important case in the current context is social norms—as direct manifestations of collective intentionality—because social norms are so integral to everything that human beings think and do. Young children's lives are structured by social norms from the beginning, but our question is how they understand and relate to these norms. It may be that, in the beginning, they do not understand them as group-minded collective expectations at all.

Social Norms

Great apes often retaliate against those who have harmed them directly (for example, Jensen et al. 2007). But they do not punish or intervene against an individual who is harming a third party, even if this is a relative or friend (Riedl et al. 2012).* Human social norms, in contrast, take a thoroughly third-party perspective: they apply to everyone in the group alike—and should be enforced on everyone alike—because they express the group's expectations for how anyone who would be one of "us" should act, on pain of admonishment, punishment, or ostracism.

Human children are born into a nexus of social norms exhorting them to behave in some ways and not in others. From early in life, children conform to social norms as articulated and enforced by adults. But the question is whether they understand these directives as a single person expressing her wishes or rather as a representative of the group expressing collective group agreements about expected behavior. Recent research makes it possible to specify, with some precision, the developmental pathway through which young children come to a more adult-like under-

* Dominant chimpanzees sometimes break up fights between third parties, but they are likely only attempting to prevent the forming of a coalition that might later threaten them.

standing of social norms as collective agreements whose normative force comes from, and only from, the process of agreement itself. This research involves children following, enforcing, and creating social norms.

Following Social Norms

Adult caregivers are constantly regulating young children's behavior in accordance with the group's social norms, and children usually comply. According to Piaget (1932), the reason children respect and follow social norms is obvious: because they respect the adults from whom they come. Based on his explicit questioning of children about the rules of children's games (for example, the game of marbles), Piaget concluded that children well into middle childhood believe that rules are part of an objective order about which adults have special knowledge (this objective order including many other things that adults teach them through pedagogy as well).

But asking children direct questions about the nature of rules and their normative force is not the only method for assessing their understanding. Turiel and colleagues (summarized in Turiel 2006) asked children more indirect questions about various kinds of norms and rules, such as "If the teacher (or other authority) says it's okay to do this, would it be okay?" and "If kids did this in another culture, would it be okay?" The conclusion from their studies is that preschool children know a lot more about norms and rules than Piaget thought. In particular, they know the difference between moral norms, which are right or wrong independent of authority and culture, and conventional norms, which apply only for certain cultures or in certain contexts.

If we look only at children's conformity to social norms (and how they verbally articulate their understanding), it would be difficult to say when they understand them as expressing group agreements. But there is now a good deal of research based on how children relate to social norms behaviorally. The key age, once again, is three years, although there are significant developments and deeper understandings that occur after this, well into school age. The key point is that children first begin to understand cultural common ground at around three years of age (see Chapter 3). The implication is that before this age they experience individuals enforcing social norms not as group-minded expectations or agreements but only as directives from individuals. After this age, children are potentially capable of understanding group-minded, collective phenomena, and thus social norms as such. And we have powerful evidence of such understanding starting at around three years of age, when children start enforcing social norms on others themselves, even when they themselves have nothing to gain.

Enforcing Social Norms

Norm enforcement may be thought of as a kind of scaled up second-personal protest: the enforcer, as representative of the group (instead of the collaborative partnership), calls the violator to task for her violation of a social norm (instead of a joint commitment) presumed to be in the interest of the group (instead of the partnership) and in the cultural common ground of the group (instead of the partners' personal common ground). Enforcers of social norms are enforcing from a third-party perspective—calling a violator to task for an act that does not necessarily affect them personally—suggesting that the enforcer is motivated by something more than immediate self-interest.

From as young as three years of age, children will intervene to sanction others for social norm violations on behalf of third parties. For example, Vaish et al. (2011b) found that if a puppet begins attempting to destroy someone else's property, three-year-olds will intervene to stop the transgression. Because the child herself is not being affected, this is not second-personal protest; she is not protesting how "you" are treating "me." What she is protesting is a lack of conformity to the group-minded social norm for how one should treat others. This interpretation is bolstered by the observation that young children also intervene against individuals who violate mere conventions (albeit with less emotion; Hardecker et al. 2016). Thus, in the first studies of this type, Rakoczy et al. (2008, 2010) found that if three-year-olds learn that on this table we play the game this way (while on another table we play it differently), and then a puppet plays the game the wrong way for this table, children intervene and stop him, even though no harm is being done to anyone. The child is not defending either her own or any other individual's self-interest; the immediate goal is simply for the wayward actor to conform to the correct way of doing it. Importantly for our developmental hypothesis, although two-year-olds in this study did sometimes respond negatively to the puppet, they did not protest normatively.

Importantly, in all types of third-party intervention three-year-olds quite often use generic normative language, as in "One can't do it like that" or even "That's wrong!" (for more on the normative language children use during norm enforcement, see Köymen et al. 2014a). Such generic language suggests that the norm enforcer is not just acting as an individual expressing a personal opinion, but rather, as in the case of intentional pedagogy, as a kind of representative of the cultural group conveying impartial and objective knowledge (in this case about how "we" act). In principle, anyone in the culture may enforce social norms; in principle, anyone in the culture may be their target (perhaps within some demographic or contextual specifications); and, in principle, the standards themselves are objective (not subjective). Norm enforcers are thus, in effect, referring the violator to an objective world of values that he himself may consult to see that his behavior is wrong. Norm enforcement is thus not a personal act, but a group-minded cultural act—the goal is to bring others into line with how "we" do things—and three-year-old children have begun to understand this.

But sometimes they overdo it. Thus, Schmidt et al. (2011) exposed three-year-old children to a conventional action on an artifact in several different experimental conditions. Even when the act was not in any way suggested to be an instance of some kind of rule following—the adult just picked up the artifact confidently and performed the act for himself (without pedagogy toward the child)—they still intervened when a puppet later acted on the artifact in a different manner, using normative language to correct him. Even more extreme, Schmidt et al. (2016a) did everything they could to discourage a normative interpretation of what was essentially an everyday intentional action. Nevertheless, they found that when three-year-old children watched someone confidently perform an action for themselves (no pedagogy) on "junk objects" (not artifacts), they still jumped to a normative interpretation and intervened against someone acting differently on that object, using normative language to do so. Young children are thus "promiscuous normativists." In addition, children of this same age will even intervene to protect the entitlements of others, for example, when an actor has been entitled by an adult to do *X*, and then another person attempts to prevent him from doing it, children stand up for the rights of the actor, in essence enforcing (second-order) against the unjust enforcement (Schmidt et al. 2013).

Norm enforcement of this type is distinctly group-minded. Schmidt et al. (2012), used the basic norm enforcement experimental paradigm but with an in-group / out-group manipulation, as well as a moral / conventional manipulation. They found that three-year-olds enforced moral norms equally often on both in-group and out-group violators, reinforcing the finding that children of this age see moral norms as universally applicable. But they enforced conventional norms selectively on in-group members because conventional norms apply only to "us," who should know better (the "black sheep" effect). The underlying rationale was thus something like this: our conventional norms were created by us for us, and so they are good for the group and its functioning, and this makes it a good thing, a legitimate group-minded thing, for me to enforce them on members of our group (whereas we do not care what out-group individuals do). Based on this rationale, it is not surprising that Vaish et al. (2016) found that five-year-olds expressed approval of, and preferred to interact with, individuals who enforced social norms in the group over those who did not (even though they were acting somewhat aggressively), presumably because they saw such enforcement as a good thing that signals concern for the good of the group.

Obviously, young children see adults enforcing norms all the time, and so we may ask whether child enforcers are just imitating adults. One point is that in most of the experiments just cited the norms that children are enforcing are novel, and so they are not imitating enforcement of those specific norms. But still social learning may be playing some role. There is one relevant study with preschoolers. Hardecker and Tomasello (2017) had young children observe an adult enforcing norms for how to operate an artifact in three conditions. In one condition, the child operated the artifact however she wished, and the adult corrected her and showed the correct way (second-party condition). In another condition, a third party operated the artifact, and then the adult corrected him and showed the correct way (third-party condition). In a baseline condition, the adult just operated the artifact but without any norm enforcement. Both two- and three-year-old children subsequently corrected a new puppet who operated the artifact incorrectly more if they had witnessed adult norm enforcement (of either type) than if they had not. But, in addition, three-year-olds also corrected the puppet at high levels in the baseline condition, when they had previously observed no norm enforcement at all, and they also corrected the puppet in a subsequent scene in which the puppet performed a completely novel action with the artifact. The conclusion is thus that two-year-olds are capable of socially learning from adults how to insist on a particular course of action, but three-year-olds do not need to see adults enforce a norm to enforce it themselves; they already have the idea that people should follow norms, and they generalize readily to novel noncanonical actions (for a study of the social learning of punishment, see Salali et al. 2015).

In general, then, young children are much more knowledgeable and competent with social norms than Piaget (1932) ever imagined. This has been a theme of Turiel (2006) and other social domain theorists for some time, and the research reviewed here has elaborated the picture considerably. But still, in their first three years of life children experience adults enforcing norms all the time, and so solely on the basis of their following and enforcing social norms (as even enforcing could, at least in some ways, come from adults), one could reasonably remain somewhat skeptical about the depth of three-year-olds' understanding. But by the time children are five years of age, such skepticism is no longer reasonable because children can now create and enforce their own social norms in novel (play) contexts with peers, without any form of adult guidance.

Creating Social Norms

The vast majority of social norm*s* to which young children are exposed come to them from adults. But how did adults come by them? At what point do children understand that social norms in fact reflect continuing collective agreements? To answer this question it is useful to examine how children create social norms for themselves. Piaget (1932) recognized the importance of child-created rules (that is why he studied child-created games such as marbles and hopscotch), but his studies actually focused on situations in which younger children learned the rules from older children as experts.

Several recent experiments have observed children in situations in which there are no established norms or rules, adult or otherwise, and so, for social control, they invent some for themselves. For example, in a recent experiment Göckeritz et al. (2014) exposed triads of five-year-old children to a complex game apparatus and only told them that the goal was to have the balls come out the end into a bucket. If the children asked any questions about how the game was or should be played, the experimenter professed ignorance. In playing the game repeatedly there were certain recurrent obstacles that the children had to overcome (for example, the balls kept falling out of a tube on the way). The children's reaction to these obstacles was not just to try to overcome them but, over time, to create explicit rules for how to do this. Thus, when it later came time to show naïve individuals how to play the game, the children did so using generic normative language, as in "You have to do it like this" or "It works like this." They made up their own rules and then enforced them as authorities, suggesting an understanding that self-created rules are as authoritative as any other.

But it is possible that the children in this experiment actually thought about things in a slightly different way. Because the apparatus was presumably set up by adults ahead of time, the children might have thought that there were indeed proper rules for how one played with the apparatus, even though the adult in the room did not know them. Hardecker et al. (2017) thus simply gave groups of three five-year-olds a set of "junk" objects (for example, sticks and a box) and explicitly told them that there were no goals or rules; they should just play as they wished. If the children asked how they should play, the experimenter said that there were no rules. But even in this situation, the children invented their own rules (for example, a rule about where one must stand in a throw-sticks-into-the-box game) and continued to pass them on to naïve peers in an explicitly normative fashion. They knew for certain that they had invented the rules whole cloth, and yet still they saw them as normative and binding for all who would play the game. This suggests at least some understanding of social norms as based on social agreement.

But five-year-olds do not understand social norms in a totally adult-like way. There was another condition in this experiment. Hardecker et al. (2017) had adults teach children the exact same rules that the peers had just made up (in a yoked design), and, as expected, the children again enforced them on naïve others in an explicitly normative fashion. The difference between children's behavior in the peer and adult conditions was that when, later, a naïve individual balked at the rule (experimentally controlled), five-year-olds were more flexible in changing the rules that they had made up themselves with peers as opposed to the adult rules, perhaps suggesting that children at this age still view adult authority as at least a partial source of normative force. In contrast, seven-year-olds saw their own self-created rules and the adult-prescribed rules as equally rigid; normative force comes only from the social agreement to which individuals bind themselves, no matter who that is. (For some similar findings, see Riggs and Young 2016.)

An interesting variation on this theme is provided by Grüneisen and Tomasello (2017). They set up five-year-old children in a conflict situation (a "chicken" game from game theory). They found that children of this age could come up themselves with various kinds of rules and norms that ended up benefiting both children in the long run (for example, a turn-taking rule) and that served to obviate costly negotiations and arguments across repeated playings of the game. In a follow-up study, Grüneisen and Tomasello (forthcoming) had groups of four five-year-olds discuss what to do when pairs of them would later face the same dilemma situation (again a "chicken" game). Because they did not know which dyads would play at any point, a turn-taking convention was not possible. In this situation, children made up rules like "The blue one always goes first" or they used rock-paper-scissors to decide on each turn. This situation mirrors more closely the situation in society in general, in which individuals encounter others with whom they have no specific agreement but who presumably know and respect the rules. Even preschool children can adapt to such situations by creating their own impartial rules for use at some indeterminate future time.

Three-year-olds have never been observed to create with peers a social norm or rule. But there are two relevant studies. First, Wyman et al. (2009) found that in pretense, once three-year-olds had designated the pretense status of an object with an adult (for example, this stick is a horse), they objected if someone then treated it as something else. Because children at this age clearly understand that they helped to create the pretense designation, enforcement of deviations suggests some understanding that normative social rules can be the product of social agreement. Second, Schmidt et al. (2016c) looked at how three-year-olds understood the process by which a social norm is formed. In two experiments, three-year-olds had the opportunity to agree upon arbitrary game norms with several puppets (they were encouraged to agree). When a puppet later violated the norm, children enforced it normatively only on a violator who had actually entered into the agreement (not bystanders who had not agreed). Interestingly, any dissent during the norm-setting process (even if there was a majority of 90 percent agreeing on one way of doing things) prevented children from seeing a norm as established for anyone at all. It would thus seem that even three-year-olds understand something of the role of agreement in establishing mutually binding social norms, although their notion of norm formation is rather rigid and assumes unanimity among all concerned.

In these studies children are making up their own social norms out of nothing. From the beginning, they enforce these norms on others in much the same way that they enforce adult norms, that is, using the normative language of *should, must,* and *ought*. By school age, they even have an adult-like understanding that social norms can be changed if everyone agrees to it, no matter their source. This developmental trajectory—established by studies using behavioral rather than verbal methods—pushes down by several years the age at which children deal competently and flexibly with social norms (for example, see Kalish and Sabbagh 2007).

Individual and Cultural Variation

In the context of life in a cultural group, developing children are under strong pressure to conform, both in order to coordinate smoothly with other group members and in order to display their group identity and loyalty. Different cultural groups have created different social norms for their particular local circumstances, so of course young children must individually learn the particular local norms of their culture.

But there has been little research into how children in different cultures enforce and relate to their particular norms. In one recent study, Kanngiesser et al. (forthcoming) found that children from three different cultural contexts (two being small-scale and basically nonliterate) enforced social norms on naïve others in the form of game rules that they had just learned from adults. Gampe and Daum (2018) found some evidence of cross-cultural variability in the way that young children go about norm enforcement, suggesting learning from adults. There are no studies, to our knowledge, of young children creating social norms with peers in different cultural contexts, although there are many ethnographic reports of older children inventing various kinds of games.

Justice

As we saw in Chapter 8, by around three years of age young children are beginning to develop a sense of fairness in dealing with particular others, especially collaborative partners. But collective intentionality and social norms are not just about individuals relating to other individuals but rather about the collectively agreed-upon ways of behaving in a group. In this context, children after three years of age also begin developing what we may call a sense of justice, which may be defined as a sense of fairness applied not just to individuals but to the members of a group, taking into account group interests (for example, showing compassion for a thief might in some cases be warranted, but it also might set a bad precedent for other group members going forward). Like fairness, justice always involves, in one way or another, some sense of equality, and the self has no special priority. But because we are dealing with the larger cultural group and its members, and often with noncooperative acts that have already occurred, justice often involves an especially complex balancing of the books.

For millennia, social theorists have distinguished two main forms of justice: retributive (or commutative) justice and distributive justice. Retributive justice is about actions: how perpetrators should be punished for antisocial acts and how victims should be compensated, taking into account the needs of the larger social group going forward. Distributive justice is about resources: how food, money (in some cultures) and other basic resources are distributed among members of the social group based on everything from simple group membership to relative need to one or another form of merit, complicated in some cultures by norms establishing and regulating private ownership of resources. Young children are just beginning to develop senses of retributive and distributive justice during the late preschool period.

Retributive Justice and Punishment

The major way that nonhuman animals stop a perpetrator is aggression: he is stealing my food or harming my child, so I attack him to make him stop. Punishment requires, in addition, an eye to the future: I wish for him to quit stealing my food and harming my child altogether, so I inflict pain on him now so that he will think twice before doing it again. In their purest forms, neither aggression nor punishment involves social norms or justice. For that, we need a way to balance the rights of individuals in the social group—some social norms that define the "right" way to punish or to compensate—so that, for example, the punishment fits the crime or compensates the victim fairly.

As noted previously, great apes retaliate against those who harm them, but they do not punish actors for harmful acts against third parties (Riedl et al. 2012). Because a third-party, disinterested, impartial stance is crucial for any sense of justice—all individuals, including the self, are conceptualized as more or less equal participants in group life—it would seem that great apes have no sense of justice. By contrast, third-party punishment, in one form or another, is a human universal. Marlowe et al. (2008) present evidence that some contemporary hunter-gatherers rarely engage in norm enforcement or third-party punishment; they mostly just move away from norm violators. But the fact is they do punish violators when leaving is not an option, and they punish violators reputationally through gossip on a regular basis (Marlowe, personal communication).

Young children from three years of age intervene or protest when others are about to harm a third party, and they protest against norm violations, even when they are only conventional (see the previous section). But retributive justice is about actually punishing the perpetrator in a way that balances out the suffering to others he has caused. Piaget (1932) interviewed preschool and school-age children about how peers who were naughty in various ways should be dealt with. His classic finding is that preschoolers believe that the punishment should reflect the harm done (for example, the number of cups broken) regardless of whether the perpetrator intended that outcome, whereas school-age children privilege the perpetrator's intentions (for example, whether the child intended to break the cups or not). Cushman et al. (2013) argue and present evidence that children actually have two competing tendencies: to assign moral blame on the basis of intentions but to assign punishment on the basis of damage done. They find a shift in children's verbal judgments from five to eight years of age in the relative weights that they assign to these two competing tendencies.

However, once again, verbal interviews are not the only way to assess children's moral judgments. Kachel et al. (2017) thus had a partner in a collaboration perform his role poorly but with different intentions. When a partner neglected to perform his role because he selfishly preferred another game, children protested normatively. But when he was ignorant of how his role was played, children did not blame him but rather tried to teach him. And when he accidentally caused collaborative failure, they did not blame him at all. It would seem that, despite their shortcomings in verbal interviews, even three-year-olds take into account the intentions of a violator in their moral judgments, at least in the context of a collaborative activity.

From an evolutionary perspective, a number of recent studies have investigated the possibility that young children have such a strong tendency to balance the books that they will pay a cost to punish violators. Several studies, for example, have found that children from four to six years of age will actually sacrifice resources (or pay some other costs) in order to make sure that a perpetrator gets punished for his acts (for example, Robbins and Rochat 2011; Kenward and Östh 2012; McAuliffe et al. 2015). Kenward and Östh (2015) found that the children would do this only if they could do so anonymously, showing that they clearly understood that punishing others carries with it some risk of retaliation. Jordan et al. (2014) report, in addition, that children in the same age range are more likely to punish members of an out-group than members of the in-group. And in a recent study Riedl et al. (2015) found that even three-year-olds will punish those who attempt to steal others' things. Indeed, they were just as likely to intervene against someone who stole a third party's toy as someone who stole theirs. They intervened especially often to return the stolen goods to the victim, thus restoring the situation to its previous rightful status (so-called restorative justice).

Punishment and enforcing social norms are obviously similar processes. These studies of third-party punishment show that preschool children will even pay a cost to punish third parties, presumably, as in the case of enforcing social norms, out of some sense of justice to the group at large. The key is that everyone is treated equitably, and when that is violated order must be restored.

Distributive Justice and Ownership

In Chapter 8, we documented that children as young as three years of age will systematically divide the spoils of a collaborative effort among themselves fairly—that is, mostly, equally. By around five years of age, they begin seeing everyone in their in-group as, in a sense, collaborative partners, so they share more or less equally with them all, other things being equal. But other things are often not equal. Although young children have a definite equality bias for in-group members, they can take other factors into account, especially need and merit (which makes their judgments not about equality but about so-called equity). For example, Svetlova and Brownell (forthcoming) found that when three- and five-year-old children were given the task of dividing resources between a needy puppet and a neutral puppet, they gave more to the needy puppet. They only did this, however, if they were given an unequal number of resources to share; with an equal number they divided equally. Also, Engelmann et al. (2016b) found that five-year-old children recognized another child's need to the degree that they overcame peer pressure to conform and instead shared with her. With regard to merit, Hamann et al. (2014) had three-year-old children work together to acquire resources, but the apparatus was such that one child had to work much harder. If equal resources were the result, once again they distributed equally. But if unequal resources were the result, the harder-working child systematically got more (see also Baumard et al. 2012; Kanngiesser and Warneken 2012).

The overall developmental pattern of children's sense of fairness and justice in sharing resources, then, suggests that collaboration is the natural home for an equality preference, but with their emerging sense of membership in a cultural group, children believe that everyone in the group is deserving of equal resources; and further, in some cases need and merit should be taken into account. But a huge mitigating factor (perhaps especially in Western, industrialized cultures) is the rights bestowed on the owners of private property. Many animal species have a sense of possession in the sense that an individual has something under its immediate physical control. The possessing individual will not give up the resources without a fight, and other individuals know this. But possession is not ownership. Ownership is a cooperative arrangement among individuals in a society who agree to respect one another's property; it is not a relation between a person and a thing, as is possession, but rather it is a (cooperative) relation *between persons with respect to a thing.* As such, ownership is very likely a uniquely human cooperative arrangement. And although its nature may differ across cultures, in all human societies the division of resources is accompanied by at least some norms establishing private ownership (for example, at the very least pertaining to one's immediate belongings such as clothing), and this respect for ownership is a cooperative arrangement that everyone is motivated to keep in place.

A number of recent studies have explored young children's earliest understanding of ownership. In one line of research, it has been shown that preschool-age children are capable of inferring who is the owner of an object by relying on such things as first possession (for example, who holds an object at the beginning of a story), control of permission (for example, who says whether others can use an object), who created an object through creative labor, or more generally on the object's history, not just when personally witnessed but also when obtained via others' verbal testimony (for example, Friedman and Neary 2008; Neary et al.

2009; Kanngiesser et al. 2010; Neary and Friedman 2013). In addition, in a verbal interview study, Kim and Kalish (2009) found that five-year-old children can talk coherently about the normative dimensions of property, including such things as who (owner or bystander) gets to decide for certain objects: who can use them, who can sell them, or who can destroy them. Rossano et al. (2011) investigated the normative dimensions of ownership behaviorally. In their study, two- and three-year-old children were shown that a particular object belonged to a particular adult; in a different condition, the object belonged to the child. A puppet then proceeded to announce that he would take that object home with him in his bag or, possibly, throw it away into the trash can. Two-year-old children objected when it was their property being purloined, but only three-year-old children demonstrated a deeper understanding of ownership and property by protesting even when it was the adult's property at risk. Quite often, the children's interventions and protests were framed in normative language.

These studies focus essentially on children's understanding of the owner and her rights. Recently, several other studies have focused on children's sense that they themselves must respect the ownership rights of others. One set involved both children and chimpanzees. Thus, Rossano et al. (in preparation) had both children and chimpanzees watch as a conspecific was raking in food for herself. The subject then had the opportunity to take that food or else other food nearby. The chimpanzees chose indiscriminately. But children from three years of age systematically avoided the food being manipulated by the actor—that is, *her* food. Similarly, Kanngiesser et al. (forthcoming) had child pairs and chimpanzee pairs interact with an apparatus with two distinct sides. Each member of the pair worked from her side to dislodge objects, which then fell into a box between the pair. Five-year-old children systematically avoided taking the objects effortfully obtained by the other child—that is, *her* objects (even though they were never labeled as such by anyone). They did this even in a condition in which the other child exited, leaving her effortfully obtained objects behind. By contrast, the chimpanzees took objects indiscriminately, no matter who had worked to obtain them and no matter who was present. Finally, in a variation on this theme, Rossano et al. (2015) found that five-year-olds showed respect for the property rights that others had signaled via actions such as piling toys in one corner of the room. Indeed, these children were even skillful at creative ways of marking ownership for themselves; for example, they might place their sweater on a chair so that the next child to come along would know the chair was theirs.

Together, these various studies of young children's sense of distributive justice and property illustrate quite clearly that as children are approaching school age they are beginning to understand the basic principles not just of fairness to individuals but of justice at work in a cooperative society. Within potential contextual and demographic constraints, everyone is to be treated as equally deserving of resources, and there are social norms that govern how resources are justly apportioned. And when people are accorded rights of ownership by the society's norms, these carry normative force as well and must be respected.

Cross-Cultural Variability

Early in development, there are few if any cross-cultural differences in the most basic senses of retributive and distributed justice. However, in the study by Blake et al. (2015), described in Chapter 8, the differences between children in different cultures began emerging in middle childhood, possibly because it is at this age that children are learning the specific ownership norms of their culture (for evidence, see House and Tomasello 2018). A study providing especially strong support for this view is that of House et al. (2013), who studied children from three to fourteen years of age across six diverse cultural contexts. They found that when sharing with others was noncostly, children became more generous over age in all societies, but when the sharing with others was costly, children became less generous over age. Then, during middle childhood, children began to conform to the sharing norms of their particular culture, reflecting differences in the way those cultures weighted such things as need and merit.

Of particular interest in this regard is a study by Schäfer et al. (2015). They had pairs of children from three different cultures (one Western, industrialized culture, one foraging / egalitarian culture, and one gerontocratic farming culture) "fish" for resources with magnetized sticks and then pool the captured resources. The experimenters rigged it so that one child ended up being much more productive than the other. When children were then instructed to divide up the resources between them however they saw fit, school-age Western children divided resources among collaborative partners proportional to the work productivity of each, whereas children of the same age from the two small-scale societies focused their divisions differently: children from the egalitarian culture focused more on absolute equality, whereas children from the gerontocratic culture were quite variable in their strategies (perhaps because they had little experience making such decisions in daily life).

With regard to property, it is well-known from anthropological research that the sense of private property in some cultures is much more restricted than in modern capitalist cultures. Kanngiesser et al. (2015) observed something of this difference in a study investigating the tendency of five- to nine-year-old children from two different cultural contexts (one Western, and one small-scale and nonliterate) to infer ownership from first touch. They found that there was a significant delay in the small-scale culture to use first touch as a cue to ownership (from age five to age nine). The difference was readily attributable to the different role of private property in the lives of young children: in the small-scale culture, young children have far fewer objects of ownership with which to deal. In a study cited in the previous subsection, Kanngiesser et al. (forthcoming) found that children in all of the three cultures they studied respected the property of others to some degree, suggesting that property as a cooperative agreement among members of a cultural group is a human universal. However, they found some quantitative differences across cultures in children's respect for property as well. By around school age, then, all children respect the property of others, but this respect manifests itself in different ways depending on cultural circumstances and norms.

Becoming Group-Minded

Most primates, including great apes, live in social groups and are more or less unfriendly to outsiders. But humans live in cultural groups, and being a cooperative member of a cultural group means favoring one's group over others and valuing the group's social norms as regulators of good group functioning. When someone breaks a social norm in a way that threatens the group's good functioning, one should sanction them and try to bring them back into line (even if one is not directly affected oneself). When there is a conflict of interest between an individual group member and the group and its functioning as a whole, one is obliged to seek a just solution that takes into account both the individual's and the group's interests. In these ways, young children gradually transform from more or less passive consumers of culture into active, group-minded contributors to its smooth functioning. This new type of group-mindedness represents a fundamental transformation in great ape social relations.

Theoretical Explanations

I have made the bold proposal that young children do not understand themselves as members of a social group until they are three years of age. Before this age, when they are in a group they interact with individuals only; they do not understand the group as a cooperative entity in itself. At three years of age children begin to understand cooperative groups based on their emerging skills and motivations of collective intentionality. But they do not recognize strangers as in-group members based only on similarity of appearance (for example, in the minimal groups paradigm) until around five years of age. So from three to five years of age young children are coming to understand ever more deeply the dual-level structure of a cultural group and its individual members as structured by the members' collective intentionality. Although it is certain that socialization and pedagogy play important roles in children's attitudes toward in-group and out-groups later in this developmental pathway, it is difficult to imagine that their capacity for group-mindedness itself is taught or socialized.

Not by accident, three to five years is also the age at which young children are coming to understand social norms and how they work. Social norms are group-minded phenomena of collective intentionality, so as children's understanding of groups progresses so does their understanding of social norms. And, as I have argued, enforcing and creating social norms—especially when applied from a third-party stance—do not in any straightforward way emanate from selfish motives but rather imply a group-minded motivation to facilitate the smooth functioning of the group and its activities.

There is one proposal, however, that enforcing social norms may not be cooperative at all. Drawing on the fact that tattling in young children is mainly done not by subordinate children but by dominant children, Hawley and Geldhof (2012) view moral norms as "tools of the social elite." In essence, the powerful coerce the weak into accepting their rules. However true this may be about modern adults in some societal contexts, my position would be that it is absolutely not the case in young children's enforcement and creation of social norms. They quite often do it from a third-party perspective when their interests are not at stake, and, as we

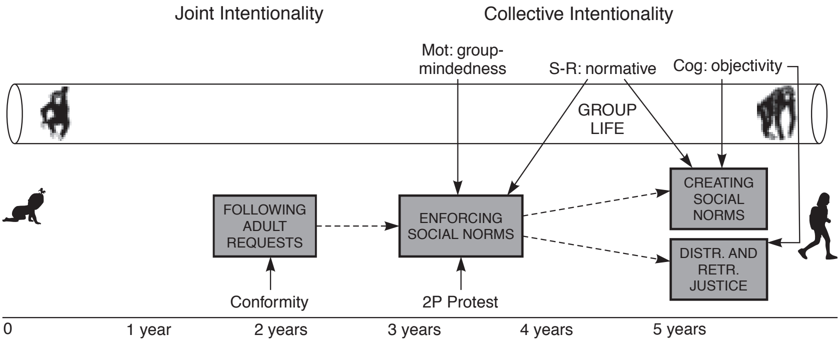

Figure 9.1 The ontogenetic emergence of young children's understanding of social norms. Abbreviations: Cog = cognitive; DISTR = distributive; Mot = motivation; RETR = retributive; S-R = executive self-regulation; 2P = second-personal.

shall see in the next chapter, they feel guilty when they themselves transgress.

Figure 9.1 depicts my account of the process in the current context, considering group-mindedness as a motivational capacity (top of diagram), maturing as a dimension of collective intentionality at three years of age. It motivates the individual to take into account the welfare of the in-group and its members, and to respect and identify with its collective expectations as embodied in its social norms—and even to create norms when they are needed to facilitate group functioning. The diagram focuses on children's changing relation to social norms, as they follow, enforce, and create them.

Before three years of age, toddlers are, of course, subject to social norms, but they are only understanding them as directives coming from individuals not as collective group expectations. Following these norms—even when they are not fully understood—has a natural grounding in children's tendency to conform to the directives of others (Figure 9.1, first box). Particular social norms are culturally learned, but our focus here is on children's ability to understand social norms as collective group expectations—agreed to and committed to by all—that they respect precisely because of their group status.

When three-year-olds start enforcing social norms, including on third parties from a noninvolved position, this can have an element of social learning and conformity as well: they are doing what adults do when they enforce norms. But, unlike two-year-olds, three-year-olds do not need an adult model: they infer a generic norm from a single observation of an intentional action; they enforce that norm with no input from adults; and they use normative language in their enforcement. These facts suggest that three-year-olds are indeed coming to understand the group-minded nature of social norms and how they work. The fact that children enforce conventional norms more strongly on in-group than out-group members also suggests a group-minded understanding of norms. In the diagram we depict three-year-olds' enforcement of social norms as having not only group-minded and normative inputs, but also an input from their previously developed tendencies to engage in second-personal protest. Second-personal protest is a natural precursor because the behavior is similar—displaying resentment or indignation when someone behaves noncooperatively—but it occurs when the disrespect is toward the self. Analogously, young children's enforcing of social norms is a display of resentment or indignation toward a disrespecting perpetrator, but in this case the target of disrespect is a group member or the group as such. Second-personal protest is transformed by group-minded and normative attitudes into the enforcement of social norms.

By the time they enter school, young children are creating their own social norms with peers (Figure 9.1, third box). True, this is mostly in game contexts; in real life their lives are still governed by adults and their norms. But in play and games, young children show the capacity by five years of age to make up their own conventions and norms either to help in their collective instrumental success or to help the game go better and be more fun. When newcomers violate these norms, the creators enforce them with normative language, which suggests that they do not just see them as somehow defective adult norms as having the same normative status as those of adults. Five-year-olds are more flexible in changing their self-created norms than ones coming from adults, but, at least to some degree, they see them both as potentially mutable social contracts. By seven years of age, there is no difference between self-created and adult norms.

Finally, as part of this process of becoming group-minded, young children's moral judgments begin to coordinate individual interests with group interests: they develop a sense of justice (Figure 9.1, the other third box). For instance, an individual child might be particularly needy, but accommodating her would set a bad precedent that might undermine future group functioning. To make a judgment in this case, one must take both sets of interests into account and balance them in some way. Thus, although young children judge norm violators based on their intentions—it is only a bad act if the actor intended the effect—they believe that just punishments take into account an act's effects, even if not intended. Presumably, the focus on effects when assigning punishment reflects some kind of consideration of the group's future functioning. In terms of distributive justice, it is during the late preschool period that children begin to fully understand individual ownership as one element in the cooperative arrangement of the group that must be continually asserted by the individual and recognized by the group. Ownership is a kind of cooperative and group-minded form of possession. Because the notion of ownership varies fairly significantly across cultures, one might assume that the attitudes in particular cultures about individual rights are an important learning component in this development.

Overall, we do not think that children's group-mindedness is something they learn from adults; it reflects the maturation of capacities for collective intentionality. But the way this capacity manifests in different behavioral domains definitely does require learning and social co-construction. Not only do children learn particular social norms from adult enforcement activities, but they imitatively learn at least some ways of enforcement from those adult activities. But this kind of learning cannot, I would argue, provide the child with an understanding of social norms as collective group agreements. When children create social norms for themselves, they endow them with the same normative status as those enforced on them by adults. Children construct their understanding of social norms as their group-minded and normative capacities mature, and they structure their social interactions with, and learning from, both adults and peers. And it is in interacting with others in group contexts that children construct, or co-construct with others, new ways of relating to others as fellow group members, including as tempered by a group-minded sense of justice.

Social and Moral Implications

By three years of age young children not only understand others as second-personal agents, worthy of respect and fairness, but they are also beginning to understand them as fellow members of a cultural group subject to the same, mutually accepted, social norms (whereas out-group members are not). By five or six years of age children understand others as members of a cultural group based on similarity of appearance alone, and they treat everyone in their group as worthy of just treatment from themselves and the group. Preschool children already favor those in their cultural group, and they also expect them to favor those in their cultural group as well as to respect the group's social norms. All this reflects children's growing understanding of collective social products such as social norms and conventions and how they work, based on maturing capacities for collective intentionality and group-mindedness.

As children's skills and motivation of collective intentionality begin to blossom, they regulate themselves not only jointly with those with whom they are collaborating in joint intentional activities, but also by the social norms of the group. However, these social norms are often conflicting—moral dilemmas are a fundamental fact of human social life—and children must find ways of dealing with that fact. So they begin to create their own normative standards, grounded in those of the culture but sometimes going beyond these to more general principles that work in their lives. This process often requires children to give reasons to others that justify their non-normative actions, and these justifying reasons become a key part of their moral identity.

— 10 —

Moral Identity

In many primates, individuals evaluate others for their suitability as social partners. Several hundred thousand years ago, as humans began moving toward a more cooperative and interdependent lifestyle, the evaluation process intensified (see Chapter 2). To survive and thrive, human individuals had to choose good collaborative partners and, crucially, to be chosen by others as good collaborative partners themselves.

But the process did not just intensify; it changed. Early humans, but not other apes, came to understand how the process of partner evaluation and choice worked, in the sense that they now knew that others were also evaluating and choosing them. At that point it became important for individuals to actively manage the impression they were making on others, to project to others in the group an identity as someone who was cooperatively competent and trustworthy. And because individuals played the role of both judger and judged—with "our" shared standards in the group applying in both cases—they came to evaluate themselves in the same way that they evaluated others, thus creating an internalized moral identity. And so was born a species that executively self-regulated its own beliefs and actions normatively—that is, morally.

From an early age, even before their first birthday, infants engage in processes of social evaluation. By three years of age children are making moral judgments: judgments that do not just express their personal preferences but assess how others meet the objective normative standards that "we" all share. By four or five years of age children discover that others are judging them in this same way, using the same normative standards, so they engage in active attempts at self-presentation to influence those judgments. But one cannot escape one's own watchful eye, so children of this age also reverse roles and begin to evaluate themselves in the same way that they evaluate others, sometimes resulting in feelings of guilt for not acting in accordance with the shared standards.

Six- and seven-year-old children have begun to understand that they must make their own moral decisions—adjudicating between selfish motives, sympathetic motives, fairness motives, and conformity to various norms—and in so doing they begin to form their own social and moral identities. They make these moral decisions in ways that they can justify to others in the community and to themselves by giving reasons. These justifications express to others, "even if I have acted in ways that are questionable, I have done so for a good reason, so I still share the group's normative standards and values." Internalizing the reason-giving process transforms social self-regulation into normative self-governance via one's cooperative identity: "I now feel that I simply must do certain things in order to continue being the person that I am." We all in the community share a hierarchy of values that forms the touchstone for how we view one another and ourselves as moral beings.

By the end of the preschool period, children begin to have a persona, a social and moral identity, both in the community and for themselves. This is the natural outcome when individuals live in a cooperative social group in which they serve—in some cases with regard to the very same act—as both judger and judged. This is the natural outcome when individuals live in a cooperative social group in which they depend totally on their social relationships with others, and any change in their social or moral identity can affect their standing in those all-important relationships. To become a member of the culture in good standing, children must learn to act responsibly with respect to "us" and our norms.

Our focus in this chapter, then, is on children's sense of who they are as cooperative and moral beings: their self-presentation to others, their self-evaluations of themselves, their sense of moral identity and responsibility in the moral community, and their use of reason-giving discourse to preserve and bolster their cooperative and moral identities.

From Apes: Social Evaluation

In all social species, individuals do best if they can confine their social interactions to others who will benefit rather than harm them. Basic forms of social evaluation are thus important in the lives of many social species.

Great Ape Social Evaluation

Great apes engage in partner choice when choosing coalition partners for dominance competition. In this case, the choice is relatively straightforward: find the most dominant individual who will be your partner. There is thus social selection for dominance. In their group hunting for monkeys, chimpanzees do not really engage in active partner choice, as far as we know, because the situation does not allow it (hunting commences upon chance encounters with a prey). There is thus not social selection for cooperation. Nevertheless, in an experimental situation chimpanzees used a fairly small amount of social experience to determine who would be the best partner—mostly the one with whom they had had past success—in a collaborative activity for resources (Melis et al. 2006c).

In another experimental situation, chimpanzees and orangutans observed a "nice" human, who had performed prosocial acts, and a "mean" human, who had performed antisocial acts. In the first study, the human was nice or mean to the ape herself; in the second study the human was nice or mean to another human. In both of these studies, both species later chose to approach and beg food from the nice human rather than the mean human (Herrmann et al. 2013). These results make sense because, again, cooperators should do everything they can to associate only with other cooperators. Finally, Schmelz et al. (2017) found that chimpanzees acted prosocially toward individuals who had taken a risk in order to cooperate with them—that is, individuals who valued their cooperation.

We have no information on the age at which great apes begin to make social evaluations in the process of partner choice. All the relevant experimental studies are with adults or older juveniles.

Human Children

From a surprisingly early age, human infants also engage in processes of social evaluation. For example, one-year-old and younger infants already prefer to interact with individuals (actually puppets) who are "helpers" versus "hinderers" (for example, Kuhlmeier et al. 2003; Hamlin et al. 2007). Infants have been shown to make such social evaluations in a variety of complex situations in which apes have never been tested, except for Krupenye and Hare's (2018) study with bonobos, who preferred the hinderer! Three- and four-year-old children will distribute more resources to a helper versus a hinderer (Kenward and Dahl 2011). The negative version of this same process is avoiding bad partners. Human children in the same age range will selectively withhold help and resources from an individual whom they perceive to be somehow "meaner" than another (Vaish et al. 2010).

But beyond just choosing or preferring one partner to another, during the preschool years young children also begin judging potential partners morally, using impartial normative standards. This was the focus of Piaget's (1932) seminal monograph, of course, in which he interviewed preschool and school-age children about hypothetical scenarios involving moral transgressions of various kinds. Kohlberg's (1969) work on stages of moral development followed in the same theoretical and methodological vein. Researchers in the social domains paradigm have used somewhat different verbal methods to determine that young children's understanding of the bases of moral judgments is much more adult-like than either Piaget or Kohlberg believed (for a review, see Turiel 2006).

Clearly children's verbal moral judgments go beyond anything great apes might do. But in the current account we want to focus on children's (possibly implicit) moral judgments that underlie their behavioral decision-making. And here we want to focus on how these judgments work in the context of partner choice, and especially on how children's behavior is affected by the knowledge that they are themselves being judged.

Self-Presentation and Self-Conscious Emotions

In comparing the social lives of great apes and human children, one difference that stands out with special salience is children's sense of self as seen through the eyes of others. Young children do not just judge others for their cooperativeness, but they also worry about how others are judging them for their cooperativeness. Great ape dominance displays—for example, a male chimpanzee puffing itself up and stomping around in front of others—are aimed at influencing others. But the process is a fairly direct one of threatening and intimidating and so trying to manipulate others' immediate reactions; it is not aimed at influencing the judgments and evaluations of others. And, of course, such dominance displays are not about cooperation at all.

Human children might in some cases be doing similar things aimed at gaining power and status and the like, but most importantly in many cases they are worried about being perceived as a cooperative partner. They do all kinds of strategic things to make that happen. But in that peculiarly human reflective step, characteristic of many domains of human activity, children then begin to judge themselves as others might judge them, using the same standards, and to attempt to live up to their own judgments.

Self-Presentation

Sometime between one and two years of age human infants begin showing signs that they know when others are observing them (for a review, see Rochat 2009). By three years of age, children will actively conceal forbidden actions from an adult (Melis et al. 2010), as will great apes (Melis et al. 2006a). But the key question is whether and when they know that others are evaluating them.

One interesting context is reactions to seeing oneself in the mirror. From around eighteen months of age, human infants who are looking at themselves in a mirror quite often show signs of coyness or shyness, sometimes even burying their heads in their mother's laps (Lewis 2000). Great apes recognize themselves in mirrors as well, demonstrating this recognition by various kinds of self-directed body inspection and so forth. But they show no signs of coyness or shyness. The most straightforward interpretation of this difference is that human infants as they look in the mirror are imagining that this is how others see them, and this evokes their natural shyness at being evaluated, whereas great apes are using the mirror as a kind of tool for inspecting their bodies, with no implication of evaluation at all.

As children develop through toddlerhood and into preschool, they become concerned with the evaluations of others in a much more direct manner. Thus, in the experiment of Haun and Tomasello (2011) on children's conformity, cited in Chapter 5, four-year-olds made simple judgments about such things as which animal on the page was bigger. When other children (actually confederates) made judgments before that, which were clearly wrong, four-year-old children went along with the crowd when they had to make their judgment publicly. The fact that they did not actually change their mind but were only managing the impression they were making on the other children is clear: when they judged in private they mostly ignored the group's judgments.

What we are focused on here, however, is children's concern for how others are judging their cooperativeness. In a comparative experiment, Engelmann et al. (2012) gave five-year-old human children and chimpanzees the opportunity to either help or steal from another child or chimpanzee. In some cases they did so while they were being watched by a peer or conspecific; in other cases they did so while they were in the room alone. As might be expected, the children helped the other child more, and stole from her less, when they were being watched by a peer than when they were alone. Chimpanzees, in contrast, did not care, one way or the other, that they were being observed (for a similar finding, see also Engelmann et al. 2016a).

Further along these lines, Rapp et al. (in press) tested four- and five-year-old children and found that they shared resources more generously if they knew that their (and other children's) contributions might later be "advertised." The five-year-olds were motivated more to create a positive impression on others than to avoid a negative one. Children as young as four years of age, then, are actively managing the impression they are making on others. In a more complex experimental arrangement, Herrmann et al. (forthcoming) had five-year-old children play a game in pairs, and they could be either generous or stingy with their partner. Again they were sometimes observed by a peer and sometimes not, and they were told that the peer would be making a partner choice between the two of them to play a highly rewarding game. When they were being observed (but not when they were not being observed), the children actually competed with one another to be more helpful and generous so that the observer would see them as better cooperators and so choose them as partners for the highly rewarding game. This phenomenon has been referred to as "competitive altruism."

Finally, Engelmann et al. (2018) set up a situation where in one condition five-year-olds could actively influence how onlookers judged them, or in another condition how onlookers judged their minimally established in-group. That is, observers saw either how much the child herself donated to needy others or how much their group as a whole donated, with no way to identify the child's individual donation. The result was that the children actively attempted to influence how onlookers judged their minimally established group itself, independent of any attempts to influence how those onlookers judged them as individuals (which they cared about as well independently). Five-year-olds care not only about their own reputation but about their group's reputation as well.

Great apes lead complex social lives, mostly aimed at social competition. This has led some theorists to talk about apes as "Machiavellian": they pursue their self-interest intelligently and strategically by manipulating others. But this precisely misses the point. The lesson from Machiavelli (1513) is that, yes, the prince should pursue his self-interest intelligently and strategically by manipulating others, but he should do this in a way that does not suggest to those others (that is, is concealed from those others) that this is what he is doing. So only humans can be truly Machiavellian, because only humans can simulate the perspectives and evaluations of others for the purpose of actively managing the impression they are making on them. Because it comes so naturally to us, the importance of this dimension of human social competence is sometimes difficult to fully appreciate. (Perhaps this is part of the reason that so many primatologists see no problem in equating great ape sociality with human sociality.)

Guilt and Shame

Children's strategic impression management is clearly not moral; it is about personal advantage. However, being able to simulate the judgments that others are making about oneself—seeing oneself from the outside, as it were—is the cognitive foundation for the moral capacity to have a conscience, to feel guilty for transgressions, and for holding oneself accountable to standards.

So how do we traverse the Rubicon from strategic impression management to a moral conscience innervated by feelings of guilt? There are two keys. The first key is what I have called role-reversal evaluation: because of self-other equivalence, I cannot help but judge myself in the same way I judge others (and / or how others would likely judge me) (Tomasello 2016). These are moral evaluations, so there is no question of manipulating the impression I am making on myself strategically; I cannot help but assess myself, as I assess others, with respect to some impartial standards of human conduct.

The second key is that these moral judgments are coming not from myself as an individual but rather from something larger than myself. Thus, in the context of a joint commitment to a partner, it is our joint intentional "we" on whose behalf I make a judgment. And in the context of a collective commitment to social norms, it is our collective intentional "we" on whose behalf I make a judgment. Thus, if I steal something and then reflect on that act and judge it harshly in feelings of guilt, it is not just an equal standoff between the self who wanted to steal and the self who now questions that—if that were the case, what basis would there be for one of the selves to win? No, it is an unfair fight because the me doing the judging is me as a part of a larger "we" with whom I identify. The moral judgment from "we" thus has a self-affirmed legitimacy: we believe that anyone who steals deserves censure. To ignore that judgment is to renounce some portion of one's identification with "we."

The natural reaction when one feels guilty for one's act is to attempt to repair the damage, and so to repair one's moral identity. Observational studies have established that preschool children often show sympathy for a victim after they have done something antisocial toward her (for example, Zahn-Waxler and Kochanska 1990). But these studies have not distinguished clearly between sympathy for the harmed person and actual guilt. Guilt is a joint function of sympathy for the harmed person and regret that I caused it. In a recent experimental study Vaish et al. (2016; see also Hepach et al. 2017d) sought to disentangle guilt from sympathy. In a 2×2 design, they varied whether the breaking of a toy was perceived by the child as a result of his own actions or those of others, and whether the person who owned the toy cared about whether it was broken or not (that is, whether harm was done or not). The result was that when three-year-old children—but not two-year-old children—thought that they had caused harm, they went to extensive efforts to repair it—much more than if they had broken the toy when it caused no harm to anyone or when someone else had caused the harm. The three-year-olds thus were not just sympathetic to a victim and did not just feel the need to repair damage they had done, they felt guilty for causing harm and wanted to make up for the damage they had caused. In contrast, two-year-olds repaired the damage whenever harm was caused, no matter by whom, thus showing only sympathy. Guilt as a distinct motivator of prosocial behavior thus seems to emerge at about three years of age. It is possible that at this age it is still a kind of second-personal guilt (a form of second-personal normativity) aimed only at the victim, whereas later children will experience a more "objective" guilt when they fail to conform to the moral norms of the moral community at large.

Humans quite often feel the need to display their guilt overtly, in everything from body postures to verbal apologies. This display may preempt punishment from others—I am already punishing myself (and my suffering evokes your sympathy) so you do not need to—and this aspect may be seen as strategic. Indeed, when viewing different individuals violating the same norm, even young children feel more positively about the one who shows guilt for having broken it than for someone who breaks it and seemingly does not care (Vaish et al. 2011a). But guilt displays also perform the even more vital function of letting everyone know (including myself) that I now acknowledge publicly that I made a bad judgment, and I regret it. I thus show solidarity with those who judge me harshly, and indeed I agree that this negative judgment of my former judgment and resulting act is deserved and legitimate. Feeling guilty for violating a moral norm thus goes beyond a strategic concern for self-reputation, and even beyond simple regret for what happened; it is a negative judgment, using "our" shared standards, about my previous poor judgment. Displaying my guilt is thus an attempt to repair my cooperative and moral identities.

Human beings, including young children, understand this process to some degree, and so often reflect on possible actions and their consequences before executing them. At least on some occasions, they ask themselves before they act: Is this a good thing to do? Is this a good thing to want? Am I making a good judgment? The philosopher Korsgaard (1996) calls this process "reflective endorsement," and it is the basic decision-making process of a socially responsible person. Guilt and reflective endorsement of this kind thus represent a new kind of social self-regulation: an internalized and reflective self-regulation comprising multiple levels of moral judgment, what Korsgaard calls normative self-governance. Guilt is retrospective: I feel guilty for what I did, and I now judge that my previous judgment that it was the right thing to do was faulty. I deserve censure. Reflective endorsement is prospective: it helps the individual decide what to do so as, negatively, to avoid censure and / or guilt and, positively, to deserve praise or the like. The overt response to guilt is thus to make reparations for the harm done, to undo the regretted act as much as possible, and to reflect on one's actions so as to avoid making the same mistake again in the future. This, in essence, constitutes what we think of as acting responsibly.

Guilt contrasts with shame, in which the main issue is whether an act affects my compatriots' reputational assessment of me. For example, a neighbor might shame me in front of others if I fail to separate my recyclables from other trash. The normal response to shame situations is to withdraw and hope that others will forget (Tangney and Dearing 2004).

Even if I correct my recycling mistake, I cannot undo the information that others now have, which affects their reputational judgments of me—I have lost face (Brown and Levinson 1987). It might also be that there are some individuals in our group who follow our conventions, norms, and institutions strategically, but always with an eye to self-interest, feeling neither guilt nor shame. But these sociopaths are not moral persons, so they cannot be fully trusted. "We" are those who genuinely believe—by virtue of our moral identities—that there are certain things that persons in our moral community owe to one another and that this should be reflected in our actions.

Finally, an especially interesting phenomenon in the context of collective intentionality and morality is the phenomenon of collective guilt (or pride). People often feel collective guilt (or pride) when someone in their group does something especially heinous or praiseworthy, even when they themselves have done nothing. In a recent experimental study, Over et al. (2016) arranged the situation so that five-year-old children thought of themselves as being part of a group (that is, a minimal group). Then either one of their in-group compatriots or an out-group member caused some harm by accidentally breaking a forbidden toy. The children felt a need to apologize and make amends for the violation if it was performed by an in-group (but not by an out-group) member. This kind of collective guilt illustrates with special clarity the vital role in all of this played by children's identification with a cultural group.

Individual and Cultural Variation

I am aware of no experimental studies investigating impression management, guilt, or shame across different cultures in young children. There is, however, a fairly extensive literature on cross-cultural differences in shame and related emotions in adults. On this basis, Fessler (2004) has argued that shame but not guilt is a cultural universal. In the current conceptualization, this would mean mainly that there is a difference across cultures in the process of internalization of moral judgments. This is a perfectly plausible hypothesis because it is well known that different parenting and socialization styles affect the process of internalization in children significantly (for example, Hoffman 2000). This would seem to be an important question for future empirical investigation.

Moral Justification and Identity

I have referred on several occasions to children's moral identity, and I am now ready to discuss more explicitly what that is, as a kind of culmination of children's moral development in the first six years of life. But first we must lay the groundwork by characterizing how it is that young children reason with others about morality because the internalization of this reasoning process is a key constituent of children's moral identity. Children create and maintain their moral identities based on their ability to provide for others in their moral community, including themselves, mutually acceptable reasons and justifications for their morally relevant acts. A morally commendable act is not just an act with good consequences but an act done for the right reasons.

Moral Reasoning and Justification

For many moral philosophers (for example, Scanlon 1998), the rational basis of morality lies in the shared justificatory structures of a moral community because these are grounded in the community's shared ordering of values. In arguing about a moral situation, the individual must always be prepared to justify—to give reasons for—her choices both to others and to herself in ways that anchor her judgments in the community's shared value system. Justifications demonstrate one's continued identification with the group and its value system. For example, if a child has not put away her toys as asked, she might reply that she could not because she needed to help her baby sibling in trouble. This justification is likely to be accepted because we all accept together that helping a baby in need is more important than following cleaning-up instructions. But if the child attempts to justify her negligence by pleading that she was too tired, this is not likely to be accepted because resting is not as important as doing as one is told. Sometimes such justifications and excuses are strategic, simply to extricate oneself from trouble, but many times they are genuine in the sense that the child, as part of the "we" that is her community, judges her own reasons and excuses as either valid or not. She judges her own reasons, just as she judges her own acts, with the internalized judgments of "we," the moral community.

In a recent study, Kanngiesser et al. (in preparation) had five-year-old children promise an adult to clean up some toys. The adult then left. The children were then lured away from their promise, either for a good reason (to help someone having difficulties) or for a lame reason (to play a fun game). When the adult came back, she approached the child first without saying anything, and then, if the child did not say anything, she said something neutral like "What's up?" or "What are you doing?" Finally, she asked, "Why are you not cleaning up the toys?" Children's excuses—their justifications—differed markedly between the two conditions. When they left their task for a good reason, they usually just stated the good reason straightaway, assuming it would be accepted. When they left their task for a poor reason, they flailed around for an excuse, engaged in denial, and, in general, displayed that they knew they had no good excuse. Five-year-olds knew, in this context, how the relevant values would be ordered by the adult.

In comprehension experiments, children discriminate morally valid and invalid excuses at a somewhat later age. Thus, Schmidt et al. (2016d) had a puppet approach and request resources from children at three, five, and eight years of age, giving one of four different reasons for requesting the resources: I am especially needy; I am especially meritorious; the rule says that I should get it; or, simply, I want it. The younger children did not differentiate among the various kinds of reasons. But the eight-year-olds clearly did, seeing need, merit, and rule as valid reasons, but not simple desire (I want it). By sometime after age five, then, young children have constructed in their collective common ground with their cultural group a hierarchy of values—not adult-like in all ways, of course, but adult-like in many ways—in which they know what kinds of reasons justify deviating from the group's norms. This shared hierarchy of values enables the child to engage now in new forms of moral discourse. Indeed, without underlying values that are assumed to be cooperatively shared we cannot reason productively at all. For example, if I justify my negligence of raking leaves by saying, "I couldn't just let that child drown," and you reply, "Why not?" then we really cannot have a productive moral discussion. We must share some underlying hierarchy of shared values to which we can refer if we are to have a meaningful back-and-forth discussion about whether any particular act is justified.

Another prerequisite is that we must be discussing things on a more or less equal footing. Thus, Piaget (1932) argued that young children cannot really reason about moral issues with adults. The problem is that adults know the "right" answer ahead of time. That is to say, if the child has hit someone at kindergarten and is discussing this with his parent, the child knows that the parent will be making sure that the discussion ends in the judgment she thinks is the right one. After all, she is socializing her child to be a moral being. But when the child is discussing the same act with a peer, the outcome of that discussion is not predetermined; the child might actually win the argument that hitting their playmate was, given the circumstances, the right thing to do. It is this freedom and independence in the reasoning process that makes peer dialogue so crucial for moral development.

Kruger and Tomasello (1986) and Kruger (1992) put Piaget's claims to a test. They first assessed seven-year-old children's moral reasoning skills using a semi-standardized task. There were then two groups of subjects. One group engaged in a discussion of moral dilemmas with their mother, and the other group engaged in a discussion of moral dilemmas with a peer. The discussions were analyzed for, among other things, children's sophistication in providing reasons for their judgments. As hypothesized, children's discussions with peers were characterized by relatively sophisticated reason-giving, whereas their discussions with mothers were more one-sided, with much adult instruction. When the children's level of moral reasoning was subsequently assessed, those children who had engaged in the most sophisticated reason-giving made the most gains over their pretest assessments. That is, the number of reason-giving turns predicted gains in moral reasoning, and these occurred more in peer discussions. In another recent study, dyads of five-year-olds shared equally with a third party either because they were instructed to by an adult or because they decided to on their own (as individuals or as a dyad). Subsequently, when a new situation presented itself—the opportunity to share with an especially needy or meritorious third party—children who previously made decisions on their own, not instructed by adults, were more likely to take the new circumstances into account (Hardecker et al., forthcoming).

The key point is that reasons, justifications, and excuses are aimed both at others and at the self, as members of the same moral community, and if they are to be accepted they must be grounded in the value system that we all share. This process is of the essence to one's moral identity. Thus, if part of my moral identity is that I am a loyal friend and then I do something seemingly disloyal, to keep my moral identity intact I must provide a reason for my action that shows loyalty is still a part of my moral identity—that there were extenuating circumstances. If I cannot do this, then my moral identity must be modified. The negative side of the identity process is captured informally by the locutions that people often produce: "I couldn't live with myself if I did that," "That is just not me," and so forth. The positive side of the identity process is captured by Adam Smith's (1759) claim that we do not act prosocially to be praised but rather *to be a praiseworthy person*—a responsible person—in the eyes of the community, including ourselves.

Moral Identity

As soon as children begin evaluating themselves from the point of view of "we" in the community, they may be said to have a sense of self. When those evaluations begin to be moral, it is appropriate to talk about a moral self or moral identity. According to moral identity theorists, the proximate psychological mechanisms responsible for human moral action involve, essentially, moral judgments made by a moral self (with the representative authority of the moral community) that endures over time and evaluates the self impartially in the same way that it evaluates others (Blasi 1984; Hardy and Carlo 2005).

Moral identity, as we conceptualize it, has as its core four sets of values that govern children's actions and that, by the end of preschool, are understood to be shared in their moral community. The particularities may vary by culture, but, on a general level, in all cultures there are four basic sets of moral concerns (see the inner circle of Figure 10.1). First there are *me-concerns:* my self-interested motives aimed at helping me to survive and thrive. Second, there are *you-concerns,* expressed in sympathy and helping toward others in the group. Third, there are *equality-concerns,* in which others and the self are seen as equally deserving individuals who should be treated fairly. And finally, there are *we-concerns,* both those emanating from a dyadic "we" formed in face-to-face interaction with a second-personal agent and those emanating from the need to conform to group-minded social norms created by "us" for "us."

Many moral situations in the real world contain complex combinations of many or all of these concerns, sometimes creating moral dilemmas. But in their idealized "pure" forms, each of the sets of other-regarding concerns is associated with distinct emotions. Prototypically, violations of equality and respect are met with resentment (Strawson 1962; Darwall 2006): the disrespected person feels that she does not deserve to be treated in this manner and resents the perpetrator. (Some theorists think that the

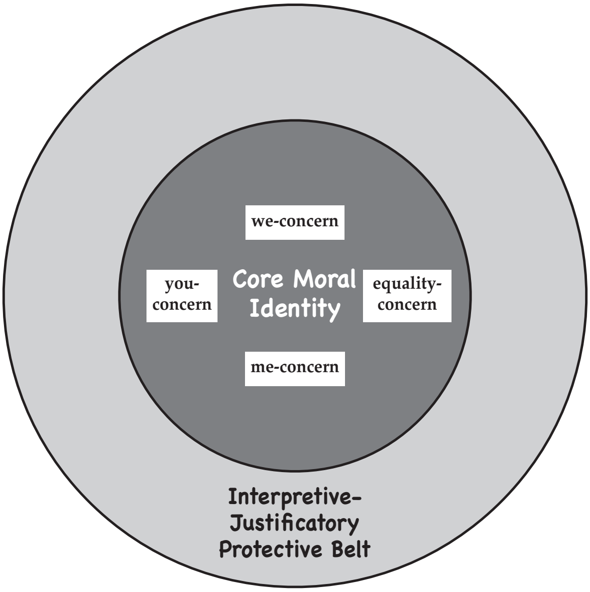

Figure 10.1 A moral identity model for human moral decision-making (from Tomasello 2016).

third-person, cultural, version of this emotion is indignation on behalf of others or the group.) In contrast, when one does not receive the sympathy that one expects, especially from a friend or other close relation, one does not feel resentment but rather "hurt feelings": the hurt friend feels that the offender has neglected the sympathy and trust on which their relationship is built. Violations of norms or rules are often coincident with other moral violations in which someone is hurt or disrespected, but in the pure case one would simply feel a sense of disapprobation or disapproval of the rule breaker: he is not a member of the moral community because he does not follow the rules for social conduct upon which we all have agreed.

Moral decisions are those that consider, at a minimum, one of the concerns other than me-concern, even if in the end one decides that the me-concern should win out. There is thus always more or less complexity in human moral decision-making. Nevertheless, the claim is that human individuals are strongly motivated to preserve their core moral identity as established by their past moral decision-making and judgments. They preserve it, first of all, by acting in ways that are consistent with it. But every situation is particular to some degree; as a given situation is being assimilated to past experience, its particularities must be accommodated in some way. One can thus interpret the wearing of a plaid coat to a funeral as being merely a breach of etiquette or as disrespecting the mourners. One can divide up food resources so that the people who weigh less get less (which means, for example, that women and children get less) under the interpretation that this preserves equality at the level of ounce for ounce, or one can see this as a violation of the equality of persons. And on and on. Just as scientists hold onto their core theoretical beliefs by construing and interpreting empirical evidence in particular ways (Lakatos 1970), individuals may maintain a sense of core moral identity, despite committing what others believe are immoral acts, by interpreting the situation creatively.

But the creativity of interpretation has its limits. Since one's moral identity is socially constructed, one must always be prepared to justify—both to others and to the self—why one chose one course of action over another. As previously argued, justification means showing that one's actions actually emanated from values that "we" all share. There thus comes to surround one's core moral identity a protective belt of interpretations and justifications, as it were (see the outer circle in Figure 10.1). Perhaps I did not share my cookies with others as I might have, but I am ill and need more nutrition than them at the moment. Does this justify my behavior to others and to myself? Perhaps I hit another child, but that was because she was picking on a peer. Does this justify my behavior to others and to myself? If the answer to these questions is yes, then I proceed ahead in the status quo. But if the answers are no, then my core moral identity is challenged; if I want to preserve it intact, then I must do something to repair it, such as display guilt, apologize, or make reparations. Also crucial to the process, of course, is whether an affected person is or is not a member of one's moral community and who is the reference group for one's justifications. We might find some actions that are unacceptable when directed to an in-group member in good standing are acceptable if they are directed to an out-group member or in-group miscreant.

Finally, critical to the whole process of moral self-governance via moral identity is the recognition that the individual is always free to go beyond the culture's social norms if necessary—and indeed this freedom makes the force of obligation all the more binding because then one owns one's decisions, as it were. Thus, in a recent study, Rapp et al. (2017) presented three- and five-year-olds with a peer needing help. Some children were ordered by an adult to help, and others were left to make a decision for themselves (almost all of them helped). When later given the chance to help still another person, the five-year-olds (but not the three-year-olds) who had freely chosen to help in the initial setting helped more in this subsequent setting (especially the girls). One could interpret this finding in attributional terms: as children observe their own free choices, they judge them and construct a moral identity consistent with them, which then governs their future moral decision-making. It is a process of individual construction from uniquely human moral actions and attitudes.

Whatever the interpretation, making moral decisions involving conflicting norms or values requires a personal weighing of values—on an executive level—in a manner that often conforms to no conventional pattern. Should I harm others to save my friend in need? Should I lie to save a classmate from being punished? Even if the punishment is just? From childhood onward, human individuals must always in some sense freely assent to and identify with the moral decisions they make, and over time this process leads each individual to attempt to construct an internally consistent moral identity.

Individual and Cultural Variation

Based on ethnographies of many different peoples living in many different cultural contexts, it is almost certain that members of different cultures reason about moral issues and justify moral actions to others in different, perhaps very different, ways. This may be based on a different hierarchy of shared values in their moral community, or in a different process of moral discourse and justification, or both (see, for example, Shweder 1991, and Haidt 2012). But in terms of ontogeny, we actually know little about how young children—especially young preschool children—engage in these dialogical processes, and almost nothing about how they do so with peers. Again we have an extremely important set of research questions ripe for empirical investigation.

Becoming Responsible

In many ways, we may view children's construction of a moral identity as the capstone of their social development in the preschool period. It comprises all their cooperative and moral values, grounded in the common values of the culture (albeit with some individual variations), and internalized and interconnected such that individuals may justify and provide reasons for their actions in ways that are acceptable both to the group and to themselves. Their social self-regulation has now become normative self-governance. They are in the process of becoming responsible persons.

Theoretical Explanations

Great apes make social evaluations of potential social interactants and prefer to interact with individuals who are nice rather than mean. Human infants do this as well from a surprisingly early age. Infants have been shown to make such social evaluations in a variety of complex situations in which apes have never been tested. It is therefore unclear the degree to which human infants, in their first year or two of life, engage in processes of social evaluation unique to the species. But for sure when children start understanding that others are observing and evaluating *them*, they start down a new, uniquely human pathway.

Human children know that they are being observed and evaluated from early in development (recall infants' self-consciousness in front of mirrors). This is a major shaper of their social lives from there on out (Rochat 2009). In Figure 10.2, we give children credit not just for knowing they are being evaluated but for self-evaluation from soon after their third birthdays, based on a single well-controlled study seeming to indicate that at this age they can feel guilty for harming others (Vaish et al. 2016). As with the cases of joint commitment and fairness, we are positing that as children's capacities for collective intentionality are maturing at around three years of age, they can view their relationship to other individuals as a kind of collective "we" that can, with a role reversal of judger and judged, make normative judgments about "me." Over the next few years, their sense of guilt will become more objective, with reference to the group social norms as they have internalized and potentially modified them for themselves.

At around four or five years of age, children become able to actively simulate the perspective and potential evaluations of others and to adjust their actions accordingly (second box in Figure 10.2). These acts of self-presentation, or impression management, may be totally strategic, aimed at manipulating others' impressions for personal benefit. But, again, the individual cannot escape her own watchful eye, so in some cases she attempts to manipulate the impression she is making on herself—that is, herself as part of a judging "we" (the same "we" that she represents when she judges others). It is this external perspective on the self, from the eval-

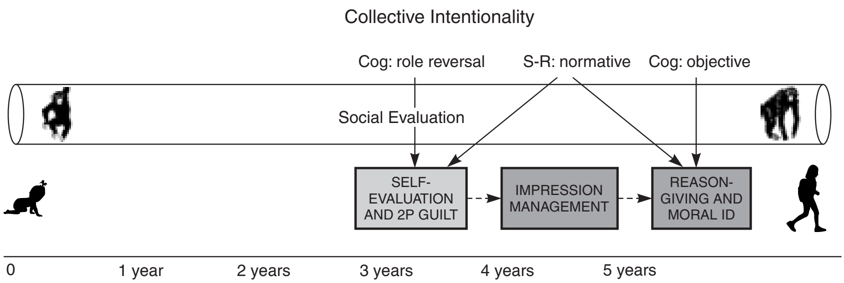

Figure 10.2 The ontogenetic emergence of young children's uniquely human sense of moral identity. Abbreviations: Cog = cognitive; S-R = executive self-regulation; 2P = second-personal.

uating "we," and the child's active attempts to influence this perspective and evaluation that creates the sense of a social self. When the actions involved are more or less moral, and the whole process is internalized, we have the foundations of a moral identity. From that point on, one feels obliged to act so as to live up to one's cooperative (for others) and moral (for the self) identities.

To maintain their cooperative and moral identities children must also construct a hierarchically ordered set of values in common with others in the cultural group. Assuming capacities of moral judgment and a sense of being judged, this enables them to give reasons to others and the self for their actions that justify those actions by grounding them in the hierarchy of values that they all share (third box in Figure 10.2). The phrase "grounding in," in this context, means that the child is able to give reasons, justifications, and excuses to show that she was acting in accordance with the same hierarchy of values and standards that govern everyone in the cultural group—even if it requires some reason-giving to see that fact. This implies the ultimate justification: if you were in my situation you would have done the same thing. Reason-giving moral discourse is thus a key constituent in children's construction of a sense of moral identity as well as its continued maintenance over time.

Crucially, the process of constructing a moral identity transforms individual motivation—the instrumental pressure to do that which one knows will advance one's goals—into a sense of obligation. We have referred previously to the philosopher Korsgaard (1996), who claimed that, in the end, the feeling that I ought or must do something is the sense that if I do not do it I will cease to be who I am—that is, to "us" in the moral community. In contrast, doing that thing helps me to reaffirm who I am to "us" in the moral community. In voluntarily taking on an obligation—as in joint commitments or in accepting and identifying with the group's collective commitments—I put on the line, I put at risk, my cooperative and moral identities. I must fulfill the obligation in order to remain who I am.

The explanation for the emergence of children's sense of moral identity is thus the coming together of all their different social and moral capacities as they seek to become responsible persons in the moral community.

Social and Moral Implications

Before three years of age, young children's social relationships with others are mostly mediated by parents and other adults. In traditional lifeways, this is the age before weaning from the mother. But from around three years, young children begin venturing out and forming relationships on their own, such as friendships with peers. They must now start worrying about being taken advantage of or being lied to, and they must also make sure that others view them in a positive light—and there is no parent to mediate. They themselves judge others for their cooperativeness, and to make sure that others find them cooperative they engage in various acts of impression management, a key part of which is rationally justifying their actions to others. Internalizing the process, they begin judging themselves as they judge others, justifying their actions to themselves as they justify them to others, feeling such self-conscious emotions and shame and guilt, and thereby forming their own moral identity.

What we now have, at around six or seven years of age, are thus nascent persons who can be held accountable for their actions. They share the moral values of the community, including their hierarchical interrelations, and they know what kinds of justifications for actions are acceptable to the community. They now self-regulate their social interactions with others in terms of a kind of normative self-governance: they think before they act about whether, from the point of view of the moral community of which they are a part and whose values they share, this is a good thing to do or to want. As they view themselves through the eyes of those whom they aspire to be like, young children are constructing what amounts to their social persona and its internal counterpart, their moral identity.

IV

Conclusion

The internalization of socially rooted and historically developed activities is the distinguishing feature of human psychology, the basis of the qualitative leap from animal to human psychology. As yet, only the barest outline of this process is known.

Lev Vygotsky

Mind in Society (1930)

— 11 —

A Neo-Vygotskian Theory

From the beginning of the Western intellectual tradition, thinkers have asked how humans are different from other animal species. Since Darwin, the additional question has been how they became different. There certainly was no answering these questions as long as Western philosophers and scientists were ignorant of great apes, which they were until about the time of Darwin. But even then there was no answering these questions in a precise manner until there were systematic comparative studies aimed at revealing subtle behavioral differences between species, which have come into existence only in the last few decades. And if the main behavioral and psychological differences are in cooperation and culture, there was no answering these questions until there were theoretically adequate conceptualizations of cooperation and culture in evolutionary terms, along with an understanding of the central role of ontogeny in the evolutionary process—both of which are relatively new on the scene as well.

All these empirical and theoretical advances have created the possibility of an evolutionarily informed theory of the ontogenetic processes that produce uniquely human psychology. Here I have proposed one such theory. I have proposed that the key novelties in human evolution were all, in one way or another, adaptations for an especially cooperative, indeed hypercooperative, way of life. I have characterized these adaptations as skills and motivations of shared intentionality, and we have looked for how they express themselves in eight centrally important ontogenetic pathways. Our goal now, to wrap things up, is to look systematically across all eight of these pathways to see whether we can discern the bigger picture. How does human psychological ontogeny as a whole compare with that of other apes, and how do we best explain the differences?

Global Theories of Human Ontogeny

Global theories of human ontogeny have been out of fashion for some time. The current theory, in one sense, is not global because it is focused only on a delimited set of phenomena: those that distinguish human psychology from great ape psychology. But in another sense the theory is global because it is intended to explain a wide range of important phenomena in human development, everything from early communication to norm-based morality. To the extent that the theory is global, it seems wise to preface a more systematic presentation by looking, at least briefly, at the global theories currently on offer in contemporary developmental psychology.

The problem is that global theories in contemporary developmental psychology are not focused specifically on the question of human uniqueness, with the possible exception of classical Vygotskian theory (most modern Vygotskians do not focus on the unique characteristics of humans in general, as a species, but rather on cross-cultural differences within the species). What we will discuss here, therefore, are brief descriptions of some existing global frameworks for explaining human ontogeny, and then we will look at what would be needed to modify them to fit our specific question about the ontogeny of human uniqueness.

Individualistic Theories

The majority of theories in the study of human ontogeny focus on the individual child, her competencies and motivations as she develops. And this, of course, has been an extremely productive way of proceeding in many important respects. But our question here is whether it is sufficient to capture the differences between the way that great apes relate to the world and the way that human children relate to the world as they develop over the first six years of life.

Individualistic theories of human development begin with Piaget, and in particular the later works of Piaget (we will address the earlier works and his concern with the social dimensions of human ontogeny, in the next subsection). Piaget (1970) explicates a basically individualistic account of the ontogeny of logicomathematical knowledge. He focuses on the overt actions of infants as they locomote in the spatial environment and manipulate and enumerate objects in various ways manually, all structured by a kind of practical logic or rationality. These overt actions become internalized into mental operations; for example, grouping objects into a pile becomes adding numbers, and removing objects from a pile becomes subtracting them. What Piaget calls "figurative knowledge" concerns specific facts about the world that children learn, and also the symbolization of their experience in a conventional language, which always takes place within the context of operative structures based on action. Piaget regularly invokes the notion of equilibration as a kind of self-regulating force (similar to bodily homeostasis) that serves to organize and coordinate knowledge endogenously. The theory explicitly acknowledges the role of the social and cultural environment in facilitating individual development, but, nevertheless, the fundamentals of the process are conceptualized as inherently individualistic: the child as scientist exploring her environment and learning how things work.

Piaget was not primarily concerned with isolating the unique aspects of human ontogeny. He cites Köhler's (1925) famous research on problem-solving in chimpanzees mainly as a way of arguing against pure empiricism and as a way of grounding sensory-motor intelligence in action. He offers no explanation for how and why humans go beyond what apes do, other than general references to the symbolic function, language, culture, and so forth. But recent research has shown that apes have some of the basics in this direction—from a nascent "theory of mind," to skills with humanlike symbols, to social transmission in the wild—so we need a more specific account. One tack would be something along the lines of Spelke's (2009) account in which humans and great apes share basic "core knowledge" of the world in terms of space, objects, causality, agency, and quantities, but then during development the acquisition of language supplies humans with a common representational medium and a common set of computational / combinatorial mechanisms for manipulating those representations mentally. But, as I have argued previously (see Tomasello 2008, 2014), the invocation of language as simply a medium of representation and computation is not sufficient to explain uniquely human cognition and sociality. Without a deeper analysis of human linguistic competence grounded in more basic abilities such as joint attention, the embedding of perspectives, and social self-monitoring—that is, basic processes of shared intentionality—it is impossible to explain the many and various ways that humans use language to communicate. And critically, these deeper processes of shared intentionality—and not linguistic representation and computation—are what is required for explaining the many and various other forms of uniquely human cognition and sociality, from children's emerging senses of fairness and obligation to their cooperative thinking with peers.*

A similar assessment can be applied to the so-called theory theory. Originating in the famous paper of Karmiloff-Smith and Inhelder (1975) entitled "If You Want to Get Ahead, Get a Theory," this approach to human development again focuses on the child as an individual scientist collecting data and proposing hypotheses to explain them. In more modern formulations (for example, Gopnik and Wellman 2012; see also Xu and Kushnir 2013) the approach adopts a Bayesian learning framework in which the individual always proceeds from some kind of existing assumptions or theory (all the way back to a kind of "starting state nativism"), but then accommodates new data by revising her assumptions or theories. The theory has been applied most directly to children's development of false-belief understanding and other aspects of their "theory of mind," and to the development of children's causal understanding in the face of mysterious blicket machines and the like. Although different domains focus on different content, there is no fundamental difference in the theory theory in how the basic hypothesis-testing mechanisms are applied. The theory theory does a good job at what it is aiming to do, but again, as in the case of Piaget, this theory was not designed to explain the species-unique aspects of human ontogeny in particular. As great apes understand some kinds of mental states but not all of the ones that humans understand, and they have some kind of causal understanding on the way to the human version, it is not clear how the theory theory might be modified and / or enriched to account for the difference. Some kind of principled distinction would have to be made between how human infants' initial theories differ from those of other apes or how their abilities of further theory construction differ from those of other apes. Almost certainly, doing this would require invoking many of the same cognitive and social processes that I have invoked in this shared intentionality account.

* In recent lectures, Spelke (for example, 2015) has argued that in addition to understanding others as agents, human infants near the end of the first year are also beginning to understand others as potential social partners. This is certainly a step along the way to recognizing that to explain the ontogeny of uniquely human psychology, we need something more than "core knowledge."

It is all too easy—and a bit unfair—to criticize scientific theories for not doing what they were not designed to do. But I began this investigation with a specific question about the ontogeny of uniquely human psychology, and I have my own theory that seeks to answer it. These more individualistic theories were not crafted to answer this question, with the point of this very brief review being only to show that they cannot easily be stretched to answer it without invoking many of the same psychological processes invoked in our shared intentionality account, processes such as joint attention, perspective-taking, dual-level collaboration, cooperative communication, the enforcement and creation of social norms, and a sense of moral obligation. To account for these processes, we need to invoke not just general biological preparedness for learning and inference, but also specific biological preparedness for uniquely human cooperative interactions and mental coordination with others.

Sociocultural Theories

Sociocultural theories of human development begin with Vygotsky (for example, 1930 / 1978; though one can find historical roots in earlier scholars such as Baldwin 1896). Vygotsky's major concern was to show that the "higher cognitive functions"—which he explicitly designated as uniquely human (for example, Vygotsky and Luria 1930 / 1993)—are not the result of such things as individual learning and hypothesis-testing. Rather, they are the result of humans' ability to create and internalize social practices, especially those concerned with the use of cultural artifacts and symbols as cognitive prostheses. Thus, as children participate in cultural practices structured by the symbols and constructions of their native language, they benefit from the historical process by which earlier members of the linguistic community partitioned the world into discrete concepts that could be symbolized by particular linguistic items and structures. And as children converse with adults using a conventional language, they experience how adults engage others in discursive interactions and provide reasons and justifications for their various statements and arguments. In the process, children inherit, as it were, ways of categorizing, thinking, and rationalizing the world.

Vygotsky died at age 37, so there is much that he simply did not have time to address. The main issue in the current context is: What are the basic cognitive and social skills that humans, but not other apes, possess that enable them to create and internalize cultural practices and artifacts in the first place? Vygotsky and Luria (1930 / 1993) specifically discuss Köhler's (1925) research with apes, but their main focus was on how human children grow up in the presence not just of physical tools but of cultural artifacts, and how these make everything possible. But how did humans come to invent cultural artifacts, and what is it about children that enables them to learn about and through them? As I have argued previously (for example, Tomasello 1999) what is missing here is an account of humans' unique adaptations for culture and cultural learning—for such things as joint attention and instructed learning—that enable them, but not great apes (even those raised in a human cultural environment), to develop into fully cultural beings. In general, Vygotsky was so concerned to show the crucially important role of culture and its artifacts in human cognitive ontogeny that he neglected the special skills required to participate in processes of culture to begin with, skills that emerge already in infancy and toddlerhood (which he never studied systematically). He also, as noted earlier, focused almost totally on the transmitive dimension of human culture and cultural learning, as opposed to its coordinative dimensions as manifest in such activities as collaboration, cooperative communication, and perspective-taking. And, of course, Vygotsky did not focus at all on children's social relationships and all the many unique ways that children relate to others socially and morally.

On the modern scene, a number of anthropologically oriented developmental psychologists—most prominent among them Cole (1998) and Rogoff (1990, 2003)—have adopted a generally Vygotskian perspective to investigate the cultural dimensions of human development. The focus of cultural psychologists has been almost exclusively on the way that variations in children's cultural experience lead to variations in the ways they relate to the world cognitively and socially. Although again we should be mindful of criticizing other theories for not answering our question, Rogoff has emphasized throughout her work processes such as children's observational learning and guided participation in the process of becoming a competent member of a culture. She has not focused on the underlying psychological processes enabling human children—but not great apes, even those raised in a human culture—to develop in the unique ways that they do. Modern cultural psychologists have criticized Vygotsky's notion of internalization as being too individualistic—as they prefer to focus on processes of distributed learning in which both the process and the outcome are indivisibly social. However, they have not explained the phenomena that internalization was meant to explain: children's skills of executive self-regulation.

Interestingly, a classic source that supplies many of the pieces that purely sociocultural theories are missing is the early work of Piaget. The most well-known source is Piaget's (1932) work on the development of moral judgment. Of most relevance to current concerns, Piaget argued that the key to children's moral development is not individually learning and following adult rules—which require only prudence and conformity—but rather cooperating and negotiating with peers based on reciprocity and mutual respect. Our account of children's moral development draws heavily on many of his seminal ideas. But in other theoretical work during the 1930s to 1960s, Piaget extended this general approach to cognitive development as well (see the papers collected in 1965 / 1995). He argued that learning things from adult instruction was fine and necessary, but because it was basically conformity it could not be responsible for children's reasoning, which originates in interactions with peers. In interactions with peers, the child has to cooperate and negotiate with an equal other in order to come to some kind of mutually acceptable outcome. This early work of Piaget is not a sociocultural theory as it actually downplays the importance of cultural learning and adult socialization per se, but it is certainly not an individualistic theory either as the key mechanisms are social interactions involving cooperation, discourse, and perspective-taking. A term used by a number of modern scholars is "social co-construction," and this would seem to fit the situation as envisaged by Piaget quite well. Nevertheless, we should note that Piaget applied this way of thinking almost exclusively to children in middle childhood during the school years (as have more modern scholars of co-construction), whereas our analyses suggest that something similar is going on—albeit in a more basic form—at earlier ages as well.

So again in this case we may say that sociocultural theories of human ontogeny were not crafted to answer our question, and they cannot easily be stretched to do so without invoking many of the same psychological processes invoked in our shared intentionality account.

What Else Is Needed?

Neither purely individualistic theories nor purely sociocultural theories can do what we need them to do. Piagetian and other individualistic theories recognize that experience and learning take place within the context of a biologically prepared organism. But they do not recognize anything special about humans' biological preparedness specifically for cooperation and culture, which, I would argue, is necessary to explain the ontogeny of uniquely human psychology. Vygotskian and other sociocultural theorists recognize that much of what makes humans unique is their sociocultural experiences. But they fail to recognize biological preparedness altogether, again of the type that enables humans to have sociocultural experiences in the first place.

In light of these theories' various limitations—again, with regard to our specific question—shared intentionality theory simultaneously invokes (1) uniquely human biological preparedness for shared intentionality as *enabling cause,* and (2) individual sociocultural experience (made possible by uniquely human biological preparedness for shared intentionality) as *proximate (efficient) cause.* Both are needed (along with some uniquely social processes of executive regulation) to explain the ontogeny of human uniqueness.

Shared Intentionality Theory

Shared intentionality theory is a Vygotskian theory because it is focused not on all of human psychology but only on uniquely human psychology, and it explains uniquely human psychology mainly in terms of the unique forms of sociocultural activity in which individuals engage over the life course. But we have attempted to fashion a modernized *neo*-Vygotskian theory by invoking an evolutionary approach to human ontogeny in which individuals are biologically adapted in specific ways for engaging in their species-unique forms of sociocultural activity. Further, we have focused much more on the way that these adaptations facilitate social and mental coordination—in such activities as joint attention, collaboration, and cooperative communication—than did Vygotsky, whose primary focus was on the process of cultural transmission and its effects on human psychology.

In summary form, the theory is that human ontogeny is a constructive process involving maturation, experience, and executive self-regulation. The maturational framework begins with general great ape cognitive and social ontogeny, but then also incorporates evolutionarily new and specifically human capacities that transform the process. There are two sets of specifically human capacities.

> *Joint Intentionality*
>
> Motivation: the motivation to socially affiliate and bond with other individuals (especially adults) by sharing / aligning psychological states (emotions, goals, attention, knowledge) with them.
>
> Cognition: the cognitive capacity to create a joint agent "we" with other individuals, creating the possibility of taking the perspective of others, including recursively (aka the dual-level structure), and relating to others second-personally as equals.
>
> *Collective Intentionality*
>
> Motivation: the group-minded motivation to affiliate with and care for the social group by respecting and conforming to (aligning with) its conventions and norms (that is, under the pressure of obligation).
>
> Cognition: the cognitive capacity to form a group-minded "we" and so to participate in conventions, norms, and institutions, and to view things from "objective" and normative perspectives.

As these new capacities enter into ontogenetic pathways, they make possible new forms of sociocultural interaction and experience—such as joint attention and dual-level collaboration, along with their associated perspectives and roles—leading to new kinds of psychological attitudes, such as the senses of fairness and guilt. These capacities and experiences also transform the process of executive regulation from the individual self-regulation characteristic of great apes into the social self-regulation and normative self-governance that enable human children to internalize the perspectives and evaluations of others and the group, and so to create their own rational and moral identities. In this way, great ape psychology becomes uniquely human psychology.

Methodologically, our ontogenetic explanation of uniquely human cognition and sociality—as all ontogenetic explanations—comprises two basic steps: first, an age-anchored description of the developmental path-

Figure 11.1 Overall ontogenetic course of uniquely human psychology.

ways involved; and second, an account of the factors affecting those developmental pathways. In each of the eight chapters in the main body of this work, we have described and explained a single, relatively specific developmental pathway. Our intention now is to look across these various pathways at the "whole child" at particular time slices. We focus on four such time slices: (1) infant emotion sharing, (2) the nine-month revolution and second-personal relations (joint intentionality), (3) the objective / normative turn (collective intentionality), and (4) reason and responsibility. Figure 11.1 provides an overview of how we will proceed, down each of the four columns in turn. Near the top of the figure (in italics) are specifications of the four new and unique cognitive and motivational elements, as just outlined, as they enter into the process. The six rows represent the six chapters in which uniquely human development begins in infancy or early childhood: social cognition, communication, cultural learning, collaboration, prosociality, and social norms (the other two are the later-emerging capstones). Each of these pathways has its foundations in great ape functioning, so we do not need to explain the existence of these functional domains; we only need to explain their transformation from a great ape form into a uniquely human form.

Infant Emotion Sharing

Human infants are adapted for a special social life from the beginning. From as early as two months of age, infants engage with adults in species-unique ways via processes of emotion sharing in protoconversations, which already have a turn-taking structure and are innervated by a drive toward emotional attunement. Infants' motivation to align their emotional state with that of their caregiver represents the first instance of the most basic motivational force of shared intentionality: sharing or aligning psychological states with others.

Because great ape mothers and infants face many of the same tasks and challenges as human mothers and infants—and both species show similar patterns of mother-infant attachment—we may ask why human infants are so different socially. The compelling answer proposed by Hrdy (2009, 2016) and Hawkes (2014) (and elaborated by Tomasello and Gonzalez-Cabrera 2017) is that at some point in evolution humans, but not other apes, switched to a system of cooperative childcare in which infants' relationships to many non-mother adults became crucially important as well. Because this system also led to greater fecundity, the result was that human infants had to compete with a greater number of siblings and peers for the care and attention of a greater number of adults, including at a distance. In this view, emotion sharing and other forms of shared intentionality emerge early in human ontogeny today because, evolutionarily, infants who possessed them were better able to bond with (and so receive more care and attention from) more adults, and at a distance.

Infants establish strong affiliative and emotional bonds with adults by aligning their positive psychological states, as in protoconversations which evolved presumably as the motivational basis of social coordination in general. Infants possess two species-unique and early-emerging social behaviors for doing this: smiling and laughing. Both continue to be important social bonding mechanisms throughout the human life span. In many social psychological experiments with adults it has been found that aligning psychological states with others—for example, in emotional attunement, in joint attention, in imitation and conformity, and in joint goals for collaboration—creates and reinforces affiliative social relationships (for example, Wolf et al. 2016). If the process works also between infants and adults (into which there is ongoing research), this would provide strong support for the hypothesis of Hrdy and colleagues. It is also telling, in this regard, that infants engage in their uniquely human forms of social engagement with others almost exclusively with adults, not peers, which is compatible with the hypothesis as well. Finally, also compatible with the hypothesis is the fact that for many of the social and social-cognitive skills that both great ape and human youngsters possess (for example, gaze following, collaboration), human infants exercise them one to three years earlier in ontogeny, presumably because they are socially adaptive for human infants.

Overall, as compared with other great apes, human ontogeny takes a very long time and depends on much more adult investment and social support. This life history strategy is clearly geared toward a cultural way of life in which individuals are interdependent on one another, at all stages of ontogeny, for everything from acquiring food to obtaining life-sustaining information. This all begins in early infancy. As they mature, children must continue to maintain good affiliative relations with the adults who feed them and teach them all the way into adolescence, so functional support for these affiliative relations is present throughout ontogeny into adulthood, at which point they underlie a wide array of culturally significant social interactions. Human infants' strong motivation for emotional attunement and alignment with others provides the emotional / motivational starting point for all uniquely human psychology.

The Nine-Month Revolution and Second-Personal Relations (Joint Intentionality)

From birth to two or three years of age, human infants' cognitive skills for dealing with the physical world—their "core" cognitive capacities for such things as object permanence and categorization, spatial relations and navigation, tool use and causality, and competence with small numerosities—just are great ape cognitive skills. These skills emerge in great apes and human infants in a very similar manner on similar timetables over the first few years of life.

But children's skills and motivations for relating to their social world are a different story. Already in early infancy infants engage with adults in species-unique forms of emotion sharing, as we have just seen. Then, as the general great ape capacity for understanding others as intentional agents matures at around nine months of age, it combines synergistically with this emotion sharing to create the earliest skills and motivations of joint intentionality. Rather than just sharing with others' emotional states, infants now share with them intentional states—goals, attention, knowledge—aimed at external referents. A dual-level structure of sharedness and individuality is thus constituted, creating in addition the possibility of relating to others second-personally as coequal partners.

Unique Ontogenetic Pathways This new dual-level structure of joint intentionality changes everything. It changes infants' cognitive skills of representation and inference as well as their social interactions and relationships with others. This is manifest in all five of the ontogenetic pathways that we specified as uniquely human already in infancy and toddlerhood: joint attention, communication, cultural learning, collaboration, and prosociality (second column of Figure 11.1). Specifically, in all these pathways great ape skills and motivations of individual intentionality are transformed into uniquely human skills and motivations of joint intentionality. Three of these pathways concern social and / or mental coordination directly.

- Great apes' ability to imagine what others perceive and know is transformed into human infants' ability to share attention (joint attention) and knowledge (common ground) with others, in which "we" perceive and know things together. Motivationally, infants and toddlers seek to share attention and knowledge with others because this facilitates their social-emotional bonding (that is, as continuation of the emotion sharing by which infants create species-unique social bonds). Cognitively, joint attention, as an instantiation of the dual-level structure, creates the possibility of different perspectives on one and the same entity. The emergence of this dual-level structure of joint attention and individual perspectives is foundational for the later emergence of the distinction between subjective attitudes (individual perspectives, beliefs) and objective facts (dependent on no single individual's perspective or belief).
- Great apes' group action is transformed into human infants' dual-level collaboration, in which "we" form a joint goal specifying our individual, often complementary, roles. Motivationally, sharing goals is another instance of the inherently

rewarding sharing of intentional states. Cognitively, dual-level collaboration reflects more or less directly the dual-level structuring of joint intentionality. Of crucial importance, dual-level collaboration creates a new type of social relationship: "I" and "you" as part of our interdependent "we." Interacting in the context of this interdependent social relationship—in which we both are equal causal forces in pursuit of the joint goal and the roles have impartial standards of ideal performance—creates a sense of partner equality (self-other equivalence), resulting in a sense of mutual trust and respect between partners, each of whom takes responsibility for the fate of the other. The outcome is that by toddlerhood, infants recognize both themselves and others as the new and unique social beings known as second-personal agents, which is foundational for entering into normatively binding commitments.

- Great apes' ability to communicate intentionally with others for self-serving purposes is transformed into human referential communication for cooperative purposes. As communicator, the infant (initially by pointing) invites the recipient to align his perspective with hers so that they jointly attend to an external referent, relying heavily on their common ground to do so. As recipient, the infant comprehends the communicator's similar attempts, relying again on their common ground but also on the ability to take perspectives recursively, for example, as she recognizes that "he" intends for "me" to know something. Establishing joint attention is inherently motivating because it facilitates social-emotional bonding, but, in addition, acts of reference are produced in order to attain cooperative social ends. Infants thus find it additionally rewarding to share psychological attitudes with others (for example, excitement or curiosity) about shared referents, which constitutes an expressive communicative motive. The pragmatic infrastructure for early forms of uniquely human communication—cooperative motives, common ground, joint attention, recursive inferencing—makes possible, after a time, the acquisition of communicative (linguistic) conventions understood as such.

Two other early emerging ontogenetic pathways of uniquely human psychology are more similar to their great ape points of departure. These do not concern completely new forms of social coordination, but simply modified forms of general great ape social interaction, based again on emerging skills and motivations of joint intentionality in the first few years of life.

- Great apes' ability to socially learn from others is transformed into human skills of imitative learning, which focus more strongly on the actions performed (as opposed to the results achieved). Motivationally, infant imitation of actions in particular (for example, in social imitation and conformity) facilitates social bonding with adults, and so, again, the cooperative breeding context would seem to play a key role. Cognitively, human infants are also able to engage in role-reversal imitation, relying quite directly on their general ability to reverse roles and take the perspective of a partner.
- Great apes' instrumental helping and (reluctant) sharing, motivated by sympathy, are transformed into human helping and sharing of a type we have called "Smithian." The key fact here is that toddler helpers put themselves imaginatively in the shoes of the recipient, and only give help if it is deserved (there is good cause for the act of helping) and with the real needs of the recipient (not her subjective desires if they are not justified) in mind. That is, they help paternalistically. This different form of helping again incorporates the ability to reverse roles and see from the other's perspective.

Looking forward, we may say that, cognitively, the dual-level structure of simultaneous sharedness (creating socially shared realities) and individuality (individuals' perspectives within those shared realities) characterizes everything from children's pretend play to adults' cultural institutions—that is to say, precisely those sociocultural activities that other great apes can neither create nor understand. From a sociomoral perspective, the emergence of the dual-level structure of joint intentionality enables human infants and toddlers to have species-unique types of sociocultural experience (for example, in acts of collaboration or helping), which form the foundation for all their subsequent species-unique sociomoral interactions and relationships. Conceiving of "I" and "you" as equivalent partners within our cooperative "we"—that is, conceiving of one another as cooperative second-personal agents—characterizes everything from dividing the spoils of a collaborative effort fairly among participants to citizens debating with one another in a modern civil society. Again, this is precisely those sociocultural activities that other great apes can neither create nor understand.

The Contributions of Maturation and Experience In much of modern psychology, maturation and experience (or genes and environment, or nature and nurture, or innate and learned) are often treated as mutually exclusive alternatives. But in actual fact maturation and experience are complementary parts of a single process. In the construction metaphor, a building cannot be built unless there are both raw materials (such as bricks and mortar) and some kind of plan or blueprint for how those raw materials should be put together. It is not incoherent to ask in particular cases whether the plan or (genetic) blueprint is so powerful it can use almost any raw materials (experiences), or whether the raw materials are so close to the final product that the plan or blueprint need be only very generic. But—especially in complex psychological phenomena such as those we are investigating here—both are always integral parts of the process.

The five joint intentional competencies reviewed above (corresponding to the first subsections of five of the corresponding chapters in our main account) all emerge in normal human ontogeny within a fairly narrow age range. The precise age depends on one's methodological criteria, but if we focus only on experimental demonstrations (rather than natural observations consistent with the emergence of the ability), we get the following ages (with one "best" citation for each; see the main chapters for other supporting citations).

- Joint attention / common ground, ages twelve to fourteen months (Moll et al. 2008).
- Cooperative / referential communication, age twelve months (Behne et al. 2012).
- Role-reversal imitation, ages twelve to eighteen months (Carpenter et al. 2005).

- Dual-level collaboration, age fourteen months (Warneken and Tomasello 2007).
- Basic helping, age fourteen months (Warneken and Tomasello 2007).

In terms of a single sample of infants followed longitudinally, Carpenter et al. (1998b) followed twenty-four infants from nine to fifteen months of age using a mix of naturalistic and experimental observations. The age of emergence for the first three of these competencies for all twenty-four infants (collaboration and helping were not tested) was nine to fourteen months. In a training study, when nine- and ten-month-old infants were trained for four weeks longitudinally by their mothers in pointing behaviors, there was no effect on age of emergence (Matthews et al. 2012). And helping behaviors do not increase in frequency when they are rewarded externally (Warneken and Tomasello 2008, 2013b). These age trends and experimental results thus suggest that these five developmental pathways are fairly heavily canalized by a strong maturational component.

This conclusion is reinforced both by research on children with autism and by cross-cultural developmental research. In terms of autism, there has been a great deal of research showing that children on the spectrum have serious problems with joint attention, and indeed there are theories proposing that this is their primary deficit. In addition, it is well-known that children with autism have trouble with imitation, and especially with role-reversal imitation. Children with autism gesture imperatively, but they do not gesture just for the joy of sharing attention or attitudes with others. And these children have a clear deficit in collaborating with partners, including especially the forming of a joint goal. (Their helping behavior seems unaffected, but they have never been tested in paternalistic helping that requires the taking of perspectives.) Cross-culturally, in a study referenced repeatedly, Callaghan et al. (2011) investigated all five of these joint intentional competencies in three very different cultural settings (one Western industrialized, and two traditional, small-scale, nonliterate cultures). They found almost identical ages of emergence across cultures in all five of these competencies (although the imitation did not involve role reversal, and the helping was not paternalistic). Other studies, including on expressive pointing, find basic cross-cultural uniformities as well.

Combined with the uniformity of age trends across individuals in well-studied populations, these findings from children with autism and from cross-cultural developmental research reinforce the conclusion that all of these key competencies emerge in early human ontogeny structured by a strong maturational component. None of this is to say that a child raised in social isolation would develop these competencies normally or on a normal schedule. It is almost certain that a species-typical social environment—especially interacting with nurturing adults—is an integral part of the developmental process. The claim is simply that, given a species-typical social environment with caring adults, the developmental pathways for these early joint intentional competencies are robustly structured maturationally, without the need for adults to actively intervene in acts of pedagogy or other forms of intentional socialization.

The other noteworthy fact is that all these competencies are mainly used in social interaction with adults, not peers (and most studies of infants' and toddlers' skills of joint intentionality observe them in interaction with adults). It takes only a few minutes in a kindergarten setting to observe that infants and toddlers before three years of age are well attuned to the adults in the room, but are basically playing in parallel with, almost ignoring, their peers. In our detailed analyses in the main chapters of the book we documented that infants and toddlers, even in ideal circumstances:

- do not engage in joint attention with peers as much as with adults (Bakeman and Adamson 1984);
- do not make bids for communicative interaction as much with peers as with adults (Ninio 2016);
- do not point for peers as readily as they do for adults, and comprehend adult points better as well (Kachel et al., in press);
- do not imitate / conform to peers as readily as they imitate / conform to adults (Zmyj et al. 2010; see also McGuigan and Stevenson 2016);
- do not collaborate with peers as readily or skillfully as they collaborate with adults (compare Warneken et al. 2006; Brownell and Carriger 1990; see also Endedijk et al. 2015);
- do not help peers as readily as they help adults (compare Warneken and Tomasello 2006; Hepach et al. 2017a).

Children at this tender age are clearly adapted for interacting in meaningful ways mainly, if not exclusively, with adults. There are interesting cultural differences in the extent to which adults attempt to interact with infants and toddlers on an equal level (simulating peers), for example, by getting down on the floor and playing with them. Although adults can never become peers totally, this strategy might potentially facilitate a transition to peer interactions because it simulates egalitarian interactions; alternatively, it might inhibit them by encouraging children to always in all circumstances seek authoritative adult scaffolding. We do not know the answer to this question, as it has not been directly investigated.

The Role of Executive Regulation Conceptualizing executive regulation as a causal factor in human ontogeny results from a basic meta-theoretical choice: the choice is to view the "active organism" as an autonomous decision-maker at least partially responsible for its own developmental fate. Nature in many cases (for example, many insects) hardwires many things so that the individual makes few if any autonomous decisions and so does not cause anything. But in more complex organisms that make behavioral decisions based on their cognitive assessment of the current situation and their competencies for dealing with it, we may say that, to some degree, the individual actively chooses its own experiences and so, indirectly and partially, directs its own development. It is this conceptualization of the autonomous, self-regulating agent that leads us to treat processes of self-regulation not just as a separate set of skills but as a causal factor inherent in the ontogeny—at one level or another—of all cognitively complex organisms.

Infants and toddlers engage in executive self-regulation in the same general manner as all great apes. When tested in traditional tests of such things as delay of gratification, susceptibility to distraction, persistence on task, inhibition of prepotent responses, and effortful control of emotions, three-year-old children perform like apes. However, in some cases what one- to three-year-olds self-regulate are uniquely human cognitive skills and motivations. And so, for example, in their early communication they must use the executive level to align the perspective of others with their own perspective (in the same representational format), and also to recursively embed perspectives within one another. To reverse roles in collaboration they must do essentially the same thing: take a bird's-eye view (representationally neutral) from the executive level in order to reverse roles and establish self-other equivalence and partner equality. When infants reverse roles in imitation, again they need an executive level. This is all what we have called "individual self-regulation of unique psychological content."

However, what we have posited as the most important uniquely human form of executive self-regulation, social self-regulation, is not something in which infants and toddlers regularly engage. Of course infants and toddlers respond to imperatives from adults and may learn to behave in accordance with recurrent imperatives in the appropriate situation—as do many household pets—but there is no evidence that they have internalized this social regulation as a way of controlling or counteracting their behavioral-level natural tendencies and prepotent impulses. The way that infants behave in front of mirrors suggests that they may understand when others are looking at them, and this makes them shy, but we do not have evidence for any active efforts to manage the impression that they are making on others, which would demonstrate the key ability to regulate their own behavior from the perspective of others. But social self-regulation will become an important part of uniquely human ontogeny soon enough.

The Whole Toddler The proposal is thus that between nine months and three years of age the uniquely human adaptations for joint intentionality synthesize with the developmental pathways characteristic of all great apes to create uniquely human ways of understanding, communicating, and learning from others, as well as unique ways of relating to others as sympathetic collaborative partners, worthy of trust and assistance. At the risk of oversimplification, we propose Figure 11.2 as a highly schematic depiction of the new way that human toddlers (that is, new relative to other apes and to younger infants) engage with others cognitively and socially.

In this diagram (Figure 11.2), there is a top level in which "we" share or align psychological states—goals, attention, knowledge, and attitudes—which is inherently motivating to infants and toddlers. On the bottom level is the new form of social engagement that this joint intentionality engenders: the equal partners "I" and "you" (as part of a "we"), each with her own role (with the possibility of reversal) and her own perspective (also with the possibility of reversal, in acts of perspective-taking, and in addition recursive embedding). By three years of age children see others and themselves both (self-other equivalence) as competent and coopera-

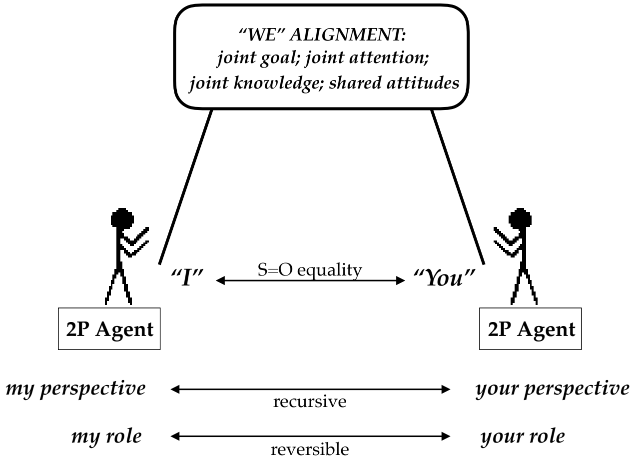

Figure 11.2 The dual-level structure of joint intentional competencies and motivations as children approach their third birthdays. Abbreviations: S=O = self-other equivalence; 2P = second-personal.

tive second-personal agents who engage with one another with mutual respect. In a very schematic way, then, this diagram depicts what it is about human infants and toddlers that makes them so different from other apes, and how they are prepared for later cognitive and sociomoral developments involving more "objective" and normative ways of dealing with the world.

But infants and toddlers are not independent agents. Their competencies are demonstrated almost exclusively with adults, who humor them and scaffold them in all kinds of ways, whereas they are almost totally incompetent with peers. The overall image is of a diapered toddler toddling along behind an adult who filters and mediates her experience—even chewing her food for her in some cultures—to scaffold her interactions with others and the world.

The Objective / Normative Turn at Three Years (Collective Intentionality)

Whereas joint intentionality arose in human evolution to facilitate coordination between individuals, collective intentionality arose to facilitate coordination among the members of a cultural group, even if they were unfamiliar with one another. In-group strangers coordinated with the support of supraindividual social structures such as conventions, norms, and institutions. The individuals who functioned best in cultural groups were those who had group-minded ways of thinking and doing things: this is the way that "we," in this cultural group, think about things, and this is the way that "we," in this cultural group, do things. Group-minded thinking and acting is not just scaling up from second-personal to multi-personal, but rather scaling up to the group's self-identity. It is understanding that this is the way that "we," and anyone who would be one of us, think about things and do things; this is who we are. Cognitively, individuals who coordinate perspectives with "anyone who would be one of us" construct a kind of perspectiveless "objective" perspective on things. Motivationally, individuals who enter into collective commitments create supraindividual social structures (norms) that regulate all group members normatively, in the sense that violators lose their cooperative identity in the group.

Unique Ontogenetic Pathways In contemporary human ontogeny, young children start becoming group-minded at around three years of age, gradually becoming more so, in a number of different ways, from three to six years. In traditional cultural settings, three years of age has a special significance, as it is the age at which toddlers are weaned and so start to become more or less independent individuals expected to, of their own accord, make their own joint commitments and respect the collective commitments (social norms) into which they are born. It is also the age at which children begin interacting with peers, thus inaugurating "the two social worlds of childhood" (adults and peers). In general, we may say that during these preschool years the child is moving on from her almost total dependence on adults to becoming simultaneously more independent as an individual, including especially with peers, and more integrated into the cultural group as an individual. Three- to six-year-olds' maturing skills and motivations of collective intentionality enter into developmental pathways that are already structured by joint intentionality and, in so doing, create new, group-minded ways of interacting, communicating, and learning from others in the cultural group as well as unique ways of relating to them as moral beings.

The transformative process can be seen in each of the six ontogenetic pathways we reviewed that have a transition between early joint intentionality and later collective intentionality: the coordination of perspectives, conventional communication, instructed learning, joint commitment, fairness, and social norms (the third column of Figure 11.1). The new cognitive capacity that emerges maturationally at this time is the capacity to think not just perspectivally but "objectively" in terms of how any rational creature, regardless of individual perspective, should think about things. The new motivation that emerges maturationally at this time is a normative obligation to think and act in accordance with the normative standards of the group. These evolutionarily new ways of operating transform all three of our cognitive pathways.

- Toddlers' ability to engage others in bouts of joint attention in which partners take one another's perspective (or attempt to align them in communication) is transformed into young children's ability to coordinate those perspectives, and then somehow to create from this process the notion of an "objective" perspective (a kind of perspectiveless view from nowhere). Facility with an objective perspective enables young children to construct the foundational notion of a belief as one potential (and corrigible) perspective on an objective situation, as well as both the distinction between appearance and reality and the aspectual nature of linguistic symbols (that is, that they enable us to symbolically construe the same objective entity in a variety of different ways, depending on our communicative purposes).
- Toddlers' skills and motivations of cooperative communication, in which they use gestural acts to align perspectives with others, are transformed into young children's skills of conventional communication using a natural language. Acquisition of linguistic conventions, including conventional linguistic constructions, before three years of age is made possible by children's participation in joint attention with mature speakers and their ability to imitatively learn instrumental actions from others. After three years of age they understand what they are doing as conforming to conventions (as supraindividual social structures created by the group). The structure of conventional languages is such that children are led to make a distinction between propositional attitude and propositional content, a distinction that both depends on and contributes to an objective way of thinking. Self-monitoring of one's discourse with others, including perspective-shifting

discourse, contributes in all kinds of ways to young children's overall understanding of social and mental life.

- Toddlers' ability to learn things from others imitatively is supplemented with a new form of cultural learning: instructed learning. When children explore the world on their own, and even imitate others, they are mostly learning about particular entities and processes. They may make generalizations, but each act of learning is more or less particular. With instructed learning, children's emerging group-mindedness and sense of objectivity transform the learning process. Children see the adult pedagogue as a representative voice coming from the culture at large that is attempting to convey objective cultural knowledge about the world. Inductive generalization from particulars is not needed; children are acquiring generalized, objective, cultural knowledge directly from the source. This mode of learning constitutes a quantum leap from the kind of particulate social learning in which other species engage.

From a sociomoral perspective, we can again see the transformative effect of skills and motivations of collective intentionality as they enter into the ontogenetic process. Toddlers collaborate and help and comply with others, but young children from three years of age inject an element of normativity into these and all the other social activities in which they engage. It is now not just about what one wants to do, but about what one ought to do.

- Toddlers' motivations for engaging with adults in dual-level collaboration are transformed from personal to normative. Three-year-old children begin to understand that when individuals voluntarily make themselves dependent on one another in collaborative activities, they incur a normative responsibility for the fate of the other. When both individuals want to assure the other that they will act responsibly, with the other's fate in mind, they can form a joint commitment, which is normatively binding. An important aspect of the joint commitment is that when either party is in violation, the other is entitled to call her out for her defection, and the violator / defector must accept this censure as legitimate and deserved or else lose her cooperative identity. At this age as well, children begin to understand groups qua groups and the collective commitments that hold them together normatively.

- Toddlers' prosocial motivations to help and to share are transformed from personal to normative. In particular, three-year-old children begin to understand that when collaborative partners have both made contributions to procuring resources, they both deserve to share them fairly. This normative sense of fairness is grounded, first of all, in children's more basic sense of self-other equivalence, enabling an impartial evaluation of us both. Second of all, it is grounded in children's sense of respect for second-personal agents, because treating someone unfairly is essentially an act of disrespect. Third, it is grounded in children's emerging sense of group-level social norms of fairness. The normative dimension of all this is especially clear in the fact that the exact same division of resources is considered fair or not fair depending on what others receive (social comparison), and in the fact that children are content with receiving less than others when a fair procedure of resource allocation has been used (procedural fairness).
- Toddlers' conformity to the requests and directives of individual adults is transformed into an understanding of collective group norms of expected behavior. Soon after their third birthdays, young children begin intervening in interactions between third parties to enforce conformity to social norms as, in some sense, objective standards of behavior that should be followed for the good of the group. By five years of age children are actually creating their own social norms in game contexts and showing an understanding that the rules may be broken if and only if the creators or users agree to it. They are beginning to understand that seemingly objective social norms are actually created by individuals making collective agreements and commitments. Young children's sense of fairness is transformed by the understanding of social norms of justice to include variations based on merit, need, and other factors.

The sociomoral structure of collective intentionality is thus normative through and through. The basic source for the sense of normativity is the individual's sense of "ought" in their instrumental behaviors: if one knows that doing *X* will accomplish one's goal, then there naturally arises a sort of private psychological force: one ought to do *X*. But children's emerging group-mindedness after three years of age transforms this more individual instrumental force into a sense of what individuals who have appropriate concern for others and the group's smooth functioning ought to do.

The Contributions of Maturation and Experience As we have said repeatedly, uniquely human cognition and sociality are a joint product of the maturation of the capacity for shared intentionality and the sociocultural experiences that this enables. But the general pattern is that as ontogeny proceeds, the plasticity of the process increases; that is to say, the role of experience increases. And that is precisely what we see here with the emergence of skills and motivations of collective intentionality at three to six years of age.

Maturation clearly plays a significant role in shaping all six of our main developmental pathways during the three- to six-year age period. We have specified as particularly critical the emergence of children's tendency, cognitively, to take an objective perspective on things, and their tendency, motivationally, to view things as governed by group-minded normative forces. These two tendencies emerge for the first time in all our developmental pathways at around three years of age. Table 11.1 lists the main phenomena (with representative citations) in all six pathways (plus moral identity as a seventh). Importantly, for most of these phenomena there are good data, mostly within the same study, to show a lack of these same skills and tendencies in two-year-old children. The absence of these skills and tendencies in two-year-olds is consistent with the observation that infants and toddlers interact skillfully only with single partners, and they have no apparent skills for coordinating in meaningful ways on the level of social groups.

The obvious conclusion from the convergence in age for the emergence of objective and normative thinking across all these different domains is that maturation is playing an important role in the process. It is perhaps also important that children with autism have deficits in most of these skills and motivations of collective intentionality, although this could just as well be due to deficits accrued earlier in joint intentionality and the ex-

Table 11.1 Evidence (only most relevant studies cited) for emergence of senses of objectivity and normativity at 3 years of age—and not at 2 years of age.

Developmental Pathway	Phenomenon	Present at 3–4 Years	Absent at 2 Years
Social cognition	"Objectivity" in false belief, appearance-reality	Many studies (child-friendly versions)	Many studies (using behavioral choice)
	Cultural common ground	Liebal et al. (2013)	Liebal et al. (2013)
Communication	Understanding conventions	Diesendruck et al. (2010)	—
	Normativity of speech acts	Rakoczy and Tomasello (2009)	Rakoczy and Tomasello (2009)
Cultural learning	Instructed learning of generic information.	Butler and Tomasello (2016)	Butler and Tomasello (2016)
Collaboration	Joint commitment	Hamann et al. (2012); Gräfenhain et al. (2009)	Hamann et al. (2012); Gräfenhain et al. (2009)
	Normative protest	Kachel et al. (in press)	Kachel et al. (pilot data)
Prosociality	Fairness	Hamann et al. (2011)	Hamann et al. (2011)
	Reciprocity	Warneken and Tomasello (2013a)	Warneken and Tomasello (2013a)
Social norms	Enforcing norms	Rakoczy et al. (2008)	Rakoczy et al. (2008)
	Respect for possession	Rossano et al. (2011)	Rossano et al. (2011)
Moral identity	Guilt	Vaish et al. (2016)	Vaish et al. (2016)

periences that these enable (and this could even differ for autists at different locations on the spectrum).

One complication in all of this that is very telling (and very Vygotskian) is that even infants and toddlers are already imitating and / or conforming to many adult cultural practices—including linguistic conventions—and this might suggest that this developmental pattern is not so neat after all. However, my proposal, following Vygotsky, is that this early imitation of conventional cultural practices represents a kind of mimicking, in the sense that children do not understand what they are imitating as a convention or norm per se, followed only by their cultural group. Toddlers understand pieces of language simply as instruments they use with other individuals to invite joint attention; they only come to understand them as shared cultural practices sometime after three years of age (as demonstrated by experiments on cultural common ground and conventions as group-specific). Similarly, toddlers understand an adult's invocation of social norms as directives emanating from individuals; they only come to understand them as group-wide normative commitments after three years of age (as demonstrated by experiments on the enforcement of social norms). As Vygotsky proposed, despite their lack of understanding, this kind of imitated behavior may be crucially important in children's development in that it provides a "zone of proximal development" in which their behavior outstrips their understanding, which provides a kind of bootstrapping effect as adults react to children as if they have full understanding. In any case, my proposal is that children's capacities for collective intentionality—in the sense that they understand conventions and norms as group-minded phenomena—first emerge at three to six years of age.

This important role of maturation notwithstanding, we have in the main chapters of this book reviewed much evidence for significant cultural and individual differences in young children's skills and motivations of collective intentionality, resulting from differences of experience. Several of the most important examples are as follows. First, children's ability to coordinate perspectives in understanding false beliefs depends crucially on the amount and type of discourse experience they have had with others, with extremely impoverished experience (such as in deaf children not exposed to a conventional sign language) leading to large delays. There are also training studies that have produced significant individual differences in false-belief understanding as a function of different amounts and kinds of discourse experience. There are no glaring differences in children's performance of false-belief tasks across cultures, but that is because children in all normal cultural contexts get sufficient amounts of the appropriate discourse experiences. Second, the acquisition of conventional linguistic skills—both the acquisition and use of both words and grammatical constructions—varies enormously as a function of linguistic experience and culture. Third, the way that young children engage with adults attempting to instruct them varies significantly across cultural contexts as well, and this is not to mention the huge differences in the content of what is learned via instruction in different individuals and cultures. Fourth, several studies have experimentally demonstrated significant cultural differences in children's tendencies to be fair in the division of resources. Fifth, there are also cultural differences in the ways children enforce social norms (again not to mention cultural difference in the content of norms), and training effects in individuals' tendency to enforce social norms have been experimentally demonstrated as well. And there are others. In general, despite somewhat sparse data in some cases, the overall tendency is clear: the normal developmental process in the case of these later-emerging skills and motivations of collective intentionality, as compared with the earlier-emerging skills and motivations of joint intentionality, is much more plastic depending on the particular experiences of individuals.

Not only does experience matter in these later-emerging skills and motivations of collective intentionality, but different types of experience matter differently. The period from three to six years of age inaugurates the two social worlds of childhood. Whereas infants' and toddlers' skills and motivations of joint intentionality are evolutionarily tailored almost exclusively for interactions with adults, young children's skills and motivations of collective intentionality must function effectively with both adults and peers: some more with one, some more with the other, and some with both. Preschoolers' interactions with adults are characterized by an asymmetry of knowledge and power, so their most common experiences with adults at this age are adult behavioral directives and various kinds of instruction—it is the transmitive dimension of culture that predominates. In contrast, their interactions with peers are about working things out with someone of equal knowledge and power, so their most common experiences with peers are playing or otherwise collaborating on an equal plane—it is the coordinative of dimension of culture that predominates. So children enter into their interactions with adults and peers with different sets of expectations, and they learn from them differently.

We see evidence for this proposal in studies in which young children trust, or find more reliable, the testimony or instruction of adults over that of peers. This is presumably because they recognize adults as more authoritative and expert in the transmission of knowledge and information. In terms of peer experience, there are a number of suggestive studies that siblings are especially important for children's learning to coordinate perspectives in understanding false beliefs, perhaps because interacting with a more-or-less equal partner is more collaborative and so promotes perspective-taking. Also, and for the same reason, siblings and peers can also play an important role in children's conversational and discourse competence. And finally, in the moral domain, children near the end of this age period have more sophisticated moral discussions with peers than with adults, whose views they tend to accord (perhaps too much) respect. Indeed, there are two studies showing that when adults instruct children, the children tend to follow this instruction fairly strictly—exploring a toy only in the way adults show them and following adult moral rules even when it might be better to be flexible—whereas when they act on their own, or with peers, they more often come up with more flexible solutions.

The overall point is that uniquely human cognition and sociality from three to six years of age must in large measure be constructed, or co-constructed, by the child in interaction with others. In some types of interactions, the power, knowledge, and status of the partner matters little; for example, in asking where my toy is, or in rolling a ball back and forth, it matters little whether the interactant is an adult or peer. But other types of interactions are fundamentally changed by the power, knowledge, and status of the interactant. Interactions in which children acquire information and learn how to function in their culture take place most naturally with adults; they are the experts, after all. Interactions in which children co-construct decisions and ways of thinking to solve a cooperative problem take place most naturally with peers because the need is to create some novel cognitive or social product or perspective, without being overpowered by adults and their entrenched and powerful norms and practices.

The Role of Executive Regulation All intelligent creatures self-regulate their basic perceptions and actions from an executive level; doing so is almost the definition of intelligence. However, across the different developmental pathways we have examined here, we have singled out two ways in which processes of executive self-regulation play a unique role in human psychological ontogeny. The first is cases in which there is species-unique psychological content that is being executively self-regulated—which toddlers already do to some limited degree in aligning perspectives, and so forth—and the second is cases in which the self-regulation process itself is socially (and / or normatively) constituted. Both forms of executive regulation play important roles in uniquely human cognition and sociality in the three- to six-year age period.

First, following the general lead of Piaget and Karmiloff-Smith, I have posited a mechanism of endogenous coordination on the executive level. Most important is the fact that human psychological organization abhors contradictions and inconsistencies. When the child recognizes that she is taking contradictory perspectives on a situation or holds inconsistent values with respect to a situation, something must be done. The result is typically some kind of reconceptualization or reevaluation—effected on the executive level—that organizes the previously contradictory elements in a new and more internally consistent manner. The most prominent examples from the cognitive domain all involve perspective-taking. Young children engage in discourse with others, and inevitably contradictions arise: I believe this to be the case, but you believe that to be the case; or I see it first as a rock, but then, after your prompting, I see it as a sponge; or I call it a dog, but you call it an animal. In all these cases, there is an apparent contradiction. But it is only apparent. The fact is that our beliefs may contradict one another because one or both of us may hold a false belief. The fact is that what is in reality a sponge may have the appearance of a rock. And dogs are not opposed to animals but are a class of animal. In the face of cognitive inconsistency, young children reconceptualize the relationship of conceptual elements, which can only take place on the executive level. Suggestive evidence for this proposal is the fact that, in the best-researched case of false-belief understanding, there is evidence that (1) confronting others with incompatible perspectives in discourse prompts developmental progress, and (2) developmental progress is contingent on the individual's level of executive functioning.

In the social domain, we may posit a similar process in children's constructing a notion of fairness. Because children naturally want things for themselves and at the same time they want to be generous to others, they are often in conflict. And they understand their partner to be in the same conflict. In the context of collaboration, they see themselves and their partner as equivalent (self-other equivalence), and this only exacerbates the situation. In parallel with the cognitive domain, then, we may propose that the child constructs a sense of fairness when her contradictory impulses for selfishness and generosity arise toward the same objects, while at the same time realizing that her coequal partner is experiencing the same conflict. This confronting of values leads the child to construct, or co-construct with her partner, a coordinated resolution resting on a sense of fairness in the division of resources. This coordination and construction can only take place, again, on the executive level.

Second, the uniquely human form of executive regulation is social and / or normative self-regulation, in which the regulation is taking place from the perspective of others. Initially, this happens second-personally as the child simulates and monitors her partner's perspectives and evaluations. Cognitively, the key is communication as the child monitors her partner's perspective and comprehension of her communicative acts—using both overt feedback from the partner and her own simulations—and adjusts appropriately. As children internalize the process, they are able to self-correct their own communicative acts and eventually choose appropriate communicative acts by ruling out alternatives mentally before producing one. At some point near the end of the preschool period, children begin to tune into norms of rational discourse—for example, not contradicting oneself—and so to begin to normatively self-govern their thoughts in the manner of all rational beings in the cultural group: we > me rationality. This presumably derives from their internalization of adult instruction. Instructed learning begins when children understand the instructor as a representative of the cultural group conveying objective knowledge, which they believe legitimately overrides their own personal knowledge. They then internalize the instruction, in Vygotskian fashion, to self-regulate their cognitive interactions with the world via the objective perspective of the cultural group.

Socially, children are monitoring the ways that others are evaluating them as good cooperators—again using both overt feedback and their own simulations—and making adjustments accordingly. As they internalize the process, they begin to actively manage the impression they are making on others by behaving in particular ways for particular persons in particular contexts. Based on but going beyond this ability to simulate the perspectives and values of other individuals is the ability to self-regulate using supraindividual social structures. At around three years of age children are beginning to understand joint commitments, which we have characterized as a kind of we > me self-regulation of a collaborative activity—that is, as a kind of collaborative regulation of their collaborative activity. Each feels an obligation to play her role according to the governing role ideal as mutually understood with her partner. When one of them does not live up to this ideal, the other protests normatively, and they feel it is deserved because they both have committed to the ideal. Children internalize this process of normative self-regulation and feel a kind of second-personal guilt when they defect or otherwise behave nonideally toward their partner. In the end, each collaborator feels a responsibility toward her interdependent partner so that she does not defect at all.

In parallel to their comprehension of joint commitments, three-year-old children are also beginning to understand social norms. Human children are born into a world of social norms, and they follow them from the outset based on respect for their source—adults. This is arguably nothing more than obedience or conformity. But at around three years of age, children start enforcing social norms on others, seemingly having come to some kind of a recognition of their legitimacy as group-minded collective commitments binding on everyone who would be one of us. To the extent that they identify with their cultural group, children see social norms as representing the same kind of we > me regulation that operates in joint commitments, with the "we" in this case being the cultural group with which they identify. They understand all of this fully by five years of age, as they create their own normatively binding rules with peers, understood as mutable agreements. At this point children are self-governing their beliefs and actions via social norms understood as such.

Key to all this is the process of internalization. It is not a mystical process. It is basically a kind of role-reversal imitation: children adopt the perspective, attitude, or action of a partner or a group toward themselves. Internalization is therefore based both on a sense of self-other equivalence and an ability to take perspectives, as well as a certain respect for social partners. The role of socialization in the internalization process has been extensively studied in the domains of problem-solving and moral development. In problem-solving, Winsler (2009) has shown that preschool children direct themselves in problem-solving situations in much the way that adults have previously directed them. In the moral domain, there is a large literature on children internalizing adult moral arguments and directives, and a key finding is that certain parenting styles—especially so-called inductive parenting, in which children are given reasons for adult judgments—facilitate the internalization of moral values in the sense that children will now act morally even in the absence of adults (see Hoffman 2000). So internalization and normative self-regulation are processes that would seem to be quite sensitive to adult socialization and instruction.

The Whole Child Three- to six-year-old children are no longer nursing, so they are no longer tied, in the same way as infants and toddlers, to their mother. Of course, children this young are still dependent on adults in many basic ways, such as for food and basic cultural knowledge. But they are at the same time becoming more independent members of the group, as seen most clearly in their more effective functioning in peer groups but also in their more effective functioning with supraindividual social structure such as joint commitments and social norms. Because they understand the distinction between beliefs and the objective situation, they are able to deal effectively with peers who try to deceive them or take advantage of them. Because they can coordinate perspectives, they can understand a whole panoply of concepts to which infants and toddlers cannot relate. Because they perceive a basic self-other equivalence, they have a sense of fairness toward others as equally deserving collaborative partners. Three- to six-year-olds are thus equipped not just to toddle along behind their mediating mother, but to begin venturing out—without a safety net, as it were—into the sometimes challenging, sometimes scary world of peers. Because adulthood is mainly about effective functioning with peers, we may view the three- to six-year age period as a kind of infancy in the world of peers.

Reason and Responsibility

By six to seven years of age, children have consolidated their previous cognitive and social achievements to take a first big step toward becoming reasonable and responsible "persons." Being reasonable means being cognitively cooperative with others: when others produce a good reason to change your beliefs, you do so. Being responsible means being socially or morally cooperative with others: when others produce a good reason to change your actions, you do so. And, indeed, as the reason-giving process is internalized, others—especially those with whom one shares in cultural common ground the group's beliefs, values, and norms—expect you to anticipate the reasons that "we" might give for particular beliefs or actions and thus do the right thing of your own accord. The internalization of reason-giving means that one is normatively self-governing in a way that conforms not only to the group's rational and moral norms but also to its manner of reason-giving and justification (what kinds of things justify what kinds of things) when there are deviations from those norms.

Six- and seven-year-olds demonstrate their reasonableness and responsibility most clearly as they interact with peers in such things as cooperative problem-solving and moral discourse. In such situations they feel obligated to give reasons for their beliefs and actions, to justify them to others in ways that "we" (that is, everyone) should find reasonable and responsible—indeed, in ways that are "objectively" reasonable and responsible. School-age children's rational and moral identities are constituted by their abilities to interact with others in these ways, and this serves to transform the nature of their interactions, especially with peers.

- Thinking individually is transformed into cooperative thinking in which individuals exchange beliefs about how to solve a problem. Children's growing ability to coordinate perspectives enables them to use both partners' contributions equally to assess the situation in new ways that they would never have considered on their own. Moreover, the collaborating thinkers justify their beliefs with reasons. Reasons are typically statements of beliefs or values that "we" share in cultural common ground and that are somehow determinative in our deliberations. They justify a belief or value in the situation by showing its connection to shared beliefs or values: it works this way because it is an instance of *X*, which we both agree works this way.

- Deliberating individually or in parallel with a peer about the right thing to do is transformed into moral discourse in which individuals express their belief about which value best applies in a situation or which value ought to take precedence. Again, children's growing ability to coordinate perspectives enables them to reach judgments and conclusions that they would never reach on their own. The discursive partners also provide reasons for their judgments, and again these are effective precisely to the degree that they ground the expressed judgment in values that "we" share in cultural common ground. In the case of moral discourse, this grounding is not just in values we all share, but in our shared rank ordering of those values as they apply in the current situation (for example, saving a child's life outranks other duties in the situation that one might have).

Being able to operate in these ways with peers constitutes the child's rational and moral identities and provides an especially strong sense of obligation: to remain the person I am, I must do *X* in this situation. In the words of Korsgaard (1996): "An obligation always takes the form of a reaction against the threat of a loss of identity" (102). To talk nonsense or to flout basic moral values is to become someone different, someone unrecognizable or unacceptable to "us." Consequently, children must be able to correctly anticipate the reasons and justifications that "we" would give for various beliefs or proposed actions, and adjust their beliefs and proposals to these reasons and justifications ahead of time (reflective endorsement). In this way six- to seven-year-old children come to engage in normative self-governance grounded in their rational and moral (cooperative) identities. They are nascent persons, with emerging public personas whose reputations among "us" must be preserved, and with internalized rational and moral identities that give them a sense of who they are. These are children whom the adults in most of the world's cultures deem reasonable and ready to take on new and culturally important responsibilities.

The kinds of cooperative thinking and moral discourse in which six-year-old children engage probably has no direct maturational bases but only indirect ones in terms of more basic competencies. Cooperative thinking and moral discourse require participants who understand that when their partner states a fact she is actually expressing her belief or her set of values. Cooperative thinking and moral discourse also require children to be able to take the perspective of their partner, and to respect the partner as a second-personal agent with the standing to call them out for uncooperative or irrational behavior. And cooperative thinking and moral discourse require children who treat one another fairly and care what others think of them, leading to a respect for others and the group's social norms. The main point is that despite requiring prerequisite skills with strong maturational bases, six- to seven-year-olds must co-construct with peers discursive practices in the context of the kinds of reason-based normative structures that are so important to uniquely human social life. Evidence that this is indeed the key process is provided by the many, and sometimes large, differences in the way that people from different cultures use cooperation and reasoning in their problem-solving and moral discourse with groupmates.

We must be careful in all of this not to make children into adults. In no society are six- and seven-year-old children considered full persons. That is typically reserved for adolescents, and indeed many cultures have rituals specifically marking the adolescent's transition into full personhood (rites of passage, and so forth). And so we may ask what our six- and seven-year-old children are missing. Our contention here would be that they are mainly missing cultural knowledge, the kind of knowledge of how our culture does things in which reason-giving discourse is grounded. Six-year-olds cannot participate in cooperative problem-solving about how to deal with the coming drought or how to deal with a festering dispute among men over money, because they do not know enough about how droughts and money work. And they are not yet fully tapped into the full hierarchy of values that govern the social and moral decision-making of persons in the culture. These are all the tasks of middle childhood, the school years during which children who are already to a significant degree reasonable and responsible acquire the cultural knowledge necessary to apply these qualities appropriately in the many and various situations that arise in daily life.

Again at the risk of oversimplification, we present Figure 11.3 to summarize in schematic form the basic ways in which six- to seven-year-old children relate to their cultural worlds. There is in this diagram a top level of sharing psychological attitudes—collective commitments to "our" way of doing things—which come with a sense of obligation. There is on the bottom level the shared beliefs, values, and the manner of reason-giving and justifying that enable individuals to preserve their cooperative and moral identities with "us" in the group. In a very schematic way, then, this diagram depicts what it is about human six- and seven-year-olds that makes them more reasonable and responsible than younger children, and how they are prepared for acquiring all the cultural knowledge that will soon make them fully fledged "persons" in the culture.

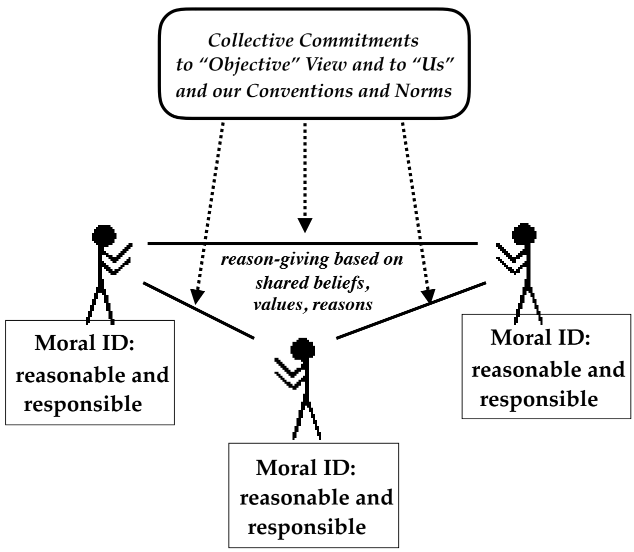

Figure 11.3 Schematic summary of the competencies and motivations of collective intentionality, underpinned by practices of reason-giving and justification.

Problems and Prospects

Many, if not most, of the conclusions we have come to in this book rest, in one way or another, on comparative studies of great apes and human children. These studies have been criticized on several different counts. Before proceeding to our final conclusions, I should address these criticisms directly and offer suggestions for ways to improve comparative research in the future.

Research with Great Apes

Most of the great ape research reported here supports conclusions about great ape cognition and sociality that occupy a middle theoretical position. On the one hand, ape "scoffers" such as Povinelli and Vonk (2003, 2004), Lurz (2011), and Heyes (2015) have all criticized this research as attributing too sophisticated skills to great apes. In particular they claim that the mind-reading experiments only show something like "behavior reading" or "submentalizing" in great apes rather than complex social-cognitive skills. On the other hand, ape "boosters" such as de Waal et al. (2008) and Boesch (2007) have criticized the research as attributing too little sophistication to the cognitive and social skills of great apes. In particular they claim that the experiments on social learning and cooperation are not well-suited to great apes' natural capacities in one way or another, and so they underestimate their skills. These are the kinds of disputes that must work themselves out over time in science, but I support a "radical middle" in which apes have very sophisticated cognitive and social skills, just not human ones.

I will not defend our results from the scoffers here. It is mainly a case, in my view, of theorists who have a bias against cognitive interpretations in general. If they were to apply their skepticism consistently, they would have to apply it to humans as well, since apes behave like human children of different ages in many tasks. And then they are basically in the position of behaviorists, as a theoretical framework that most people find too constraining for investigating the questions that interest us most today in the cognitive and social sciences.

The ape boosters have criticized the comparative aspects of the research on grounds of both internal and external validity. Internally, the basic complaint is that the experimental situations are not identical for the children and the great apes. This is of course true, but identical is not what is needed in any case. In developmental psychology, it is quite often the case that children of different ages are observed in slightly different situations, appropriate for their age, in an attempt to make the situations functionally equivalent across ages, given the different skills, motivations, and attention spans of the children. In our comparative research, therefore, making the experimental situations functionally equivalent is the goal. For example, apes are not highly motivated by toys, and young children are not highly motivated by food. So we reward each species with the thing that most motivates them. In addition, we often give the apes more trials and more time to respond on a given trial, and we repeat the trials if they were not attending, based on our assessment that this is what they need to display their competence. There is no perfect solution, of course, but once we have established a phenomenon (for example, that apes understand seeing), we test it in multiple experimental paradigms, each of which may have its own limitations but which together provide a strong set of converging operations.

The other main point in our defense is that if there are consequential differences of method for the different species they will be detectable in control conditions. For example, both de Waal et al. (2008) and Boesch (2007) note that in many studies the apes, unlike the human children, are tested by a member of a different species; the apes also, unlike the humans, are tested while in some form of caging. But this is why we have control conditions. The very same apes who are, for example, failing to understand false beliefs in some paradigm, are passing a study of knowledge-ignorance with the exact same experimenter in the exact same housing situation. Typically in the studies there are also training trials before the actual testing begins in which subjects, both child and ape, must demonstrate an understanding of any prerequisite skills involved before they can proceed to testing. It is nevertheless often desirable to have studies in which apes interact with one another and have as little pretraining as possible. When we have done studies of this type and compared them with similar studies with pretraining and a human experimenter, we have found similar results from the two ways of testing (for example, Hare et al. 2000, and Melis et al. 2006a, 2006b).

In terms of external validity, Boesch (2007) has pointed out that the captive apes we are testing are not wild apes. In particular, he believes that captive apes are growing up in "impoverished" conditions, so they may not develop the same skills as apes growing up in their natural environment.

But very few of the skills we have found in captive apes have been found in wild apes because they have not been specifically tested for; and there are no instances of systematically documented cases of skills found in wild apes that are not found in captive apes. Kummer (1995) in fact argues that captivity often places animals in especially challenging problem-situations that they would never encounter in the wild, and which they must respond to with cognitive skills we would never see in the wild. Well-known cases in point are (1) tool use, which gorillas and bonobos do not engage in systematically in the wild but only in captivity (McGrew 1989); and (2) pointing for others gesturally, which apes in captivity do (for humans) but apes in the wild do not (Tomasello 2006). And this is not even to mention all the cognitive skills displayed by apes "enculturated" by humans (for example, "linguistic" skills; Savage-Rumbaugh et al. 1993), which are obviously not shown by apes in the wild. And so while it is natural for a fieldworker to claim that animals in their natural environment have more skills than those in captive environments, it is not at all clear that this is the case. We should also add that this concern is relative to what is being studied: wild populations are presumably not crucial if we are studying chimpanzee color perception, for example, because that should develop in the same way in virtually any earthly environment. So the question is whether the cognitive and social skills we are studying are basic in this way. Given that the animals studied live in semi-natural ecological conditions in semi-natural social groups, we believe that for the most part they are.

All of this aside, there is no question that comparative research in the future could be improved in a number of ways. Most important is to find experimental paradigms in which apes can interact with a conspecific and children can interact with a peer in as natural settings as possible, with as little necessary pretraining as possible. We ourselves have achieved this goal in a few experiment paradigms, but not nearly enough. In addition, and obviously, more field experiments with wild apes are highly desirable, though it is almost always the case that field experiments lack some of the controls that would be mandatory in captive settings. Nevertheless, just as is the case with research in captive settings, the goal should be to do the best field experiments possible and see what we find. Combining laboratory and field research to come to a common conclusion is an especially worthy goal.

Another serious lacuna from the point of view of developmental psychology is research on great ape ontogeny. As can be seen from the research reviewed here, in the cognitive domain we have made a good start toward a detailed ontogenetic account. But in the social domain, including cooperation and prosociality, we know almost nothing ontogenetically. In the wild, immature apes typically are excluded from the kinds of interactions in which many important behaviors are seen in adults (for example, coalitions and alliances, grooming, and so forth), but they should be testable in captive settings.

Much of our confidence in ape–child comparative research derives, as noted earlier, from the fact that in many different cases we have tested for ape skills using several different experimental paradigms, almost always with the same result (see, for example, the review of Call and Tomasello 2008). And the criticisms from both boosters and scoffers are almost totally theoretical—based on other possible interpretations—without competing experiments that support those other interpretations. So, all things considered, we believe that the ape–child comparative experiments that are so important in the current theory of the ontogeny of uniquely human cognition and sociality are both internally and externally valid, although of course improvements are always possible.

Research with Human Children

A not-unrelated criticism of our ape–child comparative experiments is that the children mostly are not representative of the human species in general. That is, there is a problem of external validity because the children are mostly children from Western Educated Industrialized Rich Democratic (WEIRD) societies (see Bard and Leavens 2014).

Once again, a main consideration is what phenomenon is being studied. Presumably everyone would agree that, in terms of the kinds of things we are studying here, six-month-old babies are pretty much the same everywhere. The cross-cultural study of Callaghan et al. (2011) that we have cited repeatedly looked at very basic social-cognitive skills—imitation, pointing, joint attention, helping, and collaboration—in three very different cultural contexts (two of them non-WEIRD), and found not only the same behaviors in infants across cultures but also nearly identical ages of ontogenetic emergence. When the skills we are studying are very basic, we would not expect cultural differences.

Needless to say, as we and others have demonstrated, as children grow older the situation changes. There now come into play skills that are much more strongly influenced by adult socialization and teaching, such that now the cultural setting becomes of decisive importance. There are several developmental research groups, including our own, that have recently begun systematic cross-cultural research on these more culturally structured skills and motivations. We have reported some studies here that document systematic cultural differences—often based on the different social norms of the cultures into which the children are born—in the ways that they go about cooperating with others. That having been said, much more research of this type is needed before we can draw firm conclusions about the nature and degree of cross-cultural plasticity in particular ontogenetic pathways in the development of uniquely human psychology.

As in great ape research, in cross-cultural research we have the analogous problem of making the experimental settings comparable for children from different cultures. Everyone doing this kind of research makes a concerted effort to ensure that children interact with adults from their own culture in learning about the task, and that they understand the task and are motivated for any rewards that might be involved. That having been said, in our own approach to cross-cultural research with young children, we have tested children whenever possible with peers. A potential source of cultural variability is children's comfort level in interacting with adults, even adults from their own culture, and their tendency to defer to adults or to be wary of punishment. And so one good research strategy, in our view, is to provide children with a problem that they must work on with a peer or peers—with instructions from a native adult, who then leaves the room—and let them work on it by themselves.

The major lacuna in cross-cultural developmental research is investigations of toddlers and young preschoolers. As a practical matter, in many non-WEIRD cultures it is difficult to recruit and test children from one to four years of age because they are not yet reliably in school settings and because they tend to be very shy with unfamiliar adults, including those from within their own cultural setting. (There is more research with infants, but this is almost always focused less on the infant and its capabilities and more on adult socialization and parenting.) It is also not possible in many cases to leave children this young alone with peers to work things out. A number of possible solutions have been discussed among researchers in the field, and gradual progress is being made, for example, by involving parents and teachers from local schools in the process.

New Possibilities

For each of the eight ontogenetic pathways on which we have focused here, there are, needless to say, many outstanding questions. Answering them will not be easy, especially because there are not so many opportunities for research with great apes. And cross-cultural developmental research, especially with very young children, has its own challenges. But we are optimistic for the future because more opportunities for research with great apes are now opening up in various great ape sanctuaries (see https://www.pasaprimates.org). And cross-cultural developmental research is currently experiencing a boom, as important developmental questions are being addressed with culturally sensitive methods.

We are also optimistic for another reason. In the past decade or so, new measures for investigating noninvasively the internal states of organisms have been developing rapidly, and these open up new and exciting avenues of research. For example, in addition to new measures of anticipatory looking with apes (for example, Krupenye et al. 2016), Hepach et al. (2017c) have developed methods for using pupil dilation as a measure of emotional / motivational arousal as children actually interact in live scenes (in most research using pupil dilation, subjects are fixed in front of a screen). It turns out that, despite important differences in the physiology of the eyes of humans and great apes, these methods can also be used validly to measure the emotional / motivational arousal of great apes (Hepach et al., forthcoming). Somewhat similarly, special thermo-imaging cameras may be used noninvasively to detect blood flows beneath the surface of the skin in both human children and, again despite physical differences, great apes as measures of such things as anger and frustration (for example, Kano et al. 2016). And, although the work is still in an experimental stage, there are ways of automatically assessing various postural patterns in human children (Hepach et al. 2017e), which are now being extended to great apes (again, despite physical and motoric differences), as indices of the various moods and motivations of the organism.

The upshot is that there are many questions about the ontogeny of uniquely human psychology that are still wide open, and there are several exciting, new, noninvasive techniques for measuring the internal states of organisms that give us new ways of answering these and other questions.

~ 12 ~

The Power of Shared Agency

A founding principle of evolutionary psychology is that new adaptations only arise in response to specific ecological challenges. It is not sufficient to say something like being smart is a generally good thing, so humans evolved to be smart. Or being cooperative is a generally good thing, so humans evolved to be cooperative. Evolution does not work that way. Evolution is mostly conservative until a specific adaptive problem presents itself; then those individuals best equipped to solve it have an adaptive advantage. And so, because like begets like, the species evolves (Tooby and Cosmides 2005).

But the fact that a psychological adaptation is "aimed at" a specific ecological challenge does not constrain its subsequent application. Although there may be some adaptations that are narrowly targeted modules—mate choice or a preference for sweets, for example—not all work in this way. In particular, shared intentionality does not work in this way. It is not just another blade in the Swiss Army knife. Although it was originally selected to deal with a relatively specific set of socioecological challenges presented by the need to cooperate, shared intentionality empowered individuals to meet those challenges by forming with one another a joint or collective agency. They could now act together and think together, in a sense, as one. As it turned out, operating in a joint or collective agency—while still retaining individual agency—required adjustments to a whole panoply of great ape cognitive and social processes. The pervasiveness of the adjustments is clear when we look across the most important ontogenetic pathways that distinguish humans from their nearest primate relatives, as we have just done: from social cognition to cultural learning to moral identity. The overall pattern looks much less like a set of punctate adaptations and much more like a thoroughgoing transformation.

A partial list of the most important great ape psychological processes that have been transformed would include such things as imagining what others perceive and know, intentional communication, social learning, individual thinking, acting in parallel with others, sympathy and helping, group life, and social evaluation. These psychological processes arose before humans even existed, but human ontogeny has transformed these processes to yield new and uniquely human outcomes. A partial list of the most important uniquely human psychological outcomes would include such things as joint attention, perspective-taking, cooperative / referential gestures, conventional linguistic communication, role reversal imitation, conformity, instructed (pedagogical) learning, recursive thinking, cooperative problem solving, coordinated decision-making, dual-level collaboration, joint commitment, paternalistic helping, a sense of fairness and justice, second-personal protest, enforcing and creating social norms, active impression management, a sense of shame and guilt, and a conception of moral identity. A wide variety of diverse domains of great ape action and interaction have been transformed in a wide variety of diverse ways.

But there is unity in this diversity. Our review of scores of comparative and developmental experiments has suggested that in every case a great ape ontogenetic pathway has been transformed by the maturation of humans' species-unique capacity for shared intentionality and the experiences that this makes possible. The diversity of human outcomes results from the interaction of this transformative capacity with the already established ontogenetic pathways of great apes (and, to varying degrees, by individual experience). So, for example, "objectivity" manifests in the social learning domain as the child construing pedagogical communication as reflective of culturally universal and objective knowledge, while in the moral domain it manifests as the child's sense of impartiality or fairness. As another example, a normative attitude in the case of collaboration leads the child to a sense of joint commitment with her partner to play her role in the ideal way; but in the case of social norms, the child's normative attitude leads to active enforcement of conformity. Human psychological ontogeny is thus a transformation of great ape psychological ontogeny, but particular processes and outcomes differ significantly depending on the nature of the existing great ape ontogenetic pathway undergoing transformation and the nature of the challenges faced by developing children in different domains of activity.

As a final attempt to characterize the monumental transformation of human ontogeny that shared intentionality has effected, let us invoke the grand evolutionary scheme of Maynard Smith and Szathmáry (1995). They identified eight major transitions in the evolution of complexity of living things on planet Earth, including everything from the emergence of chromosomes, to the emergence of multicellular organisms, to the emergence of human culture (see also Wilson 2012). Remarkably, in each case the transition was characterized by the same two fundamental processes: (1) a new form of cooperation with almost total interdependence among individuals (be they cells or organisms) that creates a new functional entity, and (2) a concomitant new form of communication to support this cooperation. In this very broad scheme, we may say that shared intentionality represents the ability of human individuals to come together interdependently to act as single agent—either jointly between individuals or collectively among the members of a group—maintaining their individuality throughout, and coordinating the process with new forms of cooperative communication, thereby creating a fundamentally new form of sociality.

That individuals are indeed acting together as a single agent is evidenced by the fact that they adopt a shared goal, they adjust performance of their role to coordinate with their partner(s), they share the spoils of their efforts in mutually satisfactory ways, and so forth. But, perhaps most critically, individuals in a shared agency collaborate as a "we" to self-regulate their collaborative activity. Thus, when individuals make a joint commitment and one of them reneges, the other calls him out not just based on a personal preference but based on our joint understanding of our joint commitment: the "we" created by our joint commitment is calling "you" out. Or a member of a cultural group breaks a social norm to which everyone knows (in cultural common ground) we are all collectively committed. Someone then calls him out on this breach, again not based on a personal preference but based on our shared understanding of our collective commitment to the group's social norms: "we" in the group do it this way, and "you" are not conforming. In all such cases—at the level of both joint and collective intentionality—the basic structure is a we > me mode of operation in which "we" self-regulate each of us as individuals. This voluntary submission of "me" to "we," more than anything else, is evidence that the participants understand themselves to be operating interdependently as a single agent, whose powers of accomplishment and normative force transcend those that either participant possesses on his or her own as an individual.

The outcome of these ontogenetic transformations leading to uniquely human psychology—as far as we have followed them here—is the child of six or seven years of age, who operates in her culture as a nascent person based on reason and responsibility. Reason and responsibility are normative notions: they involve standards one "ought" to meet. In our view, the origin of normative force lies in the individual agent's sense of instrumental pressure—the sense that I ought to do *x* in order to attain *y*—as a self-regulatory process. Then, in first entering into a joint agency, the young child transforms this individual self-regulation into social self-regulation, in which "we" self-regulate "me" and "you" interchangeably. So now the question is what "I" and "you" as part of our "we" ought to do. Then, by six or seven years of age, the child starts to identify in addition with a cultural "we," which, upon internalization, executively self-regulates her and her compatriots' beliefs and actions normatively in the direction of collectively accepted group standards of rationality (reason) and morality (responsibility). From this point on, reason and responsibility represent the regulative ideals governing virtually all of children's behavioral decision-making, as they gradually become fully fledged persons in a culture.

References

Acredolo, L. P., and S. W. Goodwyn. 1988. Symbolic gesturing in normal infants. *Child Development* 59: 450–66.

Akhtar, N., M. Carpenter, and M. Tomasello. 1996. The role of discourse novelty in early word learning. *Child Development* 67: 635–45.

Akhtar, N., and M. Tomasello. 1996. Two-year-olds learn words for absent objects and actions. *British Journal of Developmental Psychology* 14: 79–93.

Ambridge, B., E. Kidd, C. F. Rowland, and A. L. Theakston. 2015. The ubiquity of frequency effects in first language acquisition. *Journal of Child Language* 42 (2): 239–73.

Anselmi, D., M. Tomasello, and M. Acunzo. 1986. Young children's responses to neutral and specific contingent queries. *Journal of Child Language* 13: 135–44.

Apperly, I. A., and S. A. Butterfill. 2009. Do humans have two systems to track beliefs and belief-like states? *Psychological Review* 116 (4): 953–70.

Asch, S. E. 1956. Studies of independence and conformity: I. A minority of one against a unanimous majority. *Psychological Monographs* 70 (9): 1–70.

Ashley, J., and M. Tomasello. 1998. Cooperative problem solving and teaching in preschoolers. *Social Development* 7: 143–63.

Avis, J., and P. L. Harris. 1991. Belief-desire reasoning among Baka children: Evidence for a universal conception of mind. *Child Development* 62 (3): 460–67.

Azmitia, M. 1988. Peer interaction and problem solving: When are two heads better than one? *Child Development* 59 (1): 87–96.

Bakeman, R., and L. Adamson. 1984. Coordinating attention to people and objects in mother-infant and peer-infant interactions. *Child Development* 55: 1278–89.

Baldwin, D. A. 1991. Infants' contribution to the achievement of joint reference. *Child Development* 62 (5): 874–90.

———. 1993a. Early referential understanding: Infants' ability to recognize referential acts for what they are. *Developmental Psychology* 29 (5): 832–43.

———. 1993b. Infants' ability to consult the speaker for clues to word reference. *Journal of Child Language* 20 (2): 395–418.

Baldwin, J. M. 1896. A new factor in evolution. *American Naturalist* 30 (354): 441–51.

Bard, K. A. 2012. Emotional engagement: How chimpanzee minds develop. In *The Primate Mind: Built to Engage with Other Minds,* ed. F. B. M. de Waal and P. F. Ferrari, 224–45. Cambridge, MA: Harvard University Press.

Bard, K. A., and D. A. Leavens. 2014. The importance of development for comparative primatology. *Annual Review of Anthropology* 43: 183–200.

Baron-Cohen, S. 1989. Perceptual role taking and protodeclarative pointing in autism. *British Journal of Developmental Psychology* 7: 113–27.

———. 1995. *Mindblindness: An Essay on Autism and Theory of Mind.* Cambridge, MA: MIT Press.

———. 1997. The child with autism: First lessons in mind-reading. *Psychology Review* 3: 30–33.

Baron-Cohen, S., J. Allen, and C. Gillberg. 1992. Can autism be detected at 18 months? The needle, the haystack, and the CHAT. *British Journal of Psychiatry* 161: 839–43.

Barragan, R. C., and C. S. Dweck. 2014. Rethinking natural altruism: Simple reciprocal interactions trigger children's benevolence. *Proceedings of the National Academy of Sciences of the United States of America* 111 (48): 17071–74.

Barrett, H. C. 2015. *The Shape of Thought: How Mental Adaptations Evolve.* New York: Oxford University Press.

Bartsch, K., and H. Wellman. 1995. *Children Talk about the Mind.* New York: Oxford University Press.

Bates, E. 1976. *Language and Context: The Acquisition of Pragmatics.* New York: Academic Press.

Baumard, N., J. B. André, and D. Sperber. 2013. A mutualistic approach to morality. *Behavioral and Brain Sciences* 36 (1): 59–122.

Baumard, N., O. Mascaro, and C. Chevallier. 2012. Preschoolers are able to take merit into account when distributing goods. *Developmental Psychology* 48 (2): 492–98.

Behne, T., M. Carpenter, and M. Tomasello. 2005. One-year-olds comprehend the communicative intentions behind gestures in a hiding game. *Developmental Science* 8: 492–99.

———. 2014. Young children create iconic gestures to inform others. *Developmental Psychology* 50 (8): 2049–60.

Behne, T., U. Liszkowski, M. Carpenter, and M. Tomasello. 2012. Twelve-month-olds' comprehension and production of pointing. *British Journal of Developmental Psychology* 30: 359–75.

Bellagamba, F., and M. Tomasello. 1999. Re-enacting intended acts: Comparing 12- and 18-month-olds. *Infant Behavior and Development* 22 (2): 277–82.

Bergelson, E., and D. Swingley. 2012. At 6 to 9 months, human infants know the meanings of many common nouns. *Proceedings of the National Academy of Sciences of the United States of America* 109: 3253–58.

Bjorklund, D. F. 2015. Developing adaptations. *Developmental Review* 38: 13–35.

Blake, P. R., and K. McAuliffe. 2011. "I had so much it didn't seem fair": Eight-year-olds reject two forms of inequity. *Cognition* 120 (2): 215–24.

Blake, P. R., K. McAuliffe, J. Corbit, T. C. Callaghan, O. Barry, A. Bowie, L. Kleutsch, K. L. Kramer, E. Ross, H. Vongsachang, R. Wrangham, and R. Wrangham. 2015. The ontogeny of fairness in seven societies. *Nature* 528: 258–61.

Blasi, A. 1984. Moral identity: Its role in moral functioning. In *Morality, Moral Behavior and Moral Development,* ed. W. M. Kurtines and J. J. Gewirtz, 128–39. New York: Wiley.

Bloom, P. 2000. *How Children Learn the Meanings of Words*. Cambridge, MA: MIT Press.

Boesch, C. 1991. Teaching in wild chimpanzees. *Animal Behaviour* 41 (3): 530–32.

———. 2005. Joint cooperative hunting among wild chimpanzees: Taking natural observations seriously. *Behavioral and Brain Sciences* 28: 692–93.

———. 2007. What makes us human (*Homo sapiens*)? The challenge of cognitive cross-species comparison. *Journal of Comparative Psychology* 121 (3): 227–40.

Bohn, M., J. Call, and M. Tomasello. 2016. Comprehension of iconic gestures by chimpanzees and human children. *Journal of Experimental Child Psychology* 142: 1–17.

Bonawitz, E., P. Shaft., H. Gweon, N. D. Goodman, E. Spelke, and E. Schulz. 2011. The double-edged sword of pedagogy: Instruction limits spontaneous exploration and discovery. *Cognition* 120: 322–30.

Boyd, R., and P. J. Richerson. 1996. Why culture is common but cultural evolution is rare. *Proceedings of the British Academy* 88: 77–93.

Bratman, M. 1992. Shared co-operative activity. *Philosophical Review* 101 (2): 327–41.

———. 2014. *Shared Agency: A Planning Theory of Acting Together.* New York: Oxford University Press.

Bräuer, J., J. Call, and M. Tomasello. 2005. All great ape species follow gaze to distant locations and around barriers. *Journal of Comparative Psychology* 119 (2): 145–54.

———. 2006. Are apes really inequity averse? *Proceedings of the Royal Society B, Biological Sciences* 273 (1605): 3123–28.

———. 2007. Chimpanzees really know what others can see in a competitive situation. *Animal Cognition* 10 (4): 439–48.
———. 2009. Are apes inequity averse? New data on the token-exchange paradigm. *American Journal of Primatology* 71 (2): 175–81.
Brooks, R., and A. N. Meltzoff. 2005. The development of gaze following and its relation to language. *Developmental Science* 8 (6): 535–43.
Brosnan, S. F., L. M. Hopper, S. Richey, H. D. Freeman, C. F. Talbot, S. D. Gosling, S. P. Lambeth, and S. J. Schapiro. 2015. Personality influences responses to inequity and contrast in chimpanzees. *Animal Behaviour* 101: 75–87.
Brosnan, S. F., H. C. Schiff, and F. B. M. de Waal. 2005. Tolerance for inequity may increase with social closeness in chimpanzees. *Proceedings of the Royal Society B, Biological Sciences* 272 (1560): 253–85.
Brosnan, S. F., C. Talbot, M. Ahlgren, S. P. Lambeth, and S. J. Schapiro. 2010. Mechanisms underlying the response to inequity in chimpanzees, *Pan troglodytes. Animal Behaviour* 79 (6): 1229–37.
Brown, P., and S. C. Levinson. 1987. *Politeness: Some Universals in Language Usage.* Cambridge: Cambridge University Press.
Brownell, C. A. 2016. Prosocial behavior in infancy: The role of socialization. *Child Development Perspectives* 10 (4): 222–27.
Brownell, C. A., and M. S. Carriger. 1990. Changes in cooperation and self-other differentiation during the second year. *Child Development* 61: 1164–74.
Brownell, C. A., S. S. Iesue, S. R. Nichols, and M. Svetlova. 2013a. Mine or yours? Development of sharing in toddlers in relation to ownership understanding. *Child Development* 84 (3): 906–20.
Brownell, C. A., G. B. Ramani, and S. Zerwas. 2006. Becoming a social partner with peers: Cooperation and social understanding in one- and two-year-olds. *Child Development* 77 (4): 803–21.
Brownell, C. A., M. Svetlova, R. Anderson, S. R. Nichols, and J. Drummond. 2013b. Socialization of early prosocial behavior: Parents' talk about emotions is associated with sharing and helping in toddlers. *Infancy* 18 (1): 91–119.
Brownell, C. A., M. Svetlova, and S. Nichols. 2009. To share or not to share: When do toddlers respond to another's needs? *Infancy* 14: 117–30.
Bruner, J. S. 1972. The nature and uses of immaturity. *American Psychologist* 27: 687–708.
———. 1974. From communication to language—a psychological perspective. *Cognition* 3 (3): 255–87.
———. 1983. *Child's Talk: Learning to Use Language.* New York: Norton.
Bullinger, A. F., J. Burkhart, A. P. Melis, and M. Tomasello. 2013. Bonobos, chimpanzees, and marmosets prefer to feed alone. *Animal Behavior* 85: 51–60.
Bullinger, A. F., A. P. Melis, and M. Tomasello. 2011a. Chimpanzees prefer individual over collaborative strategies toward goals. *Animal Behaviour* 82 (5): 1135–41.
———. 2014. Chimpanzees instrumentally help but do not communicate in a mutualistic cooperative task. *Journal of Comparative Psychology* 128 (3): 251–60.
Bullinger, A. F., E. Wyman, A. P. Melis, and M. Tomasello. 2011b. Coordination of chimpanzees in a stag hunt game. *International Journal of Primatology* 32 (6): 1296–310.
Bullinger, A. F., F. Zimmerman., J. Kaminski, and M. Tomasello. 2011c. Different social motives in the gestural communication of chimpanzees and human children. *Developmental Science* 14 (1): 58–68.
Butler, L. P., and E. M. Markman. 2012. Preschoolers use intentional and pedagogical cues to guide inductive inferences and exploration. *Child Development* 83: 1416–28.
———. 2014. Preschoolers use pedagogical cues to guide radical reorganization of category knowledge. *Cognition* 130 (1): 116–27.

Butler, L. P., and M. Tomasello. 2016. Two- and 3-year-olds integrate linguistic and pedagogical cues in guiding inductive generalization and exploration. *Journal of Experimental Child Psychology* 145: 64–78.

Butler, L., and G. Walton. 2013. The opportunity to collaborate increases preschoolers' motivation for challenging tasks. *Journal of Experimental Child Psychology* 116: 953–61.

Buttelmann, D., F. Buttelmann, M. Carpenter, J. Call, and M. Tomasello. 2017. Great apes distinguish true from false beliefs in an interactive helping task. *PloS One* 12 (4): e0173793.

Buttelmann, D., M. Carpenter, J. Call, and M. Tomasello. 2007. Enculturated chimpanzees imitate rationally. *Developmental Science* 10 (4): F31–38.

Buttelmann, D., M. Carpenter, and M. Tomasello. 2009. Eighteen-month-old infants show false belief understanding in an active helping paradigm. *Cognition* 112 (2): 337–42.

Buttelmann, D., H. Over, M. Carpenter, and M. Tomasello. 2014. Eighteen-month-olds understand false beliefs in an unexpected-contents task. *Journal of Experimental Child Psychology* 119: 120–26.

Buttelmann, D., N. Zmyj, M. M. Daum, and M. Carpenter. 2013. Selective imitation of in-group over out-group members in 14-month-old infants. *Child Development* 84: 422–28.

Call, J. 2001. Body imitation in an enculturated orangutan. *Cybernetics and Systems* 32 (1–2): 97–119.

Call, J., M. Carpenter, and M. Tomasello. 2005. Copying results and copying actions in the process of social learning: Chimpanzees and human children. *Animal Cognition* 8 (3): 151–63.

Call, J., and M. Tomasello. 1996. The effect of humans on the cognitive development of apes. In *Reaching into Thought: The Minds of the Great Apes,* ed. A. Russon, K. A. Bard, and S. T. Parker, 371–403. New York: Cambridge University Press.

———, eds. 2007. *The Gestural Communication of Apes and Monkeys.* Mahwah, NJ: Lawrence Erlbaum.

———. 2008. Does the chimpanzee have a theory of mind? 30 Years later. *Trends in Cognitive Sciences* 12 (5): 187–92.

Callaghan, T. C., H. Moll, H. Rakoczy, F. Warneken, U. Liszkowski, T. Behne, and M. Tomasello. 2011. Early social cognition in three cultural contexts. *Monographs of the Society for Research in Child Development* 76 (2): 1–142.

Callaghan, T. C., P. Rochat, A. Lillard, M. L. Claux, H. Odden, S. Itakura, S. Tapanya, and S. Singh. 2005. Synchrony in the onset of mental state reasoning: Evidence from five cultures. *Psychological Science* 16: 378–84.

Camaioni, L. 1997. The emergence of intentional communication in ontogeny, phylogeny, and pathology. *European Psychologist* 2 (3): 216–25.

Cameron-Faulkner, T., A. Theakston, E. Lieven, and M. Tomasello. 2015. The relationship between infant "hold out and gives" and pointing. *Infancy* 20: 576–86.

Campbell, A. L., P. Brooks, and M. Tomasello. 2000. Factors affecting young children's use of pronouns as referring expressions. *Journal of Speech, Language, and Hearing Research* 43: 1337–49.

Candland, D. K. 1995. *Feral Children and Clever Animals: Reflections on Human Nature.* Oxford: Oxford University Press.

Carlson, S. M., and L. J. Moses. 2001. Individual differences in inhibitory control and children's theory of mind. *Child Development* 72 (4): 1032–53.

Carlson, S. M., P. D. Zelazo, and S. Faja. 2013. Executive function. In *Body and Mind.* Vol. 1 of *The Oxford Handbook of Developmental Psychology,* ed. P. D. Zelazo, 706–43. New York: Oxford University Press.

Caron, A. J., E. J. Kiel, M. Dayton, and S. C. Butler. 2002. Comprehension of the referential intent of looking and pointing between 12 and 15 months. *Journal of Cognition and Development* 3 (4): 445–64.

Carpendale, J. I. M., S. Atwood, and V. Kettner. 2013. Meaning and mind from the perspective of dualist versus relational constructivist worldviews: Implications for the development of pointing gestures. *Human Development* 56 (6): 381–400.

Carpenter, M. 2006. Instrumental, social, and shared goals and intentions in imitation. In *Imitation and the Social Mind: Autism and Typical Development,* ed. S. J. Rogers, 48–70. New York: Guilford Press.

Carpenter, M., N. Akhtar, and M. Tomasello, 1998a. 14- through 18-month-old infants differentially imitate intentional and accidental actions. *Infant Behavior and Development* 21: 315–30.

Carpenter, M., J. Call, and M. Tomasello. 2002. Some 36-month-old children understand false beliefs. *British Journal of Developmental Psychology* 20: 393–420.

Carpenter, M., K. Nagell, and M. Tomasello. 1998b. Social cognition, joint attention, and communicative competence from 9 to 15 months of age. *Monographs of the Society for Research in Child Development* 63 (4): i–174.

Carpenter, M., B. F. Pennington, and S. J. Rogers. 2001. Understanding of others' intentions in children with autism and children with developmental delays. *Journal of Autism and Developmental Disorders* 31: 589–99.

Carpenter, M., M. Tomasello, and S. Savage-Rumbaugh. 1995. Joint attention and imitative learning in children, chimpanzees, and enculturated chimpanzees. *Social Development* 4 (3): 217–37.

Carpenter, M., M. Tomasello, and T. Striano. 2005. Role reversal imitation and language in typically-developing infants and children with autism. *Infancy* 8: 253–78.

Chalmeau, R. 1994. Do chimpanzees cooperate in a learning task? *Primates* 35 (3): 385–92.

Clay, Z., and C. Tennie. 2017. Is overimitation a uniquely human phenomenon? Insights from human children as compared to bonobos. *Child Development,* DOI:10.1111/cdev.12857.

Cole, M. 1998. *Cultural Psychology: A Once and Future Discipline.* Cambridge, MA: Harvard University Press.

Coqueugniot, H., J.-J. Hublin, F. Veillon, F. Houet, and T. Jacob. 2004. Early brain growth in *Homo erectus* and implications for cognitive ability. *Nature* 231: 299–302.

Corbit, J., K. McAuliffe, T. Callaghan, P. R. Blake, and F. Warneken. 2017. Children's collaboration induces fairness rather than generosity. *Cognition* 168: 344–56.

Correa-Chávez, M., and B. Rogoff. 2009. Children's attention to interactions directed to others: Guatemalan Mayan and European American patterns. *Developmental Psychology* 45 (3): 630–41.

Crawford, M. P. 1937. The cooperative solving of problems by young chimpanzees. *Comparative Psychology Monographs* 14: 1–88.

———. 1941. The cooperative solving by chimpanzees of problems requiring serial responses to color cues. *Journal of Social Psychology* 13: 259–80.

Crockford, C., R. M. Wittig, K. Langergraber, T. E. Ziegler, K. Zuberbühler, and T. Deschner. 2013. Urinary oxytocin and social bonding in related and unrelated wild chimpanzees. *Proceedings of the Royal Society B, Biological Sciences* 280 (1755): 20122765.

Croft, W. 2001. *Radical Construction Grammar: Syntactic Theory in Typological Perspective.* Oxford: Oxford University Press.

Csibra, G. 2010. Recognizing communicative intentions in infancy. *Mind and Language* 25: 141–68.

Csibra, G., and G. Gergely. 2009. Natural pedagogy. *Trends in Cognitive Sciences* 13 (4): 148–53.

———. 2011. Natural pedagogy as evolutionary adaptation. *Philosophical Transactions of the Royal Society B, Biological Sciences* 366 (1567): 1149–57.

Cushman, F. A., R. Sheketoff, S. Wharton, and S. Carey. 2013. The development of intent-based moral judgment. *Cognition* 127 (1): 6–21.

Custance, D. M., A. Whiten, and K. A. Bard. 1995. Can young chimpanzees (*Pan troglodytes*) imitate arbitrary actions? Hayes & Hayes (1952) revisited. *Behaviour* 132 (11): 837–59.

Dahl, A., E. S. Satlof-Bedrick, S. I. Hammond, J. K. Drummond, W. E. Waugh, and C. A. Brownell. 2017. Explicit scaffolding increases simple helping in younger infants. *Developmental Psychology* 53 (3): 407–16.

Darwall, S. 1977. Two kinds of respect. *Ethics* 88 (1): 36–49.

———. 2006. *The Second-Person Standpoint: Respect, Morality, and Accountability.* Cambridge, MA: Harvard University Press.

Darwin, C. 1871. *The Descent of Man.* London: John Murray.

Davidson, D. 2001. *Subjective, Intersubjective, Objective.* Oxford: Clarendon Press.

Dawson, G., A. N. Meltzoff, J. Osterling, J. Rinaldi, and E. Brown. 1998. Children with autism fail to orient to naturally occurring social stimuli. *Journal of Autism and Developmental Disorders* 28 (6): 479–85.

DeLoache, J. S. 2000. Dual representation and young children's use of scale models. *Child Development* 71: 329–38.

Demuth, C. 2009. "Talking to Infants: How Culture Is Instantiated in Early Mother–Infant Interactions; The Case of Cameroonian Farming Nso and North German Middle-Class Families." PhD diss., University of Osnabrück.

D'Entremont, B., S. M. J. Hains, and D. W. Muir. 1997. A demonstration of gaze following in 3- to 6-month-olds. *Infant Behavior and Development* 20: 560–72.

De Villiers, J. G., and J. E. Pyers. 2002. Complements to cognition: A longitudinal study of the relationship between complex syntax and false-belief-understanding. *Cognitive Development* 17 (1): 1037–60.

Devine, R. T., and Hughes, C. 2014. Relations between false belief understanding and executive function in early childhood: A meta-analysis. *Child Development* 85 (5): 1777–94.

De Waal, F. B. M. 1989. Food sharing and reciprocal obligations among chimpanzees. *Journal of Human Evolution* 18 (5): 433–59.

De Waal, F. B., C. Boesch, V. Horner, and A. Whiten. 2008. Comparing social skills of children and apes. *Science* 319 (5863): 569–69.

Diaz, V., and M. J. Farrar. 2017. The missing explanation of bilinguals false-belief advantage: A longitudinal study. *Developmental Science,* DOI: 10.1111/desc.12594.

Diesendruck, G. 2005. The principles of conventionality and contrast in word learning: An empirical examination. *Developmental Psychology* 41 (3): 451–63.

Diesendruck, G., N. Carmel, and L. Markson. 2010. Children's sensitivity to the conventionality of sources. *Child Development* 81 (2): 652–68.

Diessel, H., and M. Tomasello. 2001. The acquisition of finite complement clauses in English: A usage based approach to the development of grammatical constructions. *Cognitive Linguistics* 12: 97–141.

Doherty, M. J., and J. Perner. 1998. Metalinguistic awareness and theory of mind: Just two words for the same thing? *Cognitive Development* 13: 279–305.

Doise, W., G. Mugny, and A. N. Perret-Clermont. 1976. Social interaction and cognitive development: Further evidence. *European Journal of Social Psychology* 6 (2): 245–47.

Duguid, S., E. Wyman, A. F. Bullinger, K. Herfurth-Majstorovic, and M. Tomasello. 2014. Coordination strategies of chimpanzees and human children in a Stag Hunt game. *Proceedings of the Royal Society B, Biological Sciences* 281 (1796): 20141973.

Duguid, S., E. Wyman, S. Grüneisen, and M. Tomasello. Forthcoming. The strategies used by chimpanzees and children to solve a simple coordination problem.

Dunbar, R. 1996. *Grooming, Gossip and the Evolution of Language.* London: Faber & Faber.

Dunfield, K., V. A. Kuhlmeier, L. O'Connell, and E. Kelley. 2011. Examining the diversity of prosocial behavior: Helping, sharing, and comforting in infancy. *Infancy* 16 (3): 227–47.

Dunham, Y., A. S. Baron, and M. R. Banaji. 2008. The development of implicit intergroup cognition. *Trends in Cognitive Sciences* 12 (7): 248–53.

Durkheim, E. 1893 / 1984. *The Division of Labor in Society.* New York: Free Press.

Eckerman, C. O., C. C. Davis, and S. M. Didow. 1989. Toddlers' emerging ways of achieving social coordinations with a peer. *Child Development* 60 (2): 440–53.

Egyed, K., I. Király, and G. Gergely. 2013. Communicating shared knowledge in infancy. *Psychological Science* 24 (7): 1348–53.

Eisenberg, N., R. A. Fabes, and T. Spinrad. 2006. Prosocial development. In *Social Emotional, and Personality Development,* 6th ed. Vol. 3 of *Handbook of Child Psychology,* ed. N. Eisenberg, 646–718. Hoboken, NJ: John Wiley & Sons.

Endedijk, H., A. Cillessen, R. Cox, H. Bekkering, and S. Hunnius. 2015. The role of child characteristics and peer experiences in the development of peer cooperation. *Social Development* 24: 521–40.

Engelmann, J., J. Clift, E. Herrmann, and M. Tomasello. 2017. Social disappointment explains chimpanzees' behavior in the inequity aversion task. *Proceedings of the Royal Society B, Biological Sciences* 284 (1891): 20171502.

Engelmann, J. M., E. Herrmann, and M. Tomasello. 2012. Five-year olds, but not chimpanzees, attempt to manage their reputations. *PLoS One* 7 (10): e48433.

———. 2015. Chimpanzees trust conspecifics to engage in low-cost reciprocity. *Proceedings of the Royal Society B, Biological Sciences* 282 (1801): 20142803.

———. 2016a. The effects of being watched on resource acquisition in chimpanzees and human children. *Animal Cognition* 19: 147–51.

Engelmann, J. M., H. Over, E. Herrmann, and M. Tomasello. 2013. Young children care more about their reputation with ingroup members and potential reciprocators. *Developmental Science* 16 (6): 952–58.

Engelmann, J., D. Rapp, E. Herrmann, and M. Tomasello. 2016b. Young children (sometimes) do the right thing even when their peers do not. *Cognitive Development* 39: 86–92.

———. 2018. Concern for group reputation increases prosociality in young children. *Psychological Science* 29: 181–90.

Evans, N., and S. Levinson. 2009. The myth of language universals: Language diversity and its importance for cognitive science. *Behavioral and Brain Sciences* 32 (5): 429–92.

Fawcett, L. M., and A. F. Garton. 2005. The effect of peer collaboration on children's problem-solving ability. *British Journal of Educational Psychology* 75: 157–69.

Fehr, E., H. Bernhard, and B. Rockenbach. 2008. Egalitarianism in young children. *Nature* 454: 1079–83.

Fernyhough, C., and E. Fradley. 2005. Private speech on an executive task: Relations with task difficulty and task performance. *Cognitive Development* 20 (1): 103–20.

Ferrari, P. F., E. Visalberghi, A. Paukner, L. Fogassi, A. Ruggiero, and S. J. Suomi. 2006. Neonatal imitation in Rhesus macaques. *PLoS Biology* 4 (9): e302.

Fessler, D. M. T. 2004. Shame in two cultures: Implications for evolutionary approaches. *Journal of Cognition and Culture* 4 (2): 207–62.

Fiske, S. T. 2010. *Social Beings: Core Motives in Social Psychology.* 2nd ed. Hoboken, NJ: Wiley.

Fizke, E., D. Barthel, T. Peters, and H. Rakoczy. 2014. Executive function plays a role in coordinating different perspectives, particularly when one's own perspective is involved. *Cognition* 130 (3): 315–34.

Flavell, J. H., B. A. Everett, K. Croft, and E. R. Flavell. 1981. Young children's knowledge about visual perception: Further evidence for the level 1–level 2 distinction. *Developmental Psychology* 17 (1): 99–103.

Fletcher, G., F. Warneken, and M. Tomasello. 2012. Differences in cognitive processes underlying the collaborative activities of children and chimpanzees. *Cognitive Development* 27 (2): 136–53.

Flynn, E., and A. Whiten. 2008. Cultural transmission of tool use in young children: A diffusion chain study. *Social Development* 17 (3): 699–718.

Fodor, J. A. 1983. *The Modularity of Mind: An Essay on Faculty Psychology.* Cambridge, MA: MIT Press.

Frank, M. C., D. L. Everett, E. Fedorenko, and E. Gibson. 2008. Number as a cognitive technology: Evidence from Pirahã language and cognition. *Cognition* 108 (3): 819–24.

Friedman, O., and K. R. Neary. 2008. Determining who owns what: Do children infer ownership from first possession? *Cognition* 107 (3): 829–49.

Friedrich, D., and N. Southwood. 2011. Promises and trust. In *Promises and Agreements: Philosophical Essays,* ed. H. Sheinman, 275–92. New York: Oxford University Press.

Gampe, A., and M. M. Daum. 2018. How preschoolers react to norm violations is associated with culture. *Journal of Experimental Child Psychology* 165: 135–47.

Gaskins, S. 1999. Children's daily lives in a Mayan village: A case study of culturally constructed roles and activities. In *Children's Engagement in the World,* ed. A. Goncu, 25–81. Cambridge: Cambridge University Press.

———. 2006. Cultural perspectives on infant-caregiver interaction. In *The Roots of Human Sociality: Culture, Cognition, and Human Interaction,* ed. N. J. Enfield and S. Levinson, 279–98. Oxford: Berg Press.

Gelman, S., P. Goetz, B. Sarnecka, and J. Flukes. 2008. Generic language in parent–child conversations. *Language Learning and Development* 4 (1): 1–31.

Gelman, S., and L. Ramann 2003. Preschool children use linguistic form class and pragmatic cues to interpret generics. *Child Development* 74: 308–25.

Gelman, S., E. Ware, E. Manczak, and S. Graham. 2013. Children's sensitivity to the knowledge expressed in pedagogical and nonpedagogical contexts. *Developmental Psychology* 49 (3): 491–504.

Geraci, A., and L. Surian. 2011. The developmental roots of fairness: Infants' reactions to equal and unequal distributions of resources. *Developmental Science* 14: 1012–20.

Gergely, G., H. Bekkering, and I. Király. 2002. Rational imitation in preverbal infants. *Nature* 415 (6873): 755.

Gergely, G., and G. Csibra. 2006. Sylvia's recipe: The role of imitation and pedagogy in the transmission of cultural knowledge. In *Roots of Human Sociality: Culture, Cognition, and Interaction,* ed. N. J. Enfield and S. C. Levinson, 229–55. Oxford: Berg Press.

Gergely G., and J. S. Watson. 1996. The social biofeedback theory of parental affect-mirroring: The development of emotional self-awareness and self-control in infancy. *International Journal of Psychoanalysis* 77 (6): 1181–212.

Gilbert, M. 1989. *On Social Facts.* Princeton, NJ: Princeton University Press.

———. 2003. The structure of the social atom: Joint commitment as the foundation of human social behavior. In *Socializing Metaphysics,* ed. F. Schmitt, 39–64. Lanham, MD: Rowman & Littlefield.

———. 2011. Three dogmas about promising. In *Promises and Agreements: Philosophical Essays,* ed. H. Sheinman, 80–109. New York: Oxford University Press.

———. 2014. *Joint Commitment: How We Make the Social World.* New York: Oxford University Press.

Gilby, I. C. 2006. Meat sharing among the Gombe chimpanzees: Harassment and reciprocal exchange. *Animal Behaviour* 71 (4): 953–63.

Göckeritz, S., M. F. H. Schmidt, and M. Tomasello. 2014. Young children's creation and transmission of social norms. *Cognitive Development* 30: 81–95.

Goldin-Meadow, S. 2003. *The Resilience of Language: What Gesture Creation in Deaf Children Can Tell Us about How All Children Learn Language.* New York: Psychology Press.

Gomes, C. M., R. Mundry, and C. Boesch. 2009. Long-term reciprocation of grooming in wild West African chimpanzees. *Proceedings of the Royal Society of London B, Biological Sciences* 276 (1657): 699–706.

Goodall, J. 1986. *The Chimpanzees of Gombe: Patterns of Behavior.* Cambridge, MA: Belknap Press.

Gopnik, A., and A. N. Meltzoff. 1997. *Words, Thoughts, and Theories.* Cambridge, MA: MIT Press.

Gopnik, A., and H. M. Wellman. 2012. Reconstructing constructivism: causal models, Bayesian learning mechanisms, and the theory theory. *Psychological Bulletin* 138: 1085–108.

Gottlieb, G. 1997. *Synthesizing Nature-Nurture: Prenatal Roots of Instinctive Behavior.* New York: Psychology Press.

Gould, S. J. 1977. *Ontogeny and Phylogeny.* Cambridge, MA: Harvard University Press.

Gräfenhain, M., T. Behne, M. Carpenter, and M. Tomasello. 2009. Young children's understanding of joint commitments. *Developmental Psychology* 45 (5): 1430–43.

Gräfenhain, M., M. Carpenter, and M. Tomasello. 2013. Three-year-olds' understanding of the consequences of joint commitments. *PLoS One* 8 (9): e73039.

Graham, S., S. Nayer, and S. Gelman. 2011. Two-year-olds use the generic / nongeneric distinction to guide their inferences about novel kinds. *Child Development* 82: 493–507.

Grassmann, S., M. Stracke, and M. Tomasello. 2009. Two-year-olds exclude novel objects as potential referents of novel words based on pragmatics. *Cognition* 112 (3): 488–93.

Greenberg, J. R., K. Hamann, F. Warneken, and M. Tomasello. 2010. Chimpanzee helping in collaborative and non-collaborative contexts. *Animal Behaviour* 80 (5): 873–80.

Greenfield, P. M., and E. S. Savage-Rumbaugh. 1993. Comparing communicative competence in child and chimp: The pragmatics of repetition. *Journal of Child Language* 20: 1–26.

Grocke, P., F. Rossano, and M. Tomasello. 2015. Procedural justice in children: Preschoolers accept unequal resource distributions if the procedure provides equal opportunities. *Journal of Experimental Child Psychology* 140: 197–210.

———. 2018. Young children are more willing to accept group decisions in which they have had a voice. *Journal of Experimental Child Psychology* 166: 67–78.

Grosse, G., M. Carpenter, M. Tomasello, and T. Behne. 2010a. Infants communicate in order to be understood. *Developmental Psychology* 46 (6): 1710–22.

Grosse, G., H. Moll, and M. Tomasello. 2010b. 21-Month-olds understand the cooperative logic of requests. *Journal of Pragmatics* 42 (12): 3377–83.

Grosse, G., C. Schulz, M. Tomasello, and N. Katsos. In press. Differences and similarities in children's acquisition of different implicature types. *Glossa.*

Grosse, K., M. Carpenter, J. Call, and M. Tomasello. 2015. Differences in the ability of apes and children to instruct others using gestures. *Language Learning and Development* 11: 310–30.

Grosse Wiesmann, C., A. D. Friederici, D. Disla, N. Steinbeis, and T. Singer. 2017. Longitudinal evidence for 4-year-olds' but not 2- and 3-year-olds' false belief-related action anticipation. *Cognitive Development* 20: e12445.

Grüneisen, S., and M. Tomasello. 2017. Children coordinate in a recurrent conflict of interest by taking turns and along dominance asymmetries. *Developmental Psychology* 53: 265–73.

———. Forthcoming. How children use rules to coordinate in a recurrent social dilemma.

Grüneisen, S., E. Wyman, and M. Tomasello. 2015a. Children use salience to solve coordination problems. *Developmental Science* 18 (3): 495–501.

———. 2015b. Conforming to coordinate: Children use majority information for peer coordination. *British Journal of Developmental Psychology* 33 (1): 136–47.

———. 2015c. "I know you don't know I know . . .": Children use second-order false belief reasoning for peer coordination. *Child Development* 86 (1): 287–93.

Gurven, M. 2004. To give or not to give: An evolutionary ecology of human food transfers. *Behavioral and Brain Sciences* 27 (4): 543–83.

Haidt, J. 2012. *The Righteous Mind: Why Good People Are Divided by Politics and Religion.* New York: Pantheon.

Hale, C. M., and H. Tager-Flusberg. 2003. The influence of language on theory of mind: A training study. *Developmental Science* 6 (3): 346–59.

Halina, M., K. Liebal, and M. Tomasello. In press. Do chimpanzees (*Pan troglodytes*) and bonobos (*Pan paniscus*) point in order to direct attention? *PLOS One.*

Halina, M., F. Rossano, and M. Tomasello. 2013. The ontogenetic ritualization of bonobo gestures. *Animal Cognition* 16 (4): 653–66.

Hamann, K., J. Bender, and M. Tomasello. 2014. Meritocratic sharing is based on collaboration in 3-year-olds. *Developmental Psychology* 50 (1): 121–28.

Hamann, K., F. Warneken, J. R. Greenberg, and M. Tomasello. 2011. Collaboration encourages equal sharing in children but not in chimpanzees. *Nature* 476 (7360): 328–31.

Hamann, K., F. Warneken, and M. Tomasello. 2012. Children's developing commitments to joint goals. *Child Development* 83 (1): 137–45.

Hamlin, J. K., K. Wynn, and P. Bloom. 2007. Social evaluation by preverbal infants. *Nature* 450: 557–59.

Hardecker, S., J. Buryn-Weitzel, and M. Tomasello. Forthcoming. The double-edged sword of moral education: Instruction limits children's flexibility in moral situations.

Hardecker, S., M. F. H. Schmidt, M. Roden, and M. Tomasello. 2016. Young children's behavioral and emotional responses to different social norm violations. *Journal of Experimental Child Psychology* 150: 364–79.

Hardecker, S., M. F. H. Schmidt, and M. Tomasello. 2017. Children's developing understanding of the conventionality of rules. *Journal of Cognition and Development* 18 (2): 163–88.

Hardecker, S., and M. Tomasello. 2017. From imitation to implementation: How two- and three-year-old children learn to enforce social norms. *British Journal of Developmental Psychology* 35 (2): 237–48.

Hardy, S. A., and G. Carlo. 2005. Identity as a source of moral motivation. *Human Development* 48 (4): 232–56.

Hare, B., J. Call, B. Agnetta, and M. Tomasello. 2000. Chimpanzees know what conspecifics do and do not see. *Animal Behaviour* 59: 771–85.

Hare, B., J. Call, and M. Tomasello. 2001. Do chimpanzees know what conspecifics know and do not know? *Animal Behaviour* 61 (1): 139–51.

———. 2006. Chimpanzees deceive a human competitor by hiding. *Cognition* 101 (3): 495–514.

Hare, B., and S. Kwetuenda. 2010. Bonobos voluntarily share their own food with others. *Current Biology* 20 (5): R230–31.

Hare, B., and M. Tomasello. 2004. Chimpanzees are more skillful in competitive than in cooperative cognitive tasks. *Animal Behaviour* 68 (3): 571–81.

———. 2005. Human-like social skills in dogs? *Trends in Cognitive Sciences* 9 (9): 439–44.

Harris, P. L. 2005. Conversation, pretence, and theory of mind. In *Why Language Matters for Theory of Mind,* ed. J. W. Astington and J. Baird, 70–83. New York: Oxford University Press.

———. 2012. *Trusting What You're Told: How Children Learn from Others.* Cambridge, MA: Belknap Press.

Harris, P. L., and K. H. Corriveau. 2013. Judging for yourself versus listening to others: Conformity revisited. In *Navigating the Social World: What Infants, Children, and Other Species Can Teach Us,* ed. M. Banaji and S. Gelman, 230–34. New York: Oxford University Press.

Hart, B., and T. Risley. 1995. *Meaningful Differences in the Everyday Experience of Young American Children.* Baltimore: Paul H. Brookes.

Haun, D. B., and J. Call. 2008. Imitation recognition in great apes. *Current Biology* 18 (7): R288–90.

Haun, D. B., and H. Over. 2014. Like me: A homophily-based account of human culture. In *Cultural Evolution,* ed. P. J. Richerson and M. Christiansen, 75–85. Cambridge, MA: MIT Press.

Haun, D. B., and M. Tomasello. 2011. Conformity to peer pressure in preschool children. *Child Development* 82 (6): 1759–67.

———. 2014. Children conform to the behavior of peers: Great apes stick with what they know. *Psychological Science* 25: 2160–67.

Haux, L. M., J. M. Engelmann, E. Herrmann, and M. Tomasello. 2017. Do young children preferentially trust gossip or firsthand observation in choosing a collaborative partner? *Social Development* 26 (3): 466–74.

Hawkes, K. 2014. Primate sociality to human cooperation. Why us and not them? *Human Nature* 25 (1): 28–48.

Hawley, P. H., and G. J. Geldhof. 2012. Preschoolers' social dominance, moral cognition, and moral behavior: An evolutionary perspective. *Journal of Experimental Child Psychology* 112 (1): 18–35.

Helming, K. A., B. Strickland, and P. Jacob. 2014. Making sense of early false belief understanding. *Trends in Cognitive Sciences* 18 (4): 167–70.

Henderson, A. M., and S. A. Graham. 2005. Two-year-olds' appreciation of the shared nature of novel object labels. *Journal of Cognition and Development* 6 (3): 381–402.

Henderson, A. M., and A. L. Woodward. 2011. Let's work together: what do infants understand about collaborative goals? *Cognition* 121: 12–21.

Hepach, R., L. Benziad, and M. Tomasello. Forthcoming. Chimpanzees help with what you want; children help with what you need.

Hepach, R., N. Kante, and M. Tomasello. 2017a. Toddlers help a peer. *Child Development* 88 (5): 1642–52.

Hepach, R., S. Lambert, K. Haberl, and M. Tomasello. 2017b. Toddlers help anonymously. *Infancy* 22: 130–42.

Hepach, R., A. Vaish, K. Mueller, and M. Tomasello. 2017c. The relation between young children's physiological arousal and their motivation to help others. *Neuropsychologia,* DOI: 10.1016/j.neuropsychologia.2017.10.010.

Hepach, R., A. Vaish, and M. Tomasello. 2012. Young children are intrinsically motivated to see others helped. *Psychological Science* 23 (9): 967–72.

———. 2013. Young children sympathize less in response to unjustified emotional distress. *Developmental Psychology* 49 (6): 1132–38.

———. 2017d. Children's intrinsic motivation to provide help themselves after accidentally harming others. *Child Development* 88: 1251–64.

———. 2017e. The fulfilment of others' needs elevates children's body posture. *Developmental Psychology* 53: 100–13.

Herrmann, E., J. Call, M. V. Hernández-Lloreda, B. Hare, and M. Tomasello. 2007. Humans have evolved specialized skills of social cognition: The cultural intelligence hypothesis. *Science* 317 (5843): 1360–66.

Herrmann, E., J. Engelmann, and M. Tomasello. Forthcoming. Young children engage in competitive altruism.

Herrmann, E., M. V. Hernández-Lloreda, J. Call, B. Hare, and M. Tomasello. 2010. The structure of individual differences in the cognitive abilities of children and chimpanzees. *Psychological Science* 21 (1): 102–10.

Herrmann, E., A. P. Melis, and M. Tomasello. 2006. Apes' use of iconic cues in the object-choice task. *Animal Cognition* 9 (2): 118–30.

Herrmann, E., A. Misch, M. V. Hernández-Lloreda, and M. Tomasello. 2015. Uniquely human self-control begins at school age. *Developmental Science* 18 (6): 979–93.

Herrmann, P., C. Legare, P. Harris, and H. Whitehouse. 2013. Stick to the script: The effect of witnessing multiple actors on children's imitation. *Cognition* 129: 536–43.

Hewlett, B. S., and C. J. Roulette. 2016. Teaching in hunter–gatherer infancy. *Royal Society Open Science 3*: 150403.

Heyes, C. M. 2015. Animal mindreading: What's the problem? *Psychonomic Bulletin and Review* 22: 313–27.

Heyes, C. M., and C. D. Frith. 2014. The cultural evolution of mind reading. *Science* 344 (6190): 1243091.

Heyman, G. D., G. Fu, J. Lin, M. K. Qian, and K. Lee. 2015. Eliciting promises from children reduces cheating. *Journal of Experimental Child Psychology* 139: 242–48.

Hill, K., M. Barton, and A. M. Hurtado. 2009. The emergence of human uniqueness: Characters underlying behavioral modernity. *Evolutionary Anthropology* 18 (5): 187–200.

Hirata, S. 2007. Competitive and cooperative aspects of social intelligence in chimpanzees. *Japanese Journal of Animal Psychology* 57: 29–40.

Hobson, J. A., R. Harris, R. García-Pérez, and R. P. Hobson. 2009. Anticipatory concern: A study in autism. *Developmental Science* 12 (2): 249–63.

Hobson, J. A., and R. P. Hobson. 2007. Identification: The missing link between joint attention and imitation? *Development and Psychopathology* 19 (2): 411–31.

Hobson, P. 2002. *The Cradle of Thought: Exploring the Origins of Thinking.* London: Pan Macmillan.

Hobson, R. P., and J. A. Hobson. 2008. Dissociable aspects of imitation: A study in autism. *Journal of Experimental Child Psychology* 101 (3): 170–85.

Hobson, R. P., and A. Lee. 1999. Imitation and identification in autism. *Journal of Child Psychology and Psychiatry* 40: 649–59.

Hoffman, M. L. 2000. *Empathy and Moral Development: Implications for Caring and Justice.* Cambridge: Cambridge University Press.

Honneth, A. 1995. *The Struggle for Recognition: The Moral Grammar of Social Conflicts.* Cambridge: Polity Press.

Hopper L. M., S. P. Lambeth, S. J. Schapiro, and S. F. Brosnan. 2013. When given the opportunity, chimpanzees maximize personal gain rather than "level the playing field." *PeerJ* 1: e165.

Horner, V., and A. Whiten. 2005. Causal knowledge and imitation / emulation switching in chimpanzees (*Pan troglodytes*) and children. *Animal Cognition* 8 (3): 164–81.

Horner, V., A. Whiten, E. Flynn, and F. B. M. de Waal. 2006. Faithful replication of foraging techniques along cultural transmission chains by chimpanzees and children. *Proceedings of the National Academy of Sciences of the United States of America* 103 (37): 13878–83.

House, B. R., J. Henrich, S. F. Brosnan, and J. B. Silk. 2012. The ontogeny of human prosociality: Behavioral experiments with children aged 3 to 8. *Evolution and Human Behavior* 33 (4): 291–308.

House, B. R., J. B. Silk, J. Henrich, H. C. Barrett, B. A. Scelza, A. H. Boyette, B. S. Hewlett, and S. Laurence. 2013. Ontogeny of prosocial behavior across diverse societies. *Proceedings of the National Academy of Sciences of the United States of America* 110 (36): 14586–91.

House, B. R., and M. Tomasello. 2018. Modeling social norms increasingly influences costly sharing in middle childhood. *Journal of Experimental Child Psychology* 171: 84–98.

Hrdy, S. 2006. Evolutionary context of human development: The cooperative breeding model. In *Attachment and Bonding: A New Synthesis,* ed. C. S. Carter, L. Ahnert, K. E. Grossmann, S. B. Hrdy, M. E. Lamb, S. W. Porges, and N. Sachser, 9–32. Cambridge, MA: MIT Press.

———. 2009. *Mothers and Others: The Evolutionary Origins of Mutual Understanding.* Cambridge, MA: Belknap Press.

———. 2016. Development plus social selection in the emergence of "emotionally modern" humans. In *Childhood: Origins, Evolution, and Implications,* ed. C. L. Meehan and A. N. Crittenden, 11–44. Albuquerque: University of New Mexico Press.

Humle, T., and T. Matsusawa. 2002. Ant-dipping among the chimpanzees of Bossou, Guinea, and some comparisons with other sites. *American Journal of Primatology* 58: 133–48.

Ibbotson, P. 2014. Little dictators: a developmental meta-analysis of prosocial behavior. *Current Anthropology* 55 (6): 814–21.

Iverson, J., O. Capirci, and M. C. Caselli. 1994. From communication to language in two modalities. *Cognitive Development* 9: 23–43.

Iverson, J., and S. Goldin-Meadow. 2005. Gesture paves the way for language development. *Psychological Science* 16: 367–73.

Jensen, K., J. Call, and M. Tomasello. 2007. Chimpanzees are rational maximizers in an ultimatum game. *Science* 318 (5847): 107–9.

Jensen, K., B. Hare, J. Call, and M. Tomasello. 2006. What's in it for me? Self-regard precludes altruism and spite in chimpanzees. *Proceedings of the Royal Society B, Biological Sciences* 273 (1589): 1013–21.

Jordan, J., K. McAuliffe, and F. Warneken. 2014. Development of in-group favoritism in children's third-party punishment of selfishness. *Proceedings of the National Academy of Sciences of the United States of America* 111 (35): 12710–15.

Kachel, G., R. Moore, and M. Tomasello. In press. Two-year-olds use adults' but not peers' points. *Developmental Science.*

Kachel, U., M. Svetlova, and M. Tomasello. 2017. Three-year-olds' reactions to a partner's failure to perform her role in a joint commitment. *Child Development,* DOI: 10.1111/cdev.12816.

———. Forthcoming. Young children's tendencies to stand by a commitment in the face of bribes.

Kahneman, D., J. L. Knetsch, and R. H. Thaler. 1991. Anomalies: The endowment effect, loss aversion, and status quo bias. *Journal of Economic Perspectives* 5 (1): 193–206.

Kaiser, I., K. Jensen, J. Call, and M. Tomasello. 2012. Theft in an ultimatum game: Chimpanzees and bonobos are insensitive to unfairness. *Biology Letters* 8 (6): 942–45.

Kalish, C. 2005. Becoming status conscious: Children's appreciation of social reality. *Philosophical Explorations* 8 (3): 245–63.

Kalish, C. W., and M. A. Sabbagh. 2007. Conventionality and cognitive development: Learning to think the right way. *New Directions for Child and Adolescent Development* 115: 1–9.

Kaminski, J., J. Call, and M. Tomasello. 2004. Body orientation and face orientation: Two factors controlling apes' begging behavior from humans. *Animal Cognition* 7 (4): 216–23.

———. 2008. Chimpanzees know what others know, but not what they believe. *Cognition* 109 (2): 224–34.

Kanngiesser, P., N. Gjersoe, and B. M. Hood. 2010. The effect of creative labor on property-ownership transfer by preschool children and adults. *Psychological Science* 21 (9): 1236–41.

Kanngiesser, P., B. Köymen, and M. Tomasello. 2017. Young children mostly keep, and expect others to keep, their promises. *Journal of Experimental Child Psychology* 159: 140–58.

Kanngiesser, P., F. Rossano, R. Frickel, A. Tomm, D. Haun, H. Zeidler, and M. Tomasello. Forthcoming. Respect for ownership in human children from diverse societies, but not great apes.

Kanngiesser, P., F. Rossano, and M. Tomasello. 2015. Late emergence of the first possession heuristic: Evidence from a small-scale culture. *Child Development* 86 (4): 1282–89.

Kanngiesser, P., and F. Warneken. 2012. Young children consider merit when sharing resources with others. *PLoS One* 7 (8): 1–5.

Kano, F., S. Hirata, T. Dreschner, V. Behringer, and J. Call. 2016. Nasal temperature drop in response to a playback of conspecific fights in chimpanzees: A thermo-imaging study. *Physiology and Behavior* 155: 83–94.

Karg, K., M. Schmelz, J. Call, and M. Tomasello. 2014. All great ape species and two-and-a-half-year-old children discriminate appearance from reality. *Journal of Comparative Psychology* 128 (4): 431–39.

———. 2015a. Chimpanzees strategically manipulate what others can see. *Animal Cognition* 18: 1069–76.

———. 2015b. The goggles experiment: Can chimpanzees use self-experience to infer what a competitor can see? *Animal Behavior* 105: 211–21.

Karmiloff-Smith, A. 1992. *Beyond Modularity: A Developmental Perspective on Cognitive Science.* Cambridge, MA: MIT Press / Bradford Books.

Karmiloff-Smith, A., and B. Inhelder. 1975. If you want to get ahead, get a theory. *Cognition* 3 (3): 195–212.

Kaye, K. 1982. *The Mental and Social Life of Babies.* Chicago: University of Chicago Press.

Kenward, B. 2012. Over-imitating preschoolers believe unnecessary actions are normative and enforce their performance by a third party. *Journal of Experimental Child Psychology* 112 (2): 195–207.

Kenward, B., and M. Dahl. 2011. Preschoolers distribute resources according to recipients' moral status. *Developmental Psychology* 47: 1054–64.

Kenward, B., and T. Östh. 2012. Enactment of third-party punishment by 4-year-olds. *Frontiers in Psychology* 3: 373.

———. 2015. Five-year-olds punish antisocial adults. *Aggressive Behavior* 41 (5): 413–20.

Killen, M., K. L. Mulvey, and A. Hitti. 2013. Social exclusion in childhood: A developmental intergroup perspective. *Child Development* 84 (3): 772–90.

Kim, S., and C. W. Kalish. 2009. Children's ascriptions of property rights with changes of ownership. *Cognitive Development* 24: 322–36.

Kinzler, K. D., Corriveau, K. H., and P. L. Harris. 2011. Children's selective trust in native-accented speakers. *Developmental Science* 14 (1): 106–11.

Kinzler, K. D., K. Shutts, J. DeJesus, and E. S. Spelke. 2009. Accent trumps race in guiding children's social preferences. *Social Cognition* 27 (4): 623–34.

Kirschner, S., and M. Tomasello. 2010. Joint music making promotes prosocial behavior in 4-year-old children. *Evolution and Human Behavior* 31 (5): 354–64.

Kobayashi, H., and S. Koshima. 1997. Unique morphology of the human eye. *Nature* 387: 767–68.

Kohlberg, L. 1969. Stages and sequences: The cognitive development approach to socialization. In *Handbook of Socialization Theory of Research,* ed. R. McNally and D. A. Gosin, 347–480. Chicago: Rand McNally.

Köhler, W. 1925. *The Mentality of Apes.* London: Kegan Paul.

Korsgaard, C. 1996. *The Sources of Normativity.* Cambridge: Cambridge University Press.

Köster, M., X. Ohmer, T. D. Nguyen, and J. Kärtner. 2016. Infants understand others' needs. *Psychological Science* 27 (4): 542–48.

Köymen, B., E. V. M. Lieven, D. A. Engemann, H. Rakoczy, F. Warneken, and M. Tomasello. 2014a. Children's norm enforcement in their interactions with peers. *Child Development* 85 (3): 1108–22.

Köymen, B., M. Mammen, and M. Tomasello. 2016. Preschoolers use common ground in their justificatory reasoning with peers. *Developmental Psychology* 52 (3): 423–29.

Köymen, B., L. Rosenbaum, and M. Tomasello. 2014b. Reasoning during joint decision-making by preschool peers. *Cognitive Development* 32: 74–85.

Köymen, B., M. Schmidt, E. Lieven, and M. Tomasello. 2015. Teaching versus enforcing norms in preschoolers' peer interactions. *Journal of Experimental Child Psychology* 135: 93–101.

Köymen, B., and M. Tomasello. 2018. Children's meta-talk in their collaborative decision-making with peers. *Journal of Experimental Child Psychology* 166: 549–66.

Krachun, C., M. Carpenter, J. Call, and M. Tomasello. 2009. A competitive nonverbal false belief task for children and apes. *Developmental Science* 12 (4): 521–35.

Kruger, A. 1992. The effect of peer and adult–child transactive discussions on moral reasoning. *Merrill-Palmer Quarterly* 38 (2): 191–211.

———. 1993. Peer collaboration: Conflict, cooperation, or both? *Social Development* 2 (3): 165–82.

Kruger, A., and M. Tomasello. 1986. Transactive discussions with peers and adults. *Developmental Psychology* 22: 681–85.

———. 1996. Cultural learning and learning culture. In *Handbook of Education and Human Development: New Models of Teaching, Learning, and Schooling,* ed. D. R. Olson and N. Torrance, 369–87. Malden, MA: Blackwell.

Krupenye, C., and B. Hare. 2018. Bonobos prefer individuals that hinder others over those that help. *Current Biology* 28: 1–7.
Krupenye, C., F. Kano, J. Call, S. Hirata, and M. Tomasello. 2016. Great apes anticipate that other individuals will act according to false beliefs. *Science* 354: 110–14.
Kuhlmeier, V., K. Wynn, and P. Bloom. 2003. Attribution of dispositional states by 12-month-olds. *Psychological Science* 14 (5): 402–8.
Kuhn, D. 2015. Thinking together and alone. *Educational Researcher* 44: 46–53.
Kummer, H. 1995. *In Quest of the Sacred Baboon.* Princeton, NJ: Princeton University Press.
Kurzban, R., M. N. Burton-Chellew, and S. A. West. 2015. The evolution of altruism in humans. *Annual Review of Psychology* 66: 575–99.
Lakatos, I. 1970. Falsification and the methodology of scientific research programmes. In *Criticism and the Growth of Knowledge,* ed. I. Lakatos and A. Musgrave, 91–195. Cambridge, MA: Cambridge University Press.
Leavens, D. A., and W. D. Hopkins. 1998. Intentional communication by chimpanzees: A cross-sectional study of the use of referential gestures. *Developmental Psychology* 34: 813–22.
Lee, W. S. C., and S. M. Carlson. 2015. Knowing when to be "rational": Economic decision-making and executive function in preschool children. *Child Development* 86 (5): 1434–48.
Leslie, A. 1987. Pretense and representation: The origins of "theory of mind." *Psychological Review* 94: 412–26.
———. 1994. Pretending and believing: Issues in the theory of ToMM. *Cognition* 50 (1–3): 211–38.
LeVine, R. A., S. Dixon, S. LeVine, A. Richman, H. P. Liederman, C. H. Keefer, and T. B. Brazelton. 1994. *Child Care and Culture: Lessons from Africa.* Cambridge: Cambridge University Press.
Lewis, M. 2000. Self-conscious emotions: Embarrassment, pride, shame, and guilt. In *Handbook of emotions,* 2nd ed., ed. M. Lewis and J. M. Haviland-Jones, 623–36. New York: Guilford Press.
Lickel, B., T. Schmader, and M. Spanovic. 2007. Group-conscious emotions: The implications of others' wrongdoings for identity and relationships. In *The Self-Conscious Emotions: Theory and Research,* J. L. Tracy, R. W. Robins, and J. P. Tangney, 351–69. New York: Guilford Press.
Liebal, K., T. Behne, M. Carpenter, and M. Tomasello. 2009. Infants use shared experience to interpret pointing gestures. *Developmental Science* 12 (2): 264–71.
Liebal, K., M. Carpenter, and M. Tomasello. 2011. Young children's understanding of markedness in non-verbal communication. *Journal of Child Language* 38 (4): 888–903.
———. 2013. Young children's understanding of cultural common ground. *British Journal of Developmental Psychology* 31 (1): 88–96.
Liebal, K., C. Colombi, Rogers, S. J., F. Warneken, and M. Tomasello. 2008. Helping and cooperation in children with autism. *Journal of Autism and Developmental Disorders* 38 (2): 224–38.
Liebal, K., A. Vaish, D. Haun, and M. Tomasello. 2014. Does sympathy motivate prosocial behaviour in great apes? *PLoS One* 9 (1): e84299.
Lieven, E. V. M., and S. Stoll. 2013. Early communicative development in two cultures: A comparison of the communicative environments of children from two cultures. *Human Development* 56 (3): 178–206.
Lieven, E., and M. Tomasello. 2008. Children's first language acquisition from a usage-based perspective. In *Handbook of Cognitive Linguistics and Second Language Acquisition,* ed. P. Robinson, and N. C. Ellis, 168–96. New York: Routledge.
Liszkowski, U., P. Brown, T. Callaghan, A. Takada, and C. de Vos. 2012. A prelinguistic gestural universal of human communication. *Cognitive Science* 36: 698–713.
Liszkowski, U., M. Carpenter, A. Henning, T. Striano, and M. Tomasello. 2004. Twelve-month-olds point to share attention and interest. *Developmental Science* 7 (3): 297–307.
Liszkowski, U., M. Carpenter, T. Striano, and M. Tomasello. 2006. Twelve- and 18-month-olds point to provide information for others. *Journal of Cognition and Development* 7 (2): 173–87.

Liszkowski, U., M. Carpenter, and M. Tomasello. 2007. Pointing out new news, old news, and absent referents at 12 months of age. *Developmental Science* 10 (2): F1–F7.

———. 2008. Twelve-month-olds communicate helpfully and appropriately for knowledgeable and ignorant partners. *Cognition* 108 (3): 732–39.

Liszkowski, U., and M. Tomasello. 2011. Individual differences in social, cognitive, and morphological aspects of infant pointing. *Cognitive Development* 26 (1): 16–29.

Lohmann, H., and M. Tomasello. 2003. The role of language in the development of false belief understanding: A training study. *Child Development* 74 (4): 1130–44.

López, A., M. Correa-Chávez, B. Rogoff, and K. Gutiérrez. 2010. Attention to instruction directed to another by U.S. Mexican-heritage children of varying cultural backgrounds. *Developmental Psychology* 46 (3): 593–601.

Loveland, K. A., and S. H. Landry. 1986. Joint attention and language in autism and developmental language delay. *Journal of Autism and Developmental Disorders* 16 (3): 335–49.

Lucca, K., E. MacLean, and B. Hare. 2017. The development and flexibility of gaze alternations in bonobos and chimpanzees. *Developmental Science.* DOI: 10.1111/desc.12598.

Lurz, R. W. 2011. *Mindreading Animals: The Debate over What Animals Know about Other Minds.* Cambridge, MA: MIT Press.

Lyons, D. E., L. R. Santos, and F. C. Keil. 2006. Reflections of other minds: How primate social cognition can inform the function of mirror neurons. *Current Opinion in Neurobiology* 16: 230–34.

Lyons, D. E., A. G. Young, and F. C. Keil. 2007. The hidden structure of overimitation *Proceedings of the National Academy of Sciences of the United States of America* 104 (50): 19751–56.

Machiavelli, N. 1513 / 1988. *The Prince.* Edited by Q. Skinner and R. Price. Cambridge: Cambridge University Press.

Mannle, S., M. Barton, and M. Tomasello. 1992. Two-year-olds conversations with their mothers and preschool-aged siblings. *First Language* 12: 57–71.

Markman, E. 1989. *Categorization and Naming in Children.* Cambridge, MA: MIT Press.

Marlowe, F. W., J. C. Berbesque, A. Barr, C. Barrett, A. Bolyanatz, J. C. Cardenas, J. Ensminger, M. Gurven, E. Gwako, J. Henrich, N. Henrich, C. Lesorogol, R. McElreath, and D. Tracer. 2008. More "altruistic" punishment in larger societies. *Proceedings of the Royal Society B, Biological Sciences* 275: 587–90.

Martin, A., and K. R. Olson. 2013. When kids know better: Paternalistic helping in 3-year-old children. *Developmental Psychology* 49 (11): 2071–81.

Masangkay, Z. S., K. A. McCluskey, C. W. McIntyre, J. Sims-Knight, B. E. Vaughn, and J. H. Flavell. 1974. The early development of inferences about the visual percepts of others. *Child Development* 45: 357–66.

Matsui, T., H. Rakoczy, Y. Miura, and M. Tomasello. 2009. Understanding of speaker certainty and false-belief reasoning: A comparison of Japanese and German preschoolers. *Developmental Science* 12 (4): 602–13.

Matthews, D., T. Behne, E. Lieven, and M. Tomasello. 2012. Origins of the human pointing gesture: A training study. *Developmental Science* 15: 817–29.

Matthews, D., E. Lieven, A. L. Theakston, and M. Tomasello. 2006. The effect of perceptual availability and prior discourse on young children's use of referring expression. *Applied Psycholinguistics* 27 (3): 403–22.

Matthews, D., E. Lieven, and M. Tomasello. 2010. What's in a manner of speaking? Children's sensitivity to partner-specific referential precedents. *Developmental Psychology* 46 (4): 749–60.

Maynard Smith, J., and M. Szathmáry. 1995. *Major Transitions in Evolution.* New York: Oxford University Press.

McAuliffe, K., P. R. Blake, N. Steinbeis, and F. Warneken. 2017. The developmental foundations of human fairness. *Nature Human Behaviour* 1 :0042; DOI: 10.1038/s41562-016-0042.

McAuliffe, K., J. Jordan, and F. Warneken. 2015. Costly third-party punishment in young children. *Cognition* 134: 1–10.

McAuliffe, K., N. J. Raihani, and Y. Dunham. In press. Children are sensitive to norms of giving. *Cognition*.

McGrew, W. C. 1989. Why is ape tool-use so confusing? In *Comparative Socioecology: The Behavioural Ecology of Humans and Other Mammals,* ed. V. Standen, and R. A. Foley, 457–72. Oxford: Blackwell.

McGuigan, N., and M. J. Doherty. 2002. The relation between hiding skill and judgment of eye direction in preschool children. *Developmental Psychology* 38 (3): 418–27.

McGuigan, N., J. Makinson, and A. Whiten. 2011. From over-imitation to super-copying: Adults imitate causally irrelevant aspects of tool use with higher fidelity than young children. *British Journal of Psychology* 102 (1): 1–18.

McGuigan, N., and A. Stevenson. 2016. Does the age and familiarity of the informant group influence the tendency of 3- and 4-year-old children to conform? *Journal of Genetic Psychology* 177 (4): 122–30.

Mejia-Arauz, R., B. Rogoff, A. Dexter, and B. Najafi. 2007. Cultural variation in children's social organization. *Child Development* 78 (3): 1001–14.

Melis, A. P., J. Call, and M. Tomasello. 2006a. Chimpanzees (*Pan troglodytes*) conceal visual and auditory information from others. *Journal of Comparative Psychology* 120 (2): 154–62.

———. 2010. 36-Month-olds conceal visual and auditory information from others. *Developmental Science* 13 (3): 479–89.

Melis, A. P., A. Floedl, and M. Tomasello. 2015. Non-egalitarian allocations among preschool peers in a face-to-face bargaining task. *PLoS One* 10 (3): e0120494.

Melis, A., P. Grocke, J. Kalbitz, and M. Tomasello. 2016. One for you, one for me: Humans' unique turn-taking skills. *Psychological Science* 27: 987–96.

Melis, A. P., B. Hare, and M. Tomasello. 2006b. Chimpanzees recruit the best collaborators. *Science* 311 (5765): 1297–300.

———. 2006c. Engineering cooperation in chimpanzees: Tolerance constraints on cooperation. *Animal Behaviour* 72 (2): 275–86.

———. 2009. Chimpanzees coordinate in a negotiation game. *Evolution and Human Behavior* 30 (6): 381–92.

Melis, A. P., and M. Tomasello. 2013. Chimpanzees' (*Pan troglodytes*) strategic helping in a collaborative task. *Biology Letters* 9: 20130009.

Melis, A. P., F. Warneken, K. Jensen, A.-C. Schneider, J. Call, and M. Tomasello. 2011. Chimpanzees help conspecifics obtain food and non-food items. *Proceedings of the Royal Society B, Biological Sciences* 278 (1710): 1405–13.

Meltzoff, A. 1995. Understanding the intentions of others: Re-enactment of intended acts by 18-month-old children. *Developmental Psychology* 31: 1–16.

———. 2007. The "like me" framework for recognizing and becoming an intentional agent. *Acta Psychologica* 124: 26–43.

Mercier, H., S. Bernard, and F. Clément. 2014. Early sensitivity to arguments: How preschoolers weight circular arguments. *Journal of Experimental Child Psychology* 125: 102–9.

Mercier, H., and D. Sperber. 2011. Why do humans reason? Arguments for an argumentative theory. *Behavioral and Brain Science* 34 (2): 57–74.

Milligan, K., J. W. Astington, and L. A. Dack. 2007. Language and theory of mind: Metaanalysis of the relation between language ability and false-belief understanding. *Child Development* 78 (2): 622–46.

Misch, A., H. Over, and M. Carpenter. 2014. Stick with your group: Young children's attitudes about group loyalty. *Journal of Experimental Child Psychology* 126: 19–36.

Moll, H., M. Carpenter, and M. Tomasello. 2007. Fourteen-month-olds know what others experience only in joint engagement. *Developmental Science* 10 (6): 826–35.

———. 2014. Two- and three-year-olds know what others have and have not heard. *Journal of Cognition and Development* 15 (1): 12–21.

Moll, H., and D. Kadipasaoglu. 2013. The primacy of social over visual perspective-taking. *Frontiers in Human Neuroscience* 7: 558.

Moll, H., C. Koring, M. Carpenter, and M. Tomasello. 2006. Infants determine others' focus of attention by pragmatics and exclusion. *Journal of Cognition and Development* 7 (3): 411–30.

Moll, H., and A. N. Meltzoff. 2011. How does it look? Level 2 perspective-taking at 36 months of age. *Child Development* 82 (2): 661–73.

Moll, H., A. N. Meltzoff, K. Merzsch, and M. Tomasello. 2013. Taking versus confronting visual perspectives in preschool children. *Developmental Psychology* 49 (4): 646–54.

Moll, H., N. Richter, M. Carpenter, and M. Tomasello. 2008. Fourteen-month-olds know what "we" have shared in a special way. *Infancy* 13 (1): 90–101.

Moll, H., and M. Tomasello. 2004. 12- and 18-month-old infants follow gaze to spaces behind barrier. *Developmental Science* 7 (1): F1–F9.

———. 2006. Level 1 perspective-taking at 24 months of age. *British Journal of Developmental Psychology* 24 (3): 603–13.

———. 2007a. Cooperation and human cognition: The Vygotskian intelligence hypothesis. *Philosophical Transactions of the Royal Society B, Biological Sciences* 362 (1480): 639–48.

———. 2007b. How 14- and 18-month-olds know what others have experienced. *Developmental Psychology* 43 (2): 309–17.

———. 2012. Three-year-olds understand appearance and reality—just not about the same object at the same time. *Developmental Psychology* 48 (4): 1124–32.

Moore, C. 2009. Fairness in children's resource allocation depends on the recipient. *Psychological Science* 20 (8): 944–48.

Mueller, M. N., and J. C. Mitani. 2005. Conflict and cooperation in wild chimpanzees. *Advances in the Study of Behavior* 35: 275–331.

Mugny, G., and W. Doise. 1978. Socio-cognitive conflict and structure of individual and collective performances. *European Journal of Social Psychology* 8 (2): 181–92.

Mundy, P. 2003. Annotation: the neural basis of social impairments in autism: The role of the dorsal medial-frontal cortex and anterior cingulate system. *Journal of Child Psychology and Psychiatry* 44 (6): 793–809.

Mundy, P., and L. Newell. 2007. Attention, joint attention, and social cognition. *Current Directions in Psychological Science* 16 (5): 269–74.

Mundy, P., M. Sigman, and C. Kasari. 1990. A longitudinal study of joint attention and language development in autistic children. *Journal of Autism and Developmental Disorders* 20 (1): 115–28.

Murray, L., and C. Trevarthen. 1985. Emotional regulation of interactions between two-month-olds and their mothers. In *Social Perception in Infants,* ed. T. M. Field and N. A. Fox, 177–97. Norwood, NJ: Ablex.

Myowa, M. 1996. Imitation of facial gestures by an infant chimpanzee. *Primates* 37: 207–13.

Myowa-Yamakoshi, M., M. Tomonaga, M. Tanaka, and T. Matsuzawa. 2004. Imitation in neonatal chimpanzees (*Pan troglodytes*). *Developmental Science* 7 (4): 437–42.

Nadel, J. 2002. Imitation and imitation recognition: Functional use in preverbal infants and nonverbal children with autism. In *The Imitative Mind: Development, Evolution, and Brain Bases,* ed. A. Meltzoff, and W. Prinz, 42–62. Cambridge: Cambridge University Press.

Nagel, T. 1970. *The Possibility of Altruism.* Princeton, NJ: Princeton University Press.

———. 1986. *The View from Nowhere.* New York: Oxford University Press.

Nagell, K., R. Olguin, and M. Tomasello. 1993. Processes of social learning in the tool use of chimpanzees (*Pan troglodytes*) and human children (*Homo sapiens*). *Journal of Comparative Psychology* 107: 174–86.

Neary, K. R., and O. Friedman. 2013. The origin of children's appreciation of ownership rights. In *Navigating the Social World: What Infants, Children, and Other Species Can Teach Us,* ed. M. R. Banaji and S. A. Gelman, 356–60. Oxford: Oxford University Press.

Neary, K. R., O. Friedman, and C. L. Burnstein. 2009. Preschoolers infer ownership from "control of permission." *Developmental Psychology* 45: 873–76.

Nelson, P. B., L. B. Adamson, and R. Bakeman. 2008. Toddlers' joint engagement experience facilitates preschoolers' acquisition of theory of mind. *Developmental Science* 11 (6): 847–52.

Ng, R., G. D. Heyman, and D. Barner. 2011. Collaboration promotes proportional reasoning about resource distribution in young children. *Developmental Psychology* 47 (5): 1230–38.

Nichols, S., M. Svetlova, and C. Brownell. 2009. The role of social understanding and empathic disposition in young children's responsiveness to distress in parents and peers. *Cognition, Brain, Behavior* 4: 449–78.

Nielsen, M. 2006. Copying actions and copying outcomes: Social learning through the second year. *Developmental Psychology* 42: 555–65.

Nielsen, M., and K. Hudry. 2010. Over-imitation in children with autism and Down syndrome. *Australian Journal of Psychology* 62: 67–74.

Nielsen, M., G. Simcock, and L. Jenkins. 2008. The effect of social engagement on 24-month-olds' imitation from live and televised models. *Developmental Science* 11: 722–31.

Nielsen, M., and K. Tomaselli. 2010. Overimitation in Kalahari Bushman children and the origins of human cultural cognition. *Psychological Science* 21 (5): 729–36.

Nielsen, M., K. Tomaselli, I. Mushin, and A. Whiten. 2014. Where culture takes hold: "Overimitation" and its flexible deployment in Western, Aboriginal, and Bushmen children. *Child Development* 85: 2169–84.

Ninio, A. 2016. Bids for joint attention by parent–child dyads and by dyads of young peers in interaction. *Journal of Child Language* 43: 135–56.

Noyes, A., and Y. Dunham. 2017. Mutual intentions as a causal framework for social groups. *Cognition* 162: 133–42.

Okamoto, S., M. Tanaka, and M. Tomonaga. 2004. Looking back: The "representational mechanism" of joint attention in an infant chimpanzee (*Pan troglodytes*). *Japanese Psychological Research* 46 (3): 236–45.

Okamoto-Barth, S., J. Call, and M. Tomasello. 2007. Great apes' understanding of other individuals' line of sight. *Psychological Science* 18 (5): 462–68.

Oktay-Gür, N., A. Schulz, and H. Rakoczy. 2018. Children exhibit different performance patterns in explicit and implicit theory of mind tasks. *Cognition* 173: 60–74.

Olson, K. R., and E. S. Spelke. 2008. Foundations of cooperation in young children. *Cognition* 108 (1): 222–31.

O'Madagain, C., K. Helming, and M. Tomasello. Forthcoming. Young children understand their own beliefs as corrigible.

O'Madagain, C., and M. Tomasello. Forthcoming. Joint attention to mental content.

Onishi, K. H., and R. Baillargeon. 2005. Do 15-month-old infants understand false beliefs? *Science* 308: 255–58.

Over, H., and M. Carpenter. 2012. Putting the social into social learning: Explaining both selectivity and fidelity in children's copying behavior. *Journal of Comparative Psychology* 126 (2): 182–92.

Over, H., A. Vaish, and M. Tomasello. 2016. Do young children accept responsibility for the negative actions of ingroup members? *Cognitive Development* 40: 24–32.

Ozcaliskan, S., and S. Goldin-Meadow. 2005. Gesture is at the cutting edge of language development. *Cognition* 96: B101–13.

Paulus, M. 2014. The emergence of prosocial behavior: Why do infants and toddlers help, comfort, and share? *Child Development Perspectives* 8: 77–81.

Paulus, M., S. Gillis, J. Li, and C. Moore. 2013. Preschool children involve a third party in a dyadic sharing situation based on fairness. *Journal of Experimental Child Psychology* 116 (1): 78–85.

Pea, R. D. 1982. Origins of verbal logic: Spontaneous denials by two- and three-year olds. *Journal of Child Language* 9 (3): 597–626.

Perner, J., J. Brandl, and A. Garnham. 2003. What is a perspective problem? Developmental issues in understanding belief and dual identity. *Facta Philosophica* 5: 355–78.

Perner, J., M. C. Mauer, and M. Hildenbrand. 2011. Identity: Key to children's understanding of belief. *Science* 333: 474–77.

Perner, J., and J. Roessler. 2012. From infants' to children's appreciation of belief. *Trends in Cognitive Sciences* 16 (10): 519–25.

Perry, S., M. Baker, L. Fedigan, J. Gros-Louis, K. Jack, K. C. MacKinnon, and L. Rose. 2003. Social conventions in wild white-faced capuchin monkeys. *Current Anthropology* 44 (2): 241–68.

Peterson, C.C., and M. Siegal. 1995. Deafness, conversation and theory of mind. *Journal of Child Psychology and Psychiatry* 36: 459–74.

Piaget, J. 1932 / 1965. *The Moral Judgment of the Child*. New York: Free Press.

———. 1960 / 1995. Problems of the social psychology of childhood. In *Sociological Studies,* ed. L. Smith, trans. T. Brown et al., 287–318. London: Routledge.

———. 1965 / 1995. *Sociological Studies*. New York: Routledge.

———. 1970. Piaget's theory. In *Carmichael's Handbook of Child Psychology,* ed. P. H. Mussen, 703–32. New York: Wiley.

———. 1977. *The Development of Thought: Equilibration of Cognitive Structures*. Trans. A. Rosin. New York: Viking.

Pine, K. J., and D. J. Messer. 1998. Group collaboration effects and the explicitness of children's knowledge. *Cognitive Development* 13 (1): 109–26.

Pinker, S. 1991. Rules of language. *Science* 253: 530–35.

Plötner, M., H. Over, M. Carpenter, and M. Tomasello. 2015a. The effects of collaboration and minimal-group membership on children's prosocial behavior, liking, affiliation, and trust. *Journal of Experimental Child Psychology* 139: 161–73.

———. 2015b. Young children show the bystander effect in helping situations. *Psychological Science* 26 (4): 499–506.

Poti, P., and J. Langer. 2001. Spontaneous spatial constructions by chimpanzees (*Pan troglodytes, Pan paniscus*). *Developmental Science* 4 (4): 474–84.

Povinelli, D. J., and J. Vonk. 2003. Chimpanzee minds: Suspiciously human? *Trends in Cognitive Science* 7: 157–60.

———. 2004. We don't need a microscope to explore the chimpanzee's mind. *Mind and Language* 19: 1–28.

Powell, L. J., and S. Carey. 2017. Executive function depletion in children and its impact on theory of mind. *Cognition* 164: 150–62.

Powell, L. J., and E. S. Spelke. 2013. Preverbal infants expect members of social groups to act alike. *Proceedings of the National Academy of Sciences of the United States of America* 110 (41): E3965–72.

Proctor, D., R. A. Williamson, F. B. M. de Waal, and S. F. Brosnan. 2013. Chimpanzees play the ultimatum game. *Proceedings of the National Academy of Sciences of the United States of America* 110 (6): 2070–75.

Pyers, J. E., and A. Senghas. 2009. Language promotes false-belief understanding: Evidence from learners of a new sign language. *Psychological Science* 20 (7): 805–12.

Rakoczy, H. 2015. In defense of a developmental dogma: Children acquire propositional attitude folk psychology around age 4. *Synthese* 194 (3): 689–707.

Rakoczy, H., A. Clüver, L. Saucke, N. Stoffregen, A. Gräbener, J. Migura, and J. Call. 2014. Apes are intuitive statisticians. *Cognition* 131 (1): 60–68.

Rakoczy, H., K. Hamann, F. Warneken, and M. Tomasello. 2010. Bigger knows better: Young children selectively learn rule games from adults rather than from peers. *British Journal of Developmental Psychology* 28 (4): 785–98.

Rakoczy, H., and M. Tomasello. 2009. Done wrong or said wrong? Young children understand the normative directions of fit of different speech acts. *Cognition* 113 (2): 205–12.

Rakoczy, H., M. Tomasello, and T. Striano. 2005. On tools and toys: How children learn to act on and pretend with "virgin objects." *Developmental Science* 8 (1): 57–72.

———. 2006. The role of experience and discourse in children's developing understanding of pretend play actions. *British Journal of Developmental Psychology* 24 (2): 305–35.

Rakoczy, H., F. Warneken, and M. Tomasello. 2008. The sources of normativity: Young children's awareness of the normative structure of games. *Developmental Psychology* 44 (3): 875–81.

Rapp, D. J., J. M. Engelmann, E. Herrmann, and M. Tomasello. 2017. The impact of choice on young children's prosocial motivation. *Journal of Experimental Child Psychology* 158: 112–21.

———. In press. Young children's reputation management in a peer group context. *Developmental Psychology.*

Rawls, J. 1971. *A Theory of Justice.* Cambridge, MA: Harvard University Press.

Rekers, Y., D. B. M. Haun, and M. Tomasello. 2011. Children, but not chimpanzees, prefer to collaborate. *Current Biology* 21 (20): 1756–58.

Rendell, L., and H. Whitehead. 2001. Culture in whales and dolphins. *Behavioral and Brain Science* 24: 309–82.

Rhodes, M., and L. Chalik. 2013. Social categories as markers of intrinsic interpersonal obligations. *Psychological Science* 24 (6): 999–1006.

Richerson, P., and R. Boyd. 2005. *Not by Genes Alone: How Culture Transformed Human Evolution.* Chicago: University of Chicago Press.

Riedl, K., K. Jensen, J. Call, and M. Tomasello. 2012. No third-party punishment in chimpanzees. *Proceedings of the National Academy of Sciences of the United States of America* 109 (37): 14824–29.

———. 2015. Restorative justice in children. *Current Biology* 25 (13): 1731–35.

Riggs, A. E., and A. G. Young. 2016. Developmental changes in children's normative reasoning across learning contexts and collaborative roles. *Developmental Psychology* 52 (8): 1236–46.

Rivas, E. 2005. Recent use of signs by chimpanzees (*Pan Troglodytes*) in interactions with humans. *Journal of Comparative Psychology* 119 (4): 404–17.

Robbins, E., and P. Rochat. 2011. Emerging signs of strong reciprocity in human ontogeny. *Frontiers in Developmental Psychology* 353 (2): 1–14.

Rochat, P. 2001. *The Infant's World.* Cambridge, MA: Harvard University Press.

———. 2009. *Others in Mind: Social Origins of Self-Consciousness.* Cambridge: Cambridge University Press.

Rochat, P., M. D. G. Dias, L. Guo, T. Broesch, C. Passos-Ferreira, A. Winning, and B. Berg. 2009. Fairness in distributive justice by 3- and 5-year-olds across seven cultures. *Journal of Cross-Cultural Psychology* 40 (3): 416–42.

Rochat, P., U. Neisser, and V. Marian. 1998. Are young infants sensitive to interpersonal contingency? *Infant Behavior and Development* 21 (2): 355–66.

Rogers, S., and B. Pennington. 1991. A theoretical approach to the deficits in infantile autism. *Developmental Psychology* 3: 137–62.

Rogoff, B. 1990. *Apprenticeship in Thinking: Cognitive Development in Social Context.* New York: Oxford University Press.

———. 2003. *The Cultural Nature of Human Development.* New York: Oxford University Press.

Rogoff, B., M. J. Sellers, S. Pirrolta, N. Fox, and S. H. White. 1975. Age and assignment of roles and responsibilities to children: A cross cultural study. *Human Development* 18: 353–69.

Rollins, P. R., and C. E. Snow. 1998. Shared attention and grammatical development in typical children and children with autism. *Journal of Child Language* 25 (3): 653–74.

Rosati, A. G. 2017. The evolution of primate executive function: From response control to strategic decision-making. In *The Nervous Systems of Non-Human Primates.* Vol. 3 of *Evolution of Nervous Systems,* 2nd ed., ed. J. Kaas and L. Krubitzer, 423–37. Amsterdam: Elsevier.

Rossano, F., L. Fiedler, and M. Tomasello. 2015. Preschoolers' understanding of the role of communication and cooperation in establishing property rights. *Developmental Psychology* 51 (2): 176–84.

Rossano, F., H. Rakoczy, and M. Tomasello. 2011. Young children's understanding of violations of property rights. *Cognition* 121 (2): 219–27.

Roughley, N. 2015. Resentment, empathy and moral normativity. In *Forms of Fellow Feeling: Sympathy, Empathy, Concern and Moral Agency,* ed. N. Roughley and T. Schramme, 225–47. Cambridge: Cambridge University Press.

Rubio-Fernandez, P., and B. Geurts. 2013. How to pass the false-belief task before your fourth birthday. *Psychological Science* 24 (1): 27–33.

Ruffman T., J. Perner, M. Naito, L. Parkin, and W. A. Clements. 1998. Older (but not younger) siblings facilitate false belief understanding. *Developmental Psychology* 34: 161–74.

Salali, G. D., M. Juda, and J. Henrich. 2015. Transmission and development of costly punishment in children. *Evolution and Human Behavior* 36 (2): 86–94.

Savage-Rumbaugh, S., J. Murphy, R. Sevcik, K. Brakke, S. Williams, and D. Rumbaugh. 1993. Language comprehension in ape and child. *Monographs of the Society for Research in Child Development* 58 (3–4).

Scanlon, T. 1998. *What We Owe to Each Other.* Cambridge, MA: Belknap Press.

Schäfer, M., D. B. M. Haun, and M. Tomasello. 2015. Fair is not fair everywhere. *Psychological Science* 26 (8): 1252–60.

Schelling, T. C. 1960. *The Strategy of Conflict.* Cambridge, MA: Harvard University Press.

Schieffelin, B. B., and E. Ochs. 1986. Language socialization. *Annual Review of Anthropology* 15 (1): 163–91.

Schmelz, M., J. Call, and M. Tomasello. 2011. Chimpanzees know that others make inferences. *Proceedings of the National Academy of Sciences of the United States of America* 108 (7): 3077–79.

Schmelz, M., S. Grüneisen, A. Kabalak, J. Jost, and M. Tomasello. 2017. Chimpanzees return favors at a personal cost. *Proceedings of the National Academy of Sciences of the United States of America* 114 (28): 7462–67.

Schmerse, D., E. V. M. Lieven, and M. Tomasello. 2014. Discourse particles and belief reasoning: The case of German "doch." *Journal of Semantics* 31 (1): 115–33.

Schmidt, M., L. Butler, J. Heinz, and M. Tomasello. 2016a. Young children see a single action and infer a social norm. *Psychological Science* 27: 1360–70.

Schmidt, M., S. Hardecker, and M. Tomasello. 2016b. Young children's understanding of cooperatively structured competition. *Journal of Experimental Child Psychology* 143: 34–47.

Schmidt, M. F. H., H. Rakoczy, and M. Tomasello. 2011. Young children attribute normativity to novel actions without pedagogy or normative language. *Developmental Science* 14 (3): 530–39.

———. 2012. Young children enforce social norms selectively depending on the violator's group affiliation. *Cognition* 124 (3): 325–33.

———. 2013. Young children understand and defend the entitlements of others. *Journal of Experimental Child Psychology* 116 (4): 930–44.

———. 2016c. Young children understand the role of agreement in establishing arbitrary norms—but unanimity is key. *Child Development* 87: 612–26.

———. Forthcoming. Eighteen-month-old infants correct non-conforming actions by others.

Schmidt, M. F. H., and J. A. Sommerville. 2011. Fairness expectations and altruistic sharing in 15-month-old human infants. *PLoS One* 6 (10): e23223.

Schmidt, M., M. Svetlova, J. Johe, and M. Tomasello. 2016d. Children's developing understanding of legitimate reasons for allocating resources unequally. *Journal of Experimental Child Psychology* 37: 42–52.

Schneider, C., J. Call, and K. Liebal. 2012. Onset and early use of gestural communication in nonhuman great apes. *American Journal of Primatology* 74 (2): 102–13.

Schulze, C., and M. Tomasello. 2015. 18-Month-olds comprehend indirect communicative acts. *Cognition* 136: 91–98.

Schwier, C., C. Van Maanen, M. Carpenter, and M. Tomasello. 2006. Rational imitation in 12-month-old infants. *Infancy* 10 (3): 303–11.

Searle, J. R. 1995. *The Construction of Social Reality.* New York: Free Press.

———. 2001. *Rationality in Action.* Cambridge, MA: MIT Press.

———. 2010. *Making the Social World: The Structure of Human Civilization.* Oxford University Press.

Shaw, A., and K. R. Olson. 2012. Children discard a resource to avoid inequality. *Journal of Experimental Psychology: General* 141: 382–95.

———. 2014. Fairness as an aversion to partiality: The development of procedural justice. *Journal of Experimental Child Psychology* 119: 40–53.

Shweder, R. A. 1991. *Thinking through Cultures: Expeditions in Cultural Psychology.* Cambridge, MA: Harvard University Press.

Silk, J. B., S. F. Brosnan, J. Vonk, J. Henrich, D. J. Povinelli, A. F. Richardson, S. P. Lambeth, J. Mascaro, and S. J. Schapiro. 2005. Chimpanzees are indifferent to the welfare of other group members. *Nature* 435: 1357–59.

Siller, M., and M. Sigman. 2008. Modeling longitudinal change in the language abilities of children with autism: Parent behaviors and child characteristics as predictors of change. *Developmental Psychology* 44 (6): 1691–704.

Silva, K. G., M. Correa-Chávez, and B. Rogoff. 2010. Mexican-heritage children's attention and learning from interactions directed to others. *Child Development* 81 (3): 898–912.

Smith, A. 1759 / 1982. *The Theory of Moral Sentiments.* Indianapolis: Liberty Classics.

Smith, C., P. R. Blake, and P. L. Harris. 2013. I should but I won't: Why young children endorse norms of fair sharing but do not follow them. *PloS One* 8 (8): e59510.

Smith, L. B., S. S. Jones, and B. Landau. 1996. Naming in young children: A dumb attentional mechanism? *Cognition* 60 (2): 143–71.

Smith, L. B., S. H. Suanda, and C. Yu. 2014. The unrealized promise of infant statistical word-referent learning. *Trends in Cognitive Sciences* 18: 251–58.

Sodian, B., M. Licata, S. Kristen-Antonow, M. Paulus, M. Killen, and A. Woodward. 2016. Understanding of goals, beliefs, and desires predicts morally relevant theory of mind: A longitudinal investigation. *Child Development* 87 (4): 1221–32.

Southgate, V., A. Senju, and G. Csibra. 2007. Action anticipation through attribution of false belief by 2-year-olds. *Psychological Science* 18 (7): 587–92.

Spelke, E. S. 2009. Commentary. In M. Tomasello, *Why We Cooperate,* 149–72. Cambridge, MA: MIT Press.

———. 2015. Core knowledge and conceptual change: The concept "person." Paper presented at *The Nature and Origins of Human Cognition.* Berlin School of Mind and Brain, Humboldt University, Berlin.

Sperber, D., F. Clément, C. Heintz, O. Mascaro, H. Mercier, G. Origgi, and D. Wilson. 2010. Epistemic vigilance. *Mind and Language* 25: 359–93.

Sperber, D., and D. Wilson. 1986. *Relevance: Communication and Cognition.* Cambridge, MA: Harvard University Press.

Stern, D. N. 1985. *The Interpersonal World of the Infant: A View from Psychoanalysis and Developmental Psychology.* New York: Basic Books.

Strawson, P. F. 1962. Freedom and resentment. *Proceedings of the British Academy* 48: 1–25.

Striano, T., M. Tomasello, and P. Rochat. 2001. Social and object support for early symbolic play. *Developmental Science* 4 (4): 442–55.

Svetlova, M., and C. Brownell. Forthcoming. Three-year-olds favor those in need.

Svetlova, M., S. Nichols, and C. Brownell. 2010. Toddlers' prosocial behavior: From instrumental to empathic to altruistic helping. *Child Development* 81 (6): 1814–27.

Tangney, J. P., and R. L. Dearing. 2004. *Shame and Guilt.* New York: Guilford Press.

Tanner, J. E., and R. W. Byrne. 1996. Representation of action through iconic gesture in a captive lowland gorilla. *Current Anthropology* 37: 162–73.

Tennie, C., J. Call, and M. Tomasello. 2006. Push or pull: Imitation vs. emulation in great apes and human children. *Ethology* 112 (12): 1159–69.

———. 2009. Ratcheting up the ratchet: on the evolution of cumulative culture. *Philosophical Transactions of the Royal Society B, Biological Sciences* 364 (1528): 2405–15.

Tennie, C., V. Walter, A. Gampe, M. Carpenter, and M. Tomasello. 2014. Limitations to the cultural ratchet effect in young children. *Journal of Experimental Child Psychology* 126: 152–60.

Thornton, A., and N. J. Raihani. 2008. The evolution of teaching. *Animal Behaviour* 75 (6): 1823–36.

Tincoff, R., and P. W. Jusczyk. 1999. Some beginnings of word comprehension in six-month-olds. *Psychological Science* 10: 172–75.

Tomasello, M. 1988. The role of joint attentional process in early language development. *Language Sciences* 10: 69–88.

———. 1992. *First Verbs: A Case Study of Early Grammatical Development.* Cambridge: Cambridge University Press.

———. 1995. Joint attention as social cognition. In *Joint Attention: Its Origins and Role in Development,* ed. C. Moore and P. J. Dunham, 103–30. Hillsdale, NJ: Lawrence Erlbaum.

———. 1996. Do apes ape? In *Social Learning in Animals: The Roots of Culture,* ed. J. Galef and C. Heyes. San Diego, CA: Academic Press.

———. 1998. Reference: Intending that others jointly attend. *Pragmatics and Cognition* 6: 229–44.

———. 1999. *The Cultural Origins of Human Cognition.* Cambridge, MA: Harvard University Press.

———. 2000. The social-pragmatic theory of word learning. *Pragmatics* 10: 401–14.

———. 2001. Perceiving intentions and learning words in the second year of life. In *Language Acquisition and Conceptual Development,* ed. M. Bowerman and S. Levinson, 132–58. Cambridge: Cambridge University Press.

———. 2003. *Constructing a Language: A Usage-Based Theory of Language Acquisition.* Cambridge, MA: Harvard University Press.

———. 2005. Beyond formalities: The case of language acquisition. *Linguistic Review* 22 (2–4): 183–97.

———. 2006. Why don't apes point? In *Roots of Human Sociality: Culture, Cognition and Interaction,* ed. N. J. Enfield and S. C. Levinson, 506–30. Oxford: Berg.

———. 2008. *Origins of Human Communication.* Cambridge, MA: MIT Press.

———. 2011. Human culture in evolutionary perspective. In *Advances in Culture and Psychology,* ed. M. Gelfand, 5–51. Oxford: Oxford University Press.

———. 2014. *A Natural History of Human Thinking.* Cambridge, MA: Harvard University Press.

———. 2016. *A Natural History of Human Morality.* Cambridge, MA: Harvard University Press.

———. 2017. What did we learn from the ape language studies? In *Bonobos: Unique in Mind, Brain, and Behavior,* ed. B. Hare and S. Yamamoto, 95–104. Oxford: Oxford University Press.

———. In press. How children come to understand false beliefs: A shared intentionality account. *Proceedings of the National Academy of Sciences.*

Tomasello, M., and N. Akhtar. 2000. Five questions for any theory of word learning. In *Becoming a Word Learner: A Debate on Lexical Acquisition,* ed. R. Golinkoff and K. Hirsh-Pasek, 115–36. Oxford: Oxford University Press.

Tomasello, M., and M. E. Barton. 1994. Learning words in nonostensive contexts. *Developmental Psychology* 30 (5): 639–50.

Tomasello, M., and J. Call. 1997. *Primate Cognition.* Oxford: Oxford University Press.

———. 2004. The role of humans in the cognitive development of apes revisited. *Animal Cognition* 7 (4): 213–15.

Tomasello, M., J. Call, and A. Gluckman. 1997. The comprehension of novel communicative signs by apes and human children. *Child Development* 68: 1067–81.

Tomasello, M., J. Call, Nagell, K., Olguin, R., and M. Carpenter. 1994. The learning and use of gestural signals by young chimpanzees: A trans-generational study. *Primates* 37: 137–54.

Tomasello, M., and M. Carpenter. 2005a. The emergence of social cognition in three young chimpanzees. *Monographs of the Society for Research in Child Development* 70 (1): vii–132.

———. 2005b. Intention-reading and imitative learning. In *New Perspectives on Imitation,* ed. S. Hurley and N. Chater, 133–48. Oxford: Oxford University Press.

Tomasello, M, M. Carpenter, J. Call, T. Behne, and H. Moll. 2005. Understanding and sharing intentions: The origins of cultural cognition. *Behavioral and Brain Science* 28 (5): 675–91.

Tomasello, M., M. Carpenter, and U. Liszkowski. 2007a. A new look at infant pointing. *Child Development* 78: 705–22.

Tomasello, M., and J. Farrar. 1986. Object permanence and relational words: A lexical training study. *Journal of Child Language* 13: 495–506.

Tomasello, M., J. Farrar, and J. Dines. 1984. Children's speech revisions for a familiar and an unfamiliar adult. *Journal of Speech and Hearing Research* 27: 359–63.

Tomasello, M., B. George, A. Kruger, J. Farrar, and A. Evans. 1985. The development of gestural communication in young chimpanzees. *Journal of Human Evolution* 14: 175–86.

Tomasello, M., and I. Gonzalez-Cabrera. 2017. The role of ontogeny in the evolution of human cooperation. *Human Nature* 28: 274–88.

Tomasello, M., D. Gust, and T. Frost. 1989. A longitudinal investigation of gestural communication in young chimpanzees. *Primates* 30: 35–50.

Tomasello, M., and K. Haberl. 2003. Understanding attention: 12- and 18-month-olds know what's new for other persons. *Developmental Psychology* 39: 906–12.

Tomasello, M., B. Hare, and T. Fogleman. 2001. The ontogeny of gaze following in chimpanzees and rhesus macaques. *Animal Behaviour* 61 (2): 335–43.

Tomasello, M., B. Hare, H. Lehmann, and J. Call. 2007b. Reliance on head versus eyes in gaze following of great apes and human infants: The cooperative eye hypothesis. *Journal of Human Evolution* 52: 314–20.

Tomasello, M., A. Kruger, and H. Ratner. 1993a. Cultural learning. *Behavioral and Brain Sciences* 16: 495–552.

Tomasello, M., A. Melis, C. Tennie, E. Wyman, and E. Herrmann. 2012. Two key steps in the evolution of human cooperation: The interdependence hypothesis. *Current Anthropology* 53 (6): 673–92.

Tomasello, M., and H. Moll. 2013. Why don't apes understand false beliefs? In *Navigating the Social World: What Infants, Children, and Other Species Can Teach Us,* ed. M. R. Banaji and S. A. Gelman, 81–88. Oxford: Oxford University Press.

Tomasello, M., and H. Rakoczy. 2003. What makes human cognition unique? From individual to shared to collective intentionality. *Mind and Language* 18 (2): 121–47.

Tomasello, M., S. Savage-Rumbaugh, and A. Kruger. 1993b. Imitative learning of actions on objects by children, chimpanzees and enculturated chimpanzees. *Child Development* 64: 1688–705.

Tomasello, M., T. Striano, and P. Rochat. 1999. Do young children use objects as symbols? *British Journal of Developmental Psychology* 17: 563–84.

Tomasello, M., R. Strosberg, and N. Akhtar. 1996. Eighteen-month-old children learn words in non-ostensive contexts. *Journal of Child Language* 23: 157–76.

Tomasello, M., and J. Todd. 1983. Joint attention and lexical acquisition style. *First Language* 4: 197–212.

Tomonaga, M., M. Myowa-Yamakoshi, Y. Mizuno, M. Yamaguchi, D. Kosugi, K. Bard, M. Tanaka, and T. Matsuzawa. 2004. Development of social cognition in infant chimpanzees: Face recognition, smiling, gaze and the lack of triadic interactions. *Japanese Psychological Research* 46: 227–35.

Tooby, J., and L. Cosmides. 2005. Conceptual foundations of evolutionary psychology. In *Handbook of Evolutionary Psychology,* ed. D. Buss, 5–67. Hoboken, NJ: Wiley.

Trevarthen, C. 1979. Communication and cooperation in early infancy: A description of primary intersubjectivity. In *Before Speech: The Beginning of Interpersonal Communication,* ed. M. Bullowa, 321–47. Cambridge: Cambridge University Press.

Tronick, E. Z. 1989. Emotions and emotional communication in infants. *American Psychologist* 44 (2): 112–19.

Tuomela, R. 2007. *The Philosophy of Sociality: The Shared Point of View.* Oxford: Oxford University Press.

Turiel, E. 2006. The development of morality. In *Social, Emotional, and Personality Development.* Vol. 3 of *Handbook of Child Psychology,* 6th ed., ed. N. Eisenberg, 789–857. New York: Wiley.

Ueno, A., and T. Matsuzawa. 2004. Food transfer between chimpanzee mothers and their infants. *Primates* 45: 231–39.

Ulber, J., K. Hamann, and M. Tomasello. 2015. How 18- and 24-month-old peers divide resources among themselves. *Journal of Experimental Child Psychology* 140: 228–44.

———. 2016. Extrinsic rewards diminish costly sharing in 3-year-olds. *Child Development* 87 (4): 1192–203.

Ulber, J., and M. Tomasello. 2017. Young children, but not chimpanzees, are averse to disadvantageous and advantageous inequities. *Journal of Experimental Child Psychology* 155: 48–66.

Vaish, A., M. Carpenter, and M. Tomasello. 2009. Sympathy through affective perspective-taking and its relation to prosocial behavior in toddlers. *Developmental Psychology* 45 (2): 534–43.

———. 2010. Young children selectively avoid helping people with harmful intentions. *Child Development* 81 (6): 1661–69.

———. 2011a. Young children's response to guilt displays. *Developmental Psychology* 47 (5): 1248–62.

———. 2016. The early emergence of guilt-motivated prosocial behavior. *Child Development* 87 (6): 1772–82.

Vaish, A., M. Missana, and M. Tomasello. 2011b. Three-year-old children intervene in third-party moral transgressions. *British Journal of Developmental Psychology* 29 (1): 124–30.

Van der Goot, M. H., M. Tomasello, and U. Liszkowski. 2014. Differences in the nonverbal requests of great apes and human infants. *Child Development* 85 (2): 444–55.

Van Schaik, C. P., M. Ancrenaz, G. Borgen, B. Galdikas, C. D. Knott, I. Singleton, A. Suzuki, S. S. Utami, and M. Y. Merrill. 2003. Orangutan cultures and the evolution of material culture. *Science* 299: 102–5.

Vogelsang, M., and M. Tomasello. 2016. Giving is nicer than taking: Preschoolers reciprocate based on the social intentions of the distributor. *PLoS One* 11 (1): e0147539.

Völter, C. J., F. Rossano, and J. Call. 2015. From exploitation to cooperation: Social tool use in orang-utan mother–offspring dyads. *Animal Behaviour* 100: 126–34.

Vredenburgh, C., T. Kushnir, and M. Casasola. 2015. Pedagogical cues encourage toddlers' transmission of recently demonstrated functions to unfamiliar adults. *Developmental Science* 18 (4): 645–54.

Vygotsky, L. S. 1929. II. The problem of the cultural development of the child. *Pedagogical Seminary and Journal of Genetic Psychology* 36: 415–34.

———. 1930 / 1978. *Mind in Society: The Development of Higher Psychological Processes.* Edited by M. Cole. Cambridge, MA: Harvard University Press.

Vygotsky, L. S., and A. R. Luria. 1930 / 1993. *Studies on the History of Behavior: Ape, Primitive, and Child.* Edited and translated by V. I. Golod and J. E. Knox. Hillsdale, NJ: Erlbaum.

Warneken, F. 2013. Young children proactively remedy unnoticed accidents. *Cognition* 126 (1): 101–8.

Warneken, F., F. Chen, and M. Tomasello. 2006. Cooperative activities in young children and chimpanzees. *Child Development* 77 (3): 640–63.

Warneken, F., M. Gräfenhain, and M. Tomasello. 2012. Collaborative partner or social tool? New evidence for young children's understanding of joint intentions in collaborative activities. *Developmental Science* 15 (1): 54–61.

Warneken, F., B. Hare, A. P. Melis, D. Hanus, and M. Tomasello. 2007. Spontaneous altruism by chimpanzees and young children. *PLoS Biology* 5 (7): 1414–20.

Warneken, F., K. Lohse, A. P. Melis, and M. Tomasello. 2011. Young children share the spoils after collaboration. *Psychological Science* 22 (2): 267–73.

Warneken, F., J. Steinwender, K. Hamann, and M. Tomasello. 2014. Young children's planning in a collaborative problem-solving task. *Cognitive Development* 31: 48–58.

Warneken, F., and M. Tomasello. 2006. Altruistic helping in human infants and young chimpanzees. *Science* 31: 1301–03.

———. 2007. Helping and cooperation at 14 months of age. *Infancy* 11: 271–94.

———. 2008. Extrinsic rewards undermine altruistic tendencies in 20-month-olds. *Developmental Psychology* 44: 1785–88.

———. 2009a. Roots of human altruism. *British Journal of Psychology* 100: 455–71.

———. 2009b. Varieties of altruism in children and chimpanzees. *Trends in Cognitive Science* 13: 397–402.

———. 2013a. The emergence of contingent reciprocity in young children. *Journal of Experimental Child Psychology* 116: 338–50.

———. 2013b. Parental presence and encouragement do not influence helping in young children. *Infancy* 18 (3): 345–68.

Watson-Jones, R., C. Legare, H. Whitehouse, and J. Clegg. 2014. Task-specific effects of ostracism on imitation in early childhood. *Evolution and Human Behavior* 35: 204–10.

Wellman, H. M., D. Cross, and J. Watson. 2001. Meta-analysis of theory-of-mind development: The truth about false belief. *Child Development* 72: 655–84.

Wellman, H. M., S. Lopez-Duran, J. LaBounty, and B. Hamilton. 2008. Infant attention to intentional action predicts preschool theory of mind. *Developmental Psychology* 44 (2): 618–23.

Werner, H., and B. Kaplan. 1963. *Symbol Formation.* New York: Wiley.

West-Eberhard, M. J. 1979. Sexual selection, social competition, and evolution. *Proceedings of the American Philosophical Society* 51 (4): 222–34.

———. 2003. *Developmental Plasticity and Evolution.* Oxford: Oxford University Press.

Whiten, A., D. M. Custance, J. C. Gomez, P. Teixidor, and K. A. Bard. 1996. Imitative learning of artificial fruit processing in children and chimpanzees. *Journal of Comparative Psychology* 110: 3–14.

Whiten, A., J. Goodall, W. C. McGrew, T. Nishida, V. Reynolds, Y. Sugiyama, C. E. G. Tutin, R. Wrangham, and C. Boesch. 1999. Cultures in chimpanzees. *Nature* 399: 682–85.

Whiten, A., V. Horner, and F. B. M. de Waal. 2005. Conformity to cultural norms of tool use in chimpanzees. *Nature* 437: 737–40.

Whiten, A., N. McGuigan, S. Marshall-Pescini, and L. M. Hopper. 2009. Emulation, imitation, over-imitation and the scope of culture for child and chimpanzee. *Philosophical Transactions of the Royal Society B, Biological Sciences* 364 (1528): 2417–28.

Wilson, E. O. 1998. *Consilience: The Unity of Knowledge.* New York: Random House.

———. 2012. *The Social Conquest of Earth.* New York: W.W. Norton.

Winsler, A. 2009. Still talking to ourselves after all these years: A review of current research on private speech. In *Private Speech, Executive Functioning, and the Development of Verbal Self-regulation,* ed. A. Winsler, C. Fernyhough, and I. Montero, 3–41. New York: Cambridge University Press.

Winsler, A., M. P. Carlton, and M. J. Barry. 2000. Age-related changes in preschool children's systematic use of private speech in a natural setting. *Journal of Child Language* 27: 665–87.

Wittig, R. M., C. Crockford, T. Deschner, K. E. Langergraber, T. E. Ziegler, and K. Zuberbühler. 2014. Food sharing is linked to urinary oxytocin levels and bonding in related and unrelated wild chimpanzees. *Proceedings of the Royal Society of London B, Biological Sciences* 281 (1778): 20133096.

Wittig, R. M., K. Jensen, and M. Tomasello. 2013. Five-year-olds understand fair as equal in a mini-ultimatum game. *Journal of Experimental Child Psychology* 116 (2): 324–37.

Wobber, V., E. Herrmann, B. Hare, R. Wrangham, and M. Tomasello. 2013. Differences in the early cognitive development of children and great apes. *Developmental Psychobiology* 56 (3): 547–73.

Wolf, W., J. Launay, and R. I. Dunbar. 2016. Joint attention, shared goals, and social bonding. *British Journal of Psychology* 107 (2): 322–37.

Wood, D., J. Bruner, and G. Ross. 1976. The role of tutoring in problem solving. *Journal of Child Psychology and Child Psychiatry* 17: 89–100.

Woolfe T., S. C. Want, and M. Siegal 2002. Signposts to development: Theory of mind in deaf children. *Child Development* 73: 768–78.

Wrangham, R. W., and L. Glowacki. 2012. Intergroup aggression in chimpanzees and war in nomadic hunter-gatherers: Evaluating the chimpanzee model. *Human Nature* 23 (1): 5–29.

Wyman, E., H. Rakoczy, and M. Tomasello. 2009. Normativity and context in young children's pretend play. *Cognitive Development* 24 (2): 146–55.

———. 2013. Non-verbal communication enables children's coordination in a "Stag Hunt" game. *European Journal of Developmental Psychology* 10 (5): 597–610.

Xu, F., and T. Kushnir. 2013. Infants are rational constructivist learners. *Current Directions in Psychological Science* 22 (1): 28–32.

Yamamoto, S., and M. Tanaka. 2009. Do chimpanzees (*Pan troglodytes*) spontaneously take turns in a reciprocal cooperation task? *Journal of Comparative Psychology* 123 (3): 242–49.

Zahn-Waxler C., and G. Kochanska. 1990. The origins of guilt. *Socioemotional Development* 36: 183–258.

Zeidler, H., E. Herrmann, D. B. M. Haun, and M. Tomasello. 2016. Taking turns or not? Children's approach to limited resource problems in three different cultures. *Child Development* 87 (3): 677–88.

Zmyj, N., D. Buttelmann, M. Carpenter, and M. M. Daum. 2010. The reliability of a model influences 14-month-olds' imitation. *Journal of Experimental Child Psychology* 106: 208–20.

Index