Organisms inherit their environments as much as they inherit their genes. Indeed, biological adaptations come into existence ontogenetically "expecting" a certain environment: fish are born with fins, expecting water; bats are born with sonar, expecting caves. Some organisms even modify their environments, and then their progenitors biologically adapt to the new environment (so-called niche construction; Odling-Smee, Laland, & Feldman, 2003). For example, ants have evolved various skills for living in the anthills that they (i.e., their forebears) have built.

Human beings are big-time niche constructors, of course, with the added twist that different groups of humans construct very different niches (a.k.a. cultures), and so the species as a whole cannot be adapted to a particular constructed environment ahead of time. The solution is flexible learning and cognitive skills that enable individuals to acquire information locally and to make decisions based on that information without micromanagement from Mother Nature. This typically requires a long period of immaturity so that the young can learn about and explore the environment while still under the protection of parents (Bruner, 1972). Within this general learning-life-history strategy, some species also develop skills of social learning that enable individuals to take advantage of the knowledge and skills of group mates when that is to their benefit as well (Boyd & Richerson, 1985). Humans rely on learning and social learning perhaps more than any other species, and this both enables their unique form of cultural organization and is an adaptation to it.

What all of this adds up to is an observation banal in behavioral biology but not sufficiently appreciated in cognitive psychology: It makes no sense to speak of cognitive skills independent of the environmental contexts within which they evolved and operate. With specific reference to humans, our proposal here is that most, if not all, of the unique features of human cognition evolved as adaptations to humans' unique form of cultural organization, that is, as adaptations to a self-constructed niche involving cooperative social practices with group mates and their material and symbolic artifacts. Clearly this is not all there is to human
Cognition, as many human skills evolved in the context of such things as foraging (e.g., skills of object recognition, manipulation, categorization, and quantification), and other human skills evolved in the context of competitive interactions with group mates over food, mates, and other resources (e.g., the understanding of goal-directed action). However, our argument is that humans have also evolved some unique cognitive skills for cooperating and communicating with others culturally. That is, humans are adapted for special kinds of cooperative and communicative interactions that require them to take multiple perspectives on things, and ultimately, through some kind of internalization process, to develop so-called perspectival cognitive representations— which are taken for granted in cognitive psychology but are actually unique in the animal kingdom (Tomášello, 1994).

In this chapter, we argue and provide evidence for this view of the evolution of the unique features of human cognition and culture. After a brief evolutionary introduction, “we do this, first, by looking closely at the process of human cognitive development, especially in its early social and cultural aspects, and then by comparing human social-cognitive skills to those of our nearest primate relatives, the great apes, who share some but not all of our skills for navigating through a complex social world.

1. Primate and Human Social Cognition and Learning

Nonhuman primates are intensely competitive creatures, and so they have evolved uniquely complex social-cognitive skills for competing with group mates for food, mates, and other valued resources. Following Humphrey (1976), the social cognition of primates has been characterized by appareations such as primate politics (de Waal, 1982) and Machiavellian intelligence (Byrne & Whiten, 1988). This competitive orientation becomes especially clear when we look at experiments aimed at testing nonhuman primates’ theory of mind.

Chimpanzees and other primates have failed all sorts of experiments testing their ability to determine the perceptions, intentions, and beliefs of others (for overviews, see Povinelli, Bering, & Giambrola, 2000; Tomášello & Call, 1997). For example, they did not seem to take the visual perception of others into account as they indiscriminately begged for food from humans who either could or could not see them (Povinelli & Eddy, 1996), and they did not understand a human’s communicative intention to indicate the location of hidden food by looking and pointing at it (for an overview, see Call & Tomášello, 2005). Importantly, in all of these studies, the chimpanzees interacted with a cooperative experimenter who would provide (rather than hide) information and act for (rather than against) them. However, these cooperative situations might not come as naturally to them as they come to humans. Consequently, Hare (2001) proposed that the chimpanzee mind is especially adapted for competitive encounters and will thus demonstrate its peak performance in competitive rather than cooperative situations. Thus, when Hare and colleagues placed a dominant subadult chimpanzee in competition over food—with some pieces of food visible to both individuals and some only to the subordinate—the subordinates were more likely to go for the food that was hidden from the dominant’s view (Hare, Call, Agetina, & Tomášello, 2000; Hare, Call, & Tomášello, 2001). Relatively, chimpanzees also try to conceal their own approach to contested food by selecting paths on which the competitor cannot see or hear them when they steal the food (Hare, Call, & Tomášello, 2006; Melis, Call, & Tomášello, 2006). Thus, chimpanzees can interpret what others see and how that affects their intentional actions (see also Call, Hare, Carpenter, & Tomášello, 2004) but mainly in the context of competitive social interactions. Taken together, these and a number of other studies provide evidence that chimpanzees actually do understand important aspects of intentional action and perception (Tomášello, Call, & Hare, 2003; but for a different view, see Povinelli & Vonk, 2003). The fact that the majority of situations eliciting these skills are competitive in nature reveals something fundamental about the chimpanzee mind; namely, that it is mainly adapted for competitive rather than for cooperative social interactions. Accordingly, Tomášello, Carpenter, Call, Behne, and Moll (2005) have proposed two distinct biological adaptations underlying human social-cultural cognition. The first concerns the understanding of intentional action and perception, a pathway that humans share to a large extent with chimpanzees and that evolved in the context of intraspecific competition. The second concerns the skills and motivations to share these psychological states with others, which very likely is unique to humans and evolved in the context of intensely cooperative social activities of a particular kind.

Our proposal is thus that the human primate has evolved—on top of its competitive skills and propensities—additional skills and motivations for interacting with others cooperatively. Specifically, humans engage with one another in cooperative activities characterized by shared intentionality (Bratman, 1992; Gilbert, 1989; Searle, 1995, 1993; Tomasello, 1999). Shared intentionality refers to activities in which participants have a shared goal and jointly coordinate their actions to pursue that goal (joint intentions)—and both represent the entire interaction cognitively. This cognitive representation reaches beyond an understanding of the intentions the other individual might have (she intends to do x by means of y in that so-called intentional acts are formed. Specifically, in we-intentions the intentions of each participant include something of the intentions of the other (we intend to do x by means of me doing y, and you doing y). This embedded intentional structure characterizes simple activities such as lifting a heavy stone together, as well as complex activities such as building a house or playing a symphony. When people share intentions with one another repeatedly in particular social contexts, this results in habitual social practices and beliefs that create what Searle (1995) calls “social or institutional facts”: such entities as marriage, money, and government, which are of course uniquely human and exist only through the shared practices and beliefs of a group.

The evolutionary processes for this unique adaptation are still unclear, but it is possible that premortem humans developed these skills of shared intentionality, which enabled more complex forms of cooperation, ultimately leading to the cultural organizations characteristic of modern humans. These cooperative motivations might have originated in nuclear families (Wrangham, Jones, Ladef, Pilbeam, & Conklin-Brittain, 1999) and spread as selection pressures favored individuals possessing these skills because groups pooling their individual efforts outcompeted other groups (Richerson & Boyd, 2005; Sober & Wilson, 1998).

Ontogenetically, human children grow up in the midst of all of these cooperative activities. Their emerging understanding of shared intentionality enables them to participate in an increasing number of interactions involving joint attention, cooperative communication, the use of artifacts and symbols, as well as normative social practices (the way we “ought” to do it). This understanding cannot be taken for granted, and indeed there are some individuals who are not equipped biologically to learn to participate in cultural activities. These are individuals with autism. Children with autism grow up in essentially the same environment as other children, but because of their biological deficit, they cannot participate in the cultural and symbolic activities around them in the species-typical manner. The development of human cognitive skills thus depends both on a species-typical cultural environment and on biologically evolved skills for participating meaningfully in such an environment.

2. The Ontogeny of Cultural Cognition

Perhaps the best place to observe the unique aspects of human cognition is in human infants and young children, as their
species-typical cognitive skills are first beginning to emerge. Comparison to nonhuman primates helps to identify what are indeed the species-unique aspects.

Cooperative Activities in the Second Year of Life

Human children do not just go around pursuing their own individual goals; they also are interested in and concerned for others. Thus, starting at around their first birthday, infants show concern for others in distress and occasionally comfort them (for an overview, see Eisenberg & Fabes, 1998). In experimental studies, infants at eighteen months of age – and to some extent even fourteen-month-olds – perform spontaneous acts of helping (Warnke & Tomasello, 2006) by, for example, helping an adult retrieve an out-of-reach object or opening the doors of a cabinet for him or her. To engage in these helpful acts, the children had to both understand the other’s unachieved goal and be motivated to altruistically help her to achieve it. This shows that young children can use their understanding of intentional action not only to learn from others (imitation) or to predict the other’s next move in a competitive situation (as chimpanzees) but also to actually act altruistically for another person. Young, human-raised chimpanzees may also in some situations be helpful to humans (Warnke & Tomasello, 2006). But whereas in helping it is sufficient simply to understand another individual’s intentional goal, cooperative activities are based on shared intentionality, with partners coordinating interdependent roles directed at a shared goal. The first steps in this direction are taken when infants at around one year of age engage in ritualized games such as peekaboo or rolling a ball back and forth, which rely on scaffolding by an adult (Gustafson, Green, & West, 1979; Ratner & Bruner, 1978; Ross & Lollis, 1987). Infants appear to understand that these social interactions involve interdependent actions, as in one study they prompted their adult partner to continue the game when she stopped participating (Ross & Lollis, 1987). Infants of this age also are able to reverse roles with an adult in a joint activity, demonstrating their understanding of the different roles involved (Carpenter, Tomasello, & Striano, 2005). In a set of more naturalistic observations, Bakeman and Adamson (1984) found that already in the first half of the second year, infants are active participants in joint activities. In a longitudinal study, they identified a considerable increase of coordinated joint engagements in free-play situations at about a year and a half to eighteen months of age. The category coordinated joint engagement denotes triadic interactions between a child, an adult, and an external object or event, in which the child not only follows the adult’s lead but also actively directs the adult’s attention. This shows that even before language acquisition has begun in earnest, young children become increasingly more active partners in joint activities in which they conceive of their own and a partner’s actions and attentions as directed at a third object and each other.

However, in one-year-olds, coordinated social actions remain restricted to rather ritualized games. When approaching the second year of life, children begin to generate bouts of coordinated social actions also in simple nonritualized contexts, as shown in a series of studies by Eckerman and colleagues (for an overview, see Eckerman & Peterman, 2003). They do this mainly by what the authors called the “imitative pattern,” as the partners imitate each other’s actions in a turn-taking sequence. In a study by Warneken, Chen, and Tomasello (2006), children at eighteen to twenty-four months of age were able to cooperate with an adult partner in both novel social games and problem-solving tasks. For example, in one task, the partners had to perform complementary roles like one person holding a container open so that the other could retrieve the object from inside. Interestingly, when the partner interrupted in the middle of the activity (as in the study of Ross & Lollis, 1987), children of both age groups frequently communicated to the partner in an attempt to request his or her cooperation. All children produced at least one such communicative attempt. This shows that the children understood their own and their partner’s action as interconnected parts of a joint activity. On a generous interpretation, this can also be taken as evidence that they were trying to redirect the partner toward a shared goal, insisting on the commitment to support each other’s actions in a cooperative activity.

Between eighteen and twenty-four months, children’s behavioral skills in coordinating their actions with a partner increase in terms of time and space improve remarkably, as shown by Eckerman (e.g., Eckerman, 1993) and Warneken et al. (2006). This also marks the phase during which children become able to solve problems cooperatively with same-aged peers. In a study by Brownell and Carriger (1990, 1991), children at eighteen months virtually always failed in problem-solving tasks with complementary roles where one child had to manipulate an apparatus so that the other could retrieve an object, but children at two years solved the tasks successfully over repeated trials. Thus, despite the small number of studies in this age group, we may tentatively conclude that in the first half of the second year of life, children already understand the basic joint intentional structure of cooperative activities in social games and problem solving, and their improving behavioral skills during the second half of the second year of life enable them to establish coordinated interactions in a wider array of contexts with different social partners.

Cooperative Communication in the Second Year of Life

Human communication is an inherently cooperative activity (Clark, 1996). When human beings converse with one another they are playing the complementary roles of speaker and listener, and each does his or her part toward the shared goal of the listener comprehending the speaker’s communicative intention. The speaker cooperates by expressing his or her communicative intentions in ways that are potentially comprehensible to the listener, even clarifying (helping) when necessary; and the listener cooperates by making good-faith attempts to comprehend the speaker’s communicative intentions and ask for clarifications (help) where necessary. These two roles are actually directly embodied in the main conventional devices that human beings have created for the purpose of communication, linguistic symbols, which are bidirectional in the sense that both speaker and listener can switch roles in using the symbols to influence what the other says, or that they influence themselves (Mead, 1934).

To comprehend and produce such communicative meanings, especially nonlinguistic ones such as pointing, interactants have to create some shared frame of reference (common ground, joint attentional frame) in which these means become meaningful in specific situations. A point by itself means nothing. For instance, if I point at a drawer, you will probably be confused, but if we both know together that you are looking for your glasses, you would immediately comprehend my meaning. You understand that my communicative intention is to change your intentional act of searching for the glasses by providing new information. Such comprehension depends not only on the ability to grasp the embedded structure of a communicative intention but also on the ability to understand the cooperative motive behind it – that you are doing this for me to help me find the object. This cooperative structure becomes apparent already in the preverbal communicative exchanges in which infants are able to participate shortly after their first birthday – in terms of both their comprehension and their production. On the comprehension side, infants begin to follow another person’s gaze direction and pointing gestures, interpreting such cues as communicative means to inform them about objects and events in the world. For example, in one study Behne, Carpenter, and Tomasello (2003) played a hiding and finding game in which the experimenter hid a toy in one of two locations and then, addressing the infant through eye-contact, indicated the
correct location by either gazing or pointing at it. Already at fourteen months of age, infants chose the correct location, indicating that they used the experimenter's communicative cues to find the toy. Importantly, this was not an automatic gaze- or pointing-following response, but rather resulted from an actual understanding of the communicative intentions behind it. Thus, when the adult produced similar surface behaviors, but without expressing the communicative intent to inform them (e.g., the index finger directed at the target, but only because the experimenter was looking at her wristwatch), infants searched randomly. The infant constructed with the adult a joint activity in which he or she represented that what we are doing together is playing a game in which I search for a toy and you help me find it — so the looking and pointing is taken as a communicative means to inform me of the location.

On the production side, it is in the same age range when infants make their first nascent attempts to express their own communicative intentions in putatively simple gestures such as pointing. First of all, infants point imperatively with the goal of having another adult do something for them, like hand them an object. This has been described as a situation in which they use the other person as a tool that can make certain things happen (Bates, 1979; Bates, Camianno, & Volterra, 1975). Second, they point declaratively to influence others' attention. When they see something interesting happening, they often point this out to adults and seem to expect them to comment back: they do not seem satisfied when the adult attends only to the object or only to the infant, as they repeat their point under these circumstances (Liszowska, Carpenter, Hennig, Striano, & Tomasello, 2004). Thus, these declarative points are aimed at sharing attention and interest in external objects and events. Third, infants sometimes point to provide information for others. In a study by Liszowska, Carpenter, Striano, and Tomasello (2006), an adult was using some kind of instrument, for example, a stapler, which got misplaced together with a distracter object. When the adult wanted to resume his action (e.g., picked up his papers ready to staple), he discovered the stapler missing and looked quizzically around. Twelve- and eighteen-month-old infants pointed more often to the target than the distracter object, presumably to help the adult find what he needed. In sum, starting at one year of age, infants point for three main reasons: imperatively, with the goal of having the other do something for them; declaratively, to share information about and interest in external objects and events; and informatively, in which their pointing is directed at helping others with their goal.

These acts of preverbal communication can be seen as ontogenetic forerunners to fully linguistic communication in that the basic structure of human communication is already laid out. In comprehending and expressing communicative intentions, infants demonstrate an understanding of the complementary roles of recipient and informant of a communicative act. In performing either role, they can take the other person's role into account and can switch between them, at one time requiring information (see Behne et al., 2008) and at another time being the informant themselves (see Liszowska et al., 2006). Linguistic communication adds in the perspective component inherent in linguistic symbols as different choices for construing a situation.

In general, human infants begin quite early to participate in cooperative activities involving the sharing of psychological states with others (e.g., attention toward or information about aspects of the world). In some theories, these interactions then become internalized in a Vygotskian fashion: comprehension of the external social interaction leads to an internal cognitive representation. Our proposal is that social interactions involving shared intentionality lead specifically to what we have called "dialogic cognitive representations" (Tomasello et al., 2005; see also Fernyhough, 1996). In dialogic cognitive representations, each participant conceives the activity holistically, with the shared goal and both roles (including its perspective) in a single representational format. These representations then enable children's full participation in cultural mediated practices such as linguistic communication and other forms of symbolic interaction with an interpersonal structure.

3. Children and Chimpanzees: From Understanding to Sharing Intentions

Comparing the cognitive skills of human children and chimpanzees — one of two closest relatives — is instructive because it helps us to identify those aspects of human cognition that were already present in the common evolutionary ancestor of the two species from those aspects that developed only in the human lineage. Such a comparison might also enable us to identify the social cognitive prerequisites for participating in a human culture, including in the comparison here of chimpanzees that have been raised by humans in a human environment, including exposure to artifacts and language. Interaction with humans may lead chimpanzees to adopt some more human-like skills of social behavior than is typical for their wild conspecifics (the so-called enucleated hypotheses; see Tomassello, 1996; Tomassello & Call, 2004).

To make our summary comparison, we will rely on data from three studies involving the same three human-raised chimpanzees between one and five years of age: Tomassello and Carpenter (2005), Warneken and Tomasello (2006), and Warneken et al. (2005). The tasks in these studies were generally modeled after experiments with human children and were focused on two dimensions of social cognition: (1) the basic understanding of goal-directed action and perception, and (2) the ability to participate in cooperative and communicative interactions involving shared intentionality.

Understanding of Goal-Directed Action and Perception

Perhaps the most fundamental skill of pri mate social cognition is the understanding of intentional action and perception. If organisms observe others repeatedly in the same situations, they can predict what they will do next on the basis of simple association and memory. But if they are to predict what others will do in novel situations, they must know what the others are trying to do (their goal) and what they can perceive in the world around them.

With regard to the understanding of goals, the critical test involves exposing subjects to a situation in which the environmental outcome produced by an actor's action does not match with his goal. For example, Melzov et al. (2002) had children observe an actor try but fail to put a ring on a hook. Eighteen-month-old infants attempted to bring about the desired but unobserved goal (ring on hook) rather than the undesired but observed end state (ring falling down) (twelve-month-olds do not do this [Bellagamba & Tomasello, 1995] but fifteen-month-olds do [Johnson, Booth, & O'Hearn, 2001]). In the study of Tomassello and Carpenter (2005), when the three young chimpanzees were tested with the same procedure with a set of several novel objects (including control conditions), they reproduced the intended acts rather than the failed attempts, indicating that they were actually able to interpret the demonstrator's actions in terms of his goals. The same three chimpanzees showed their understanding of goal-directed action also in a similar study in which they successfully reproduced actions an actor produced on purpose while basically ignoring those he produced by accident (signaled by the vocal marker "Whoops!"); for the original study with fourteen-month-old infants, see Carpenter, Akhtar, & Tomasello, 1998).

Beyond the realm of social learning, there is another context in which the understanding of unachieved goals is crucial: helping. To successfully help another person, one has to have not only an altruistic motivation but also an understanding of the goal that the other cannot achieve. To test this, the helping tasks developed for the human infant study were adapted for the three human-raised chimpanzees (Warneken & Tomasello, 2006). As it turned out, all three
chimpanzees helped the human caregiver by handing her objects she was unsuccessfully reaching for— for example, after she had accidentally dropped them on the floor (and did not bring them when she had discarded them intentionally). However, the chimpanzees did not help in the other kinds of situations with more complex goals (e.g., completing the stacking of objects, opening a door for the other). These findings support the interpretation that chimpanzees are able to understand goal-directed action, at least when the goals are easy to discern, as in situations in which a person is reaching for an object.

Just to round out the picture, we should also report that several other studies also demonstrate that other chimpanzees can distinguish accidental from intentional actions and trying and failing from succeeding (see Call et al., 2004; Call & Tomasello, 1998; Uller, 2004). Taken together, these results demonstrate that chimpanzees understand important aspects of intentional action, and they even do this on some occasions outside of competitive situations— namely, when learning about the properties of new objects and when helping another to achieve a goal.

With regard to visual perception, it is well known that many nonhuman primates follow the gaze direction of others to targets (Tomasello et al., 1998). As did the chimpanzees in the study of Tomasello, Hiré, and Agnetta (1999), the three human-raised chimpanzees followed the gaze direction of a human to hidden locations behind barriers. When an experimenter was alternating gaze between the chimpanzee and an object that the chimpanzee could not see because the view was obstructed by some kind of opaque barrier, the chimpanzee locomoted behind the barrier to see what the experimenter was looking at. Thus, these three chimpanzees knew that others see things that they themselves cannot see, similarly to human infants at twelve months of age (Moll & Tomasello, 2004).

However, despite the understanding of what others can or cannot see, the same subjects did not seem to understand that others attend to specific aspects of things in their perceptual field. Studies with human infants have shown that from around twelve to fourteen months of age they know that others selectively attend to things that are new to them. For example, in a study by Moll, Koring, Carpenter, and Tomasello (2006), an adult looked at a single object and exclaimed excitedly, "Oh, wow, look at that!" When the object was old for the adult— both child and adult had played together with the object— the children inspected the side of the object or looked for something else in the room, possibly because they assumed that the adult could not refer to such an excited way to the object as a whole that it already knew quite well. On the other hand, when the object was new to the adult, the children did not display such searching behavior presumably because they thought the adult was excited about the new object as a whole. When the three chimpanzees were tested with essentially the same method, they inspected the object indiscriminately of whether it was new or old to the experimenter.

Overall, then, the three human-raised chimpanzees demonstrated an understanding of perception— they see even when that differs from what they themselves see— but they did not understand that humans selectively attend to things depending on what is new to them. This failure might be because chimpanzees simply do not understand that humans get excited about new rather than old things. It is also possible, however, that human infants but not chimpanzees can distinguish between aspects of the world that they have and have not previously shared with others in episodes of joint attention (see Moll & Tomasello, 2004). Thus, their failure in this task might reflect their general lack of skills and motivation for joint attention (see the subsequent section).

Understanding Shared Intentionality

Chimpanzees in the wild do many things in small groups, including hunting for monkeys (Boesch & Boesch-Achermann, 2000). In experimental studies, chimpanzees will work together, under some circumstances, to obtain food, demonstrating in the process an understanding that the partner is needed and selecting the partners that work best (Melis et al., 2006). These behaviors from the wild and the laboratory could all be called "cooperative," in the general sense of the term, but it is not clear whether they are underlain more specifically by shared goals and intentions; that is, by skills and motivations for shared intentional action.

Warenke et al. (2006) adapted the four cooperative tasks from their experiment with children to test the three human-raised chimpanzees on their skills to engage in cooperative activities with their human caregiver. The chimpanzees were able to solve problem-solving tasks with food as target object (e.g., by lifting a door so that the partner could retrieve it for them), but they showed no interest in social games with no external goal as such. Most important, when the partner interrupted the activity by not performing her role, the chimpanzees never once attempted to reengage her actions. The chimpanzees instead tried to solve the task alone or disengage from the task completely, which suggests that they did not conceive of the activity as one involving two roles directed at a shared goal. This stands in stark contrast to the human children at eighteen and twenty-four months of age, who reliably produced such reengagement attempts.

Similarly, the three chimpanzees did not show evidence for role-reversal in simple social games such as one person holding out a plate and the other placing an object on top (Tomasello & Carpenter, 2005). The chimpanzees performed either action but did not perform it in a manner that could be interpreted as an overt invitation to the partner to take her turn. In contrast, human children at eighteen months— occasionally already at twelve months— reverse roles spontaneously. When they start out with one role (e.g., placing the object on top), they switch to the other role of holding out the plate for the partner, with an expectant look to the other's face (Carpenter et al., 2005). The interpretation here is that human children— but not chimpanzees— understand joint activities from a bird's-eye view in which the shared goal and both roles are part of one representational format, and so easily reversed if needed.

In terms of cooperative communication, it is very interesting that chimpanzees basically never point out things to one another, show things to one another, or instruct one another intentionally (Tomasello, 2006). Human infants do these things from around their first birthdays, demonstrating a strong motivation to share experience with others. Chimpanzees do, however, sometimes point to things they want for humans. Thus, Tomasello and Carpenter (2005) found that all of their three human-raised chimpanzees produced communicative gestures from early in life. However, all of the gestures by the three human-raised chimpanzees were imperative for action, such as pointing to distant objects to have the human retrieve it for them. Similarly, all three chimpanzees used more proximal gestures such as giving a closed container to their caregiver when they could not open it themselves. By contrast, they never once produced a declarative gesture such as showing or pointing to the interest in an object or an event, behaviors that are very common in human infants from around twelve months of age.

With regard to comprehension of communicative gestures, there is no indication that the three chimpanzees understood that pointing could be used to inform others of things in the world. They were tested in a situation very similar to the hiding and finding situation by Behne et al. (2005) used with human infants. When a piece of food was placed under one of two opaque containers, they randomly chose either one of them, unable to use communicative cues by the experimenter who indicated the correct location by pointing at it or, in a variation of this, placing a marker on top (for a review of other studies coming to the same conclusion, see Call & Tomasello, 2005). Thus, in contrast to one-year-old infants, the chimpanzees were unable to interpret the
cooperative communicative gestures of others. One interpretation for this is, again, that they did not view the interaction as a cooperative activity in which the other expresses the communicative intention to inform them about something.

Interestingly, when the situation was framed as a competitive one, chimpanzees were suddenly successful. Hare and Tomasello (2004) tested mother-reared chimpanzees by directly comparing a competitive and a cooperative version of the task. When they saw a competitor (human or chimpanzee) unsuccessfully reaching for one of two containers with a hand gesture very similar to pointing, they were able to infer that this was the one containing food and chose accordingly when it was their turn. However, when a cooperative experimenter pointed to the correct container, the same subjects chose at random. Thus, they were able to read the competitor’s intention to snatch the food but did not understand the communicative intention to inform them of the correct location. Once again, one proposal to account for this difference is that this communicative situation is fundamentally cooperative and therefore not mastered by the chimpanzees. Cooperative gestures involving sharing information become meaningful only under the premise that the subject views the gesture as part of a joint activity, in which the gesturer is sharing information with them. Thus, although chimpanzees are able to read the perception and goals of others, a critical skill in the context of competitive interactions, they seem evolutionarily less well prepared to participate in cooperative activities that are based on sharing attention and intentions with others.

4. Conclusion

From an evolutionary perspective, cognition is always situated. In the case of humans in particular, many cognitive skills are situated in individual activities of locomotion, perception of the physical and social worlds, manipulation of objects, and so forth. But others are situated in social interactions. Our proposal is that, in general, developed skills for understanding intentional action and perception in the context of competitive social interactions, and this enabled all kinds of new skills for predicting and manipulating the behavior of others. In addition, human beings also developed some additional skills of social cognition to create and participate in highly cooperative social interactions involving shared intentionality. These species-unique social-cognitive skills enabled the creation, over historical time, of all kinds of very different cultural practices and artifacts in which most human children in different cultures develop ontogenetically today. Following Vygotsky, we can posit that the internalization of these interactions leads to some new forms of dialogic or perspectival cognitive representations. These new forms of cognitive representation are fundamentally social in nature, involving both shared and differentiated perspectives on a single set of entities, so that one and the same entity may be simultaneously construed in different ways, under different descriptions, for different purposes. Such perspectival cognitive representations are taken for granted in cognitive science— all theories of knowledge representation assume them as a matter of course—but in fact there is no evidence that any other species develops such representations (Tomasetto, 1999). Our proposal is that perspectival cognitive representations are an ontogenetic product resulting from humans’ unique biological adaptation for social interactions involving shared intentionality, and that other species do not have such representations because they are not adapted for such social interactions.

Thus, we see here the basic human cultural dialectic: biologically evolved skills for social interaction enable the creation of cultural artifacts and practices, which then structure the ontogeny of each new generation of children. Children internalize the use of these cultural artifacts and practices, and the social interactions in which they are mastered, resulting in the kinds of perspectival cognitive representations that distinguish human cognition from that of all other animal species. A full understanding of any aspect of human cognition thus requires an understanding of the ecological contexts—in this case the social and cultural contexts—in which it has evolved and developed.

References


