Social Conventions, Institutions, and Human Uniqueness: Lessons from Children and Chimpanzees

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Abstract Cooperative behavior has become conventionalized and institutionalized over the course of human evolution. When faced with situations in which we desire to coordinate with others, we adopt social conventions such as driving on a particular side of the road, and adhere to these for social reasons: we expect others to, they expect us to, and this is common knowledge in our cultural community. Many of these practices have also become institutionalized via processes of formal codification and symbolic mediation, resulting for instance, in traffic laws and road signs. And such practices have a normative quality such that there may be penalties for non-adherence.

Conventional and institutionalized modes of coordinating represent derived evolutionary traits in the human lineage. Here, proximate causes of this uniqueness are grounded in a group of human-specific social-cognitive abilities, known as 'collective intentionality'. Already apparent in young children, and apparently absent in chimpanzees, these abilities include a capacity to cooperate with joint goals and joint attention; to collectively assign symbolic functions and to grasp the 'collective imaginings' that these prescribe; and to act according to social norms. Ultimate causes of this uniqueness are discussed in terms of reduced levels of social competition; group-selection processes promoting hyper-cooperativeness; and the institution of an egalitarian social organization in human evolution.

1 Introduction

Social conventions constitute ways of coordinating with others (Lewis 1969). It is by adhering to a convention that people convene at set times, travel without collisions, and communicate what they mean to one another in various spoken

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languages. However, these conventional modes of coordination are not simply regularities in practice. Many have become institutionalized over the course of human evolution. In some cases, this amounts to formal or legal codification of the practices, as in the cases of terms of employment, marriage contracts, and traffic rules. But human social life is also guided by less formally codified institutions in the forms of symbolically mediated practices. These include, for instance, codes of dress, modes of greeting people, and symbolic communication systems such as spoken languages. Central to both legally codified and uncodified modes of coordination are their normative quality (Gilbert 1989). Social conventions and institutions do not specify what "is done", but rather what "ought to be done". Thus, if a person breaches the terms of his or her employment contract or, more informally, arrives to a wedding inappropriately dressed, there will be consequences such as legal punishment or loss of social standing. The normative force of social conventions thus becomes especially evident in the sanctions that follow deviance from the rules.

Institutionalized forms of cooperation appear to be unique to humans. This is not to say that our phylogenetically closest relatives, the chimpanzees, do not exhibit impressive cultural capacities. Indeed, they coordinate action with one another in a wide range of activities including group hunting (Boesch and Boesch 1989; Gilby et al. 2008; Watts and Mitani 2002), boundary patrol (Mitani and Watts 2005), and mate guarding (Watts 1998). They also communicate with one another intentionally and flexibly in their gesture (Call and Tomasello 2007). And there appear to be local, group-based traditions in tool-use techniques, grooming and courtship behaviors, and modes of gestural communication (Boesch and Boesch 1990; Pika et al. 2005; Whiten et al. 1999, 2005), such that a range of styles are habitually or customarily adopted by different groups.

However, while the extent to which these traditions result from social learning processes, or are rather shaped by variations in the local ecology between different groups is unclear [see, for example Huffman and Hirata (2004) and Humle and Matsuzawa (2002)], a striking difference remains between chimpanzee and human culture: In addition to the massive discrepancy in the quantity and complexity of material culture between our two species, in no case does chimpanzee social interaction appear to be mediated symbolically or governed by any type of socially and collectively recognized normative rules (Hill et al. 2009). Thus, while chimpanzees act in socially coordinated ways with one another to great success, human interaction additionally involves predetermined social roles, such as "colleague", "parent", or "friend", that prescribe cooperation according to culturally defined norms. Furthermore, the use of artifacts in chimpanzee traditions appears to be restricted to instrumental tool use [such as nutcracking, see Boesch and Boesch (1990)]. This in no way compares with the way in which humans assign symbolic status to objects, as well as the human body, in the form of uniforms, tattoos, passports, jewelry, religious artifacts, money, and so on, resulting in the creation and transfer of normative rights and obligations. Thus, while chimpanzee coordination and cultural traditions are impressive, they are not conventionally and institutionally governed.

In order to explore the basis of this cultural disparity, we examine the following: some important aspects of young children's engagement in conventionalized

institutional practice; the social-cognitive abilities they recruit in such practice; and some critical points at which the social-cognitive abilities of chimpanzees and children appear to diverge. In particular, children's engagement in cooperative activities involving collective intentions to act together with others are explored. Relatedly, their use of joint attention in coordinating such activities, their engagement in play with objects assigned with conventional status, and their understanding of social norms are discussed. Cross-species differences between children and chimpanzees in the behavioral and social-cognitive components of conventional institutional practice are considered at each stage.

Finally, these proximate social-cognitive differences are placed within a wider evolutionary framework. It is proposed that factors that may have fundamentally contributed to species divergence in conventional and institutionalized modes of cooperation include (1) inter-species variation in more general levels of competitive cognitive constraint; (2) processes of gene–culture coevolution involving social conformity, moralistic punishment, and group-level adaptations for hypercooperativeness (Richerson and Boyd 2005); and (3) the institution of an egalitarian social organization in human evolution (Boehm 1999; Erdal and Whiten 1996; Knauft 1991).

2 The Background of Collective Intentionality

The underlying structure of human institutional reality may be described in terms of its collective intentional basis (Searle 1995). A group of individuals have a collective intention to do something together when their reasons for acting are not reducible to a set of individual intentions. Thus, for instance, when two people take a walk together, it is not simply that they each have individual intentions to walk that happen to coincide. Their individual intentions derive from their collective intention, such that it is *because they intend to walk together* that either of them wishes to walk at all. These collective intentions involve joint goals of the form "We intend to X", and are normatively binding, such that abandoning the activity entails a risk of censure (Gilbert 1989). So, if one person unexpectedly departs from the joint walk without warning, the other may reprimand them, or demand explanation, and this reaction will be recognized as legitimate.

Importantly, collective intentions underlie the existence of different types of rules in human society: regulative and constitutive rules [see Rawls (1955) and Searle (1995)]. Regulative rules are those that regulate existing social practices, such as traffic rules. Constitutive rules, by contrast, bring new social practices into existence, such as the rules of marriage ceremonies. The difference is that people may have driven cars before traffic rules were in place, but people did not stand before altars and exchange wedding rings before the rules of marriage existed; the marriage rules create the practices associated with official marriage. The collective intentional basis of both types of rule, however, leads to a degree of arbitrariness in form such that people can drive on either the left or the right in order to coordinate,

and exchange wedding rings or some other object in order to symbolize their marriage status. What matters is that there is collective agreement on the rules and a community-wide commitment to adhere to them.

Constitutive rules have the form "X counts as Y in context C", and impose nonphysical functions or what are known as "status functions", on people, actions, and objects by collective intentionality (Searle 1995). For instance, there is nothing to the physical makeup of a person that enables him to perform the duties of a religious official. It is rather by collective recognition of his status as "priest" within a particular context that he is invested with such powers. Similarly, there is nothing intrinsic to the rings that are exchanged or the words that are spoken at a marriage ceremony that renders the couple married; they count as having married status because we recognize that they do, within the context of our cultural practice. The primary effect of status assignment is the creation of deontic relationships between people, in the form of rights and obligations. For instance, the ordainment of a priest gives that individual the right to conduct marriage ceremonies, but also obliges them to conduct services. When humans coordinate with one another with collective intentions and the imposition of status, normatively governed conventions and institutions emerge.

In light of this, it seems notable that children in their second year of life show indications of cooperating with others in collectively intentional ways, and chimpanzees overall do not (Tomasello et al. 2005). Specifically, they appear to cooperate with joint goals, involving rudimentary commitments to the joint activity: On engaging with an adult in a simple task such as retrieving a toy, when the adult ceases to cooperate for no apparent reason, toddlers wait patiently for him to restart, and eventually try to reengage him (Warneken et al. 2006). Chimpanzees in a similar situation (but involving food), however, do not wait for their partner or make any attempts to direct or reengage them, despite the fact that this is well within their capabilities (Gómez 2007). They rather attempt the task on their own (Warneken et al. 2006). Importantly, human toddlers do not appear simply to want to continue their own selfish enjoyment of the activity: even when aware that they can perform the task alone, they still try to reengage their recalcitrant partner (Gräfenhain et al. 2009).

Another species difference appears to be in the way that young children are concerned for the equal sharing of resources at the end of a cooperative activity. After acting together jointly in pairs, once a child has retrieved his or her rewards they continue to cooperate with their partner to ensure the partner likewise retrieves their own reward (Hamann et al. in press). And they do not appear similarly concerned when there has been no previous cooperation between the two. This concern that all receive rewards after joint activity does not arise in chimpanzees on the same task (Greenberg et al. in press).

Lastly, young children also appear to understand something of the more explicit commitments that characterize collective intentional activity: After a verbal declaration to engage in joint activity (e.g., "let's play together"), young children are more likely to engage recalcitrant partners, and also more likely to verbally excuse themselves when a more attractive activity presents itself (Gräfenhain et al. 2009).

In all, this suggests that young children form joint goals and commitments in their simple forms of cooperation, but there is no convincing evidence yet that

chimpanzees do the same. In fact, what appears to critically affect the rates at which chimpanzees cooperate with each other is whether or not the food to be secured can be easily monopolized by social dominants, as well as the specific levels of tolerance between pairs in separate feeding situations (Melis et al. 2006). This issue will be explore in more detail later on (Section 7), but for now it may be taken to suggest that the cooperative activities of chimpanzees are more tightly constrained by competitive motivations than are those of human infants. Thus, it may be that such motivations prohibit the formation of collective intentions in chimpanzees.

3 Coordination and Convention

At the root of conventional and institutional practice lies the notion of coordination. In his seminal work, Lewis (1969) defined a social convention as one of the multiple solutions to a recurrent problem in which several individuals wish to coordinate and each person's best action depends on what the others do. For example, two friends find their telephone conversation cut off, and they both desire to reestablish connection. The two solutions in which one calls and the other waits, or vice versa, represent alternative solutions to the coordination problem, in other words, alternative conventions. And while neither minds much as to which convention is settled on, both prefer one of these solutions to coordination failure (e.g., both trying to call back). Importantly, in such a situation, each party must reason about what the other person will do. But a potential recursion problem may arise here. In order to figure out what to do, I have to reason about whether you will decide to call back. But you are likely to be reasoning the same about me. Therefore, in order to decide what to do, I must reason about your reasoning about my reasoning, and so on potentially *ad infinitum*. Central to the adoption of a particular coordination convention is, therefore, some form of joint, mutual, or shared knowledge of what each party understands of the situation.

However, the particular cognitive prerequisites for coordinating toward a convention have become a matter of some debate. One possibility is that coordinators require "common knowledge" of a situation, such that they may recursively reason about what each other understands of the situation, at least a few levels up the reasoning hierarchy ("I expect you to expect me to expect you", etc.). But then questions arise as to when and how appropriate "cut off" points are reached in this hierarchy of inferences, such that an individual can ever be satisfied that common knowledge exists (Gilbert 1989). This, as well as other concerns about the capacity of adults to reason about recursively embedded states [let alone young children, see Tollefson (2005)], has led to alternative proposals as to how such mutual understanding might be established. These place joint understanding of a situation more squarely in the domain of perception and suggest that children and adults may use psychological heuristics for assessing whether or not mutual knowledge exists between parties. Thus, for example, in situations requiring coordination, two individuals might assess the evidence that their partners are rational and attending to the task-relevant aspects of the environment (including themselves)

and make inferences about whether common knowledge holds on this basis (Clark and Marshall 1981).

The more specific phenomenon of "joint attention", in which each partner monitors the same aspect of their environment *as well as the other's attention* (Bruner 1983; Tomasello 1995), has recently been proposed not just as a basis for common knowledge but as a form of common knowledge in itself [see Peacocke (2005) and Tomasello (1995)]. On the one hand, there are structural resemblances in the way in which joint attention and common knowledge may both iterate recursively: just as I may "know that you know that I know, etc"., I may "see that you see that I see, etc". But it is also possible that the perceptual basis of joint attention enables individuals to bypass complex inferential processes altogether, since the other person can literally see their partner attend to a target and themselves (Peacocke 2005). In fact, since perception is an intentionally guided process of information acquisition (Brink 2001; Gibson and Rader 1979), this picture may be oversimplified. But behavioral cues such as gaze and head direction may operate as salient cues in assessing whether individuals are in joint attention (that are not obviously available in the case of common knowledge). And within a frame of joint activity, particularly one of potential coordination, children may reason something of the form: "if we've both looked towards the target, and to each other, perhaps we can assume enough information is shared between us to launch cooperation".

We, therefore, assessed the role of joint attention in young children's decisions to coordinate toward a convention in a coordination game (Wyman et al. submitted). In this particular game, known as the "Stag Hunt" (Rousseau 1762; Skyrms 2004), the child and an adult partner continually and individually collected low-value prizes (hares). Occasionally, the additional option of collecting a high-value prize (a stag) cooperatively with the adult arose, and children had to decide which of the two to opt for. However, the decision entailed a risk: a lone attempt on the high-value prize would certainly fail and would also lead to loss of the child's low-value prize (see Fig. 1).

Half of the children played the game in conditions of individual but parallel attention: the child could see the prizes, could see the adult monitor the prizes, and was potentially aware that the adult could see the same of them. For the other half of the children, by contrast, the adult also looked over and made mutual eye contact with the child, thus creating *joint* attention to the high-value prize. The result was that children coordinated with the adult to obtain the high-value prize more often in conditions of joint attention to the prizes than in conditions of individual attention.

		Player 1	
		Stag	Hare
Player 2	Stag	x,x	0,y
	Hare	y,0	y,y

Fig. 1 Schematic payoff matrix of the stag hunt game (where $x > y$)

This suggests an important role for joint attention in children's decisions to coordinate toward joint goals with others. It also points to the possibility that joint attention may act as a developmental precursor to the type of recursive, inference-based common knowledge that adults seem capable of contemplating to some degree. Lastly, it suggests joint attention may act as a psychological heuristic for the assessment of common knowledge in general (Campbell 2005; Peacocke 2005).

Interestingly, chimpanzees in a "Stag Hunt" situation are quite capable coordinators: when two conspecifics can either retrieve a low-value food (raisins) alone, or rather coordinate to cooperatively retrieve a high-value food (banana) that is available for a limited period of time, they are highly successful in securing the high-value food (Bullinger et al. in press). However, the strategies by which they achieve coordination may be slightly different from those of young children. In particular, they do not appear to visually monitor their partners or actively seek out mutual eye contact with them. Rather, one partner spontaneously approaches the high-value food, and if the other does not follow after some time, attempts to communicate with him or her. Further studies that investigate the cooperative propensities of child peers in "Stag Hunt" games, and the particular strategies they use to coordinate are currently under way. But these provisional results suggest that coordination in children may be centrally mediated by the mutual expectations or knowledge embodied in joint attention, whereas that in chimpanzees may be based on a behavioral strategy involving the mutual adjustment of actions and, when the risk of failure seems immanent, imperative communication.

In fact, while it appears that chimpanzees have good grasp of what others see (Call and Tomasello, 2008), there is some suggestion that joint attention (in which they understand that they and others attend to an object and each other's attention) is not within their cognitive repertoire. In particular, there are quite specific developmental differences in the emergence of joint attention-related abilities in human and chimpanzee infants (Tomasello and Carpenter 2005): Human infants first develop skills of "joint engagement" in which they check back and forth between an object and an adult's face during interaction; they then begin to engage in attention following behaviors in which they "tune into" the attentional frame of others and direct others' attention with their own communicative gesturing; lastly, they engage in imitative learning [see also Carpenter et al. (1998)]. Chimpanzee infants, by contrast, first produce some imitative behaviors, and their attention following and communicative gesturing emerge afterward. Importantly, they fail to develop any joint engagement behaviors at all (Tomasello and Carpenter 2005). In line with this, chimpanzee infants conspicuously fail to develop any declarative gestures, that is, gestures produced for the purpose of sharing attention with others or showing objects for that purpose. Human infants, by contrast, from the age of 12 months, spontaneously point for others simply with the singular goal of sharing attention with them (Liszkowski et al. 2004).

One possibility, then, is that while chimpanzees engage in relatively sophisticated forms of behavioral coordination and communication, they do not do so on the basis of mutual expectations, or the type of mutual knowledge embodied by joint attention, as young children appear to do. In this sense, their coordination is not by convention.

4 Coordination and Fiction

A special case of coordination arises in human interaction that is mediated by collectively assigned status functions. As mentioned, status is assigned to people, actions, and objects via the constitutive rule "X counts as Y in Context C". This essentially results in the symbolic mediation of social interaction, and places particularly interesting cognitive demands on interactants. Since there is nothing in the X term that physically denotes the Y term, in order to understand status functions, Searle (2005) notes that we have to "think at two different levels at once". He elaborates "we have to be able to see the physical movements, but see them as a touchdown, to see the piece of paper, but see it as a dollar bill, to see the man but to see him as a leader. . ." (pp. 12–13).

The cognitive ability to take such a dual perspective is required for an appreciation of symbolic phenomena in general. For example, in order to successfully interpret the symbols on a map, one cannot simply observe that there are markings on a piece of paper. One must additionally recognize that the map maker intends the reader to interpret the blue lines as rivers, the numbers as altitude markers, and so on [see Rakoczy et al. (2005b) on the development of this ability in children]. The way this dual perspective works in another domain, that of symbolic art, offers additional insights into how we understand institutional status. The idea is that the assignment of status functions to props generates a set of *prescribed imaginings* (Walton 1990). In observing a painting, for instance, one not only observes that there are strokes of paint applied to a flat canvas. To appreciate the painting as work of art, one is also required to imagine that there is a couple who stroll through the park, the sun is setting, and so on. Indeed, this is precisely the intention of the artist: In crafting a work of art, he or she invests in shaping some aspect of the environment such that it will result in something more than observations of a literal nature (such as "there is a canvas" or "there is a block of wood"). He or she creates a work with the intention of triggering associations, interpretations, and imaginings. And only to the extent that others adhere to these psychological prescriptions do they engage with or appreciate the work as art.

This notion of prescribed imaginings may provide some insight into how institutional structures exert social force in governing our daily coordinations, despite their ontological subjectivity: Ultimately, we ascribe to a set of "collective fictions" in our recognition of institutional status and its associated norms because neither exists independently of our collective acceptance that they exist (Castoriadis 1998; Plotkin 2003; Searle 1995). Thus, in a similar sense to our collectively imagining that a couple strolls through the park in appreciating a painting, we may be said to collectively imagine that a paper is "money" or that a couple is "married" in our institutional affairs. This is precisely the function of symbolic status: to direct our imaginings in collectively recognized, normatively governed ways. But critically, in the case of institutional status, this leads to normatively governed patterns of behavior: We allow those in possession of money to acquire certain goods and we require that those in receipt of money relinquish those goods; we allow married couples

certain rights and oblige them to fulfill certain duties. In this way, the prescribed imaginings associated with the assignment of status functions may be central in mediating the social norms at the basis of institutional practice.

From a developmental perspective, it may be important that props invested with status functions via constitutive rules underlie the institution of fiction more generally (Walton 1990). In particular young children's games of fictional play appear to contain something of the elementary structure of institutional practice (Rakoczy 2006, 2007). Just as paper may count as "money" in the context of our adult exchange practices, blocks may count as "apples" in young children's games of joint pretense (Walton 1990). The assignment of status functions is by collective intention (it is only by our intentions that these blocks count as "apples") and results in normative prescriptions for action: Once children assign the status of pretend of "apples" to their blocks, they ought, therefore, to be "eaten" and not "drank" or used to build with. In addition, the role of performative speech acts in pretense is central to status function creation: Just as a priest may consecrate a marriage with the words "I now pronounce you man and wife", in pretense, children may ordain objects with conventional status, for example, with the words, "these are now our apples!"

However, pretend play is not yet institutional practice, and the differences between the two render pretense "proto-institutional" rather than directly analogous to the adult phenomenon (Rakoczy and Tomasello 2007). For instance, typically in pretense, status is assigned and must be respected by just a few individuals, and so children do not need to consider whether, and how, a whole community understands that status. The status functions are not part of a wider "web" of functions and practices (as in the case of money, for instance, in which an individual must grasp not only what a dollar bill is, but how it is earned, the relative value of goods, and so on). And the status functions exist temporarily and nonseriously such that they do not have "real-life" consequences in the way that, for instance, acquiring and spending dollar bills do.

In fact, it is precisely because of these differences that pretense has been proposed to constitute a developmental "cradle" for children's understanding of social conventions and institutions (Rakoczy and Tomasello 2007). And this possibility renders pretend play a useful tool for investigating what young children understand of status assigned by constitutive rules, and their associated normativity.

5 Coordinating with Objects and Status

Young children begin pretending during their second year, mostly in social interactions with caregivers (Haight and Millar 1992), and by imitating the pretend actions they see others perform (Rakoczy and Tomasello 2006; Rakoczy et al. 2005a). An interesting question with regard to their understanding of institutional phenomena is what, during such play, they understand of the constitutive rule "X counts as Y in C" such that, for example, a "wooden block" counts as an "apple" in the context of "their game".

By around age three, children appear to understand something of the dual perspectives involved in pretending with objects. They correctly state, for instance, that although somebody is pretending a piece of string is a snake, it is really only a piece of string (Abelev and Markman 2006; Flavell et al. 1987; Lillard 1993). Children this age also understand that an object may be assigned multiple pretend identities, for instance, observing that while they pretend an empty cup contains chocolate milk, another person may pretend it contains orange juice (Bruell and Woolley 1998; Gopnik and Slaughter 1991; Hickling et al. 1997). More revealing, however, are situations in which children *inferentially extend* the pretend stipulations that have been set up in a game through their own pretend actions. When a child, for instance, pretends to drink pretend milk that an adult has pretended to pour, they demonstrate a collective or joint intention to assign status together with that person (Rakoczy 2006). This is because, unlike in the case of real pouring (in which the adult's pouring actually enables the child's drinking), there is no physical contingency between the two pretend actions that could otherwise motivate or explain the child's pretend elaboration. It is significant, then, that children as young as 2 years old produce inferential pretense in their object substitution, for instance, pretending to eat what the other has cooked, or clean what the other had spilled (Harris and Kavanaugh 1993; Rakoczy and Tomasello 2006; Rakoczy et al. 2004). This serves as particularly convincing evidence that they engage in status assignment, and thus understand at least the "X counts as Y" part of the constitutive rule.

However, whether they also assign this status *context-specifically* is not yet clear. This is important because it is the essence of status assignment that it exists only relative to context. Thus, for instance, a religious dignitary may be allocated substantial authority by one group of people, but be considered powerless by another; a bank note may enable the purchase of valuable goods in one country and be rejected as invalid outside that country. It is only within the context of a joint agreement, practice, or particular community that conventional status holds any force.

We, therefore, investigated the understanding that 3-year-old children have of the context-specific nature of jointly assigned status. Specifically, we assessed their ability to pretend with an object whose pretend status *changed* between two different contexts (Wyman et al. 2009b). Children were initially confronted with an object that had no obvious function (such as a stick). They were then required to pretend that the object had one status (such as "spoon") in one context and a different status (such as "toothbrush") in a second context. Crucially, however, they were also required to switch back to the original context, pretending appropriately again (that the object was a "spoon"). In addition, as a particularly convincing measure of their understanding, they were required to pretend inferentially at each stage of the game (in context 1, again in context 2, and then again back at context 1) by not only repeating, but in some way elaborating the pretend acts that had previously been performed there. The result was that 3-year-olds pretended appropriately and inferentially when switching back and forth between contexts. And this was the case regardless of whether the

contexts were set up by one adult who moved between two locations, or rather by two different adults at the same location.

Thus, young children appear to understand the rudiments of the constitutive rule "X counts as Y in Context C" in their games of joint pretense. Additionally, they demonstrate not only an understanding of status function assignment but also the consequences this has for what may be deemed appropriate action in each context. Lastly, the fact that children pretended appropriately both with the same person at two different locations and with two different people at the same location suggests that they do not simply associate or "map" different statuses to people or places. It rather indicates an understanding that it is joint activity or practice that underlies status function assignment.

In contrast to the relatively sophisticated understanding young children have of symbolic status, the symbolic capacities of chimpanzees appear to be quite limited. Strikingly, chimpanzees are able to both understand and use a wide variety of seemingly symbolic devices in the form of American Sign Language gestures (Fouts 1972; Gardner and Gardner 1969), as well as abstract lexicon symbols (Greenfield and Savage-Rumbaugh 1990; Savage-Rumbaugh et al. 1986). They are also able to match sets of objects presented on a screen to the Arabic numeral representing the sum of the set, and to select the set of objects that correctly matches the numeral (Biro and Matsuzawa 2001). However, while these abilities are unquestionably impressive, they may demonstrate highly advanced associative learning capacities, rather than any real symbolic competence, and they do not indicate that chimpanzees understand anything like constitutive rules. For the most part, these capacities rely on massively extended training programs of conditional reinforcement, containing hundreds of trials in which the animals receive food after successfully connecting a sign with a particular referent. Over time, they then develop a wide range of arbitrary sign-referent connections, enabling them to later select referents in responses to signs, and signs in response to referents. But this does not demonstrate an understanding that any particular symbol "counts as" or "stands for" something beyond itself, that it does so context-specifically, or that it does so by social agreement.

In fact, there is some indication that what chimpanzees understand of these symbolic devices is their instrumental use in interactions, rather than any collectively assigned meaning: Almost all instances of chimpanzee productive communication in gestures and lexicons are restricted to one communicative function: requesting objects or actions from humans (Greenfield and Savage-Rumbaugh 1990; Rivas 2005). This disinclination to use either signs or lexicons for other communicative functions, such as to inform or to share attention with others (as infants as early as 12 months old do with their pointing gestures, see Liszkowski 2005; Liszkowski et al. 2004, 2006), suggests that what chimpanzees understand of particular gestures and lexicons is their functional role in acts of request, rather than the underlying structure of their assigned symbolic status. In effect, what chimpanzees may understand of gesture signs, lexicons, and numerals is that when humans produce them, they themselves should respond in a particular way, and when they produce them, humans will likely act in a particular way.

There is another domain in which it appears possible that chimpanzees and apes in general might symbolically assign status to objects: that of pretend play. For instance, there are suggestions that chimpanzees may pretend to eat from a picture of food, or to feed a cuddly toy with grapes (Lyn et al. 2006). Similarly, there is an observation of a captive gorilla apparently handling a wooden log as though it was a baby (Gómez and Martín-Andrade 2002). However, not only are these apparent pretend behaviors highly infrequent in captivity and rarely observed in the wild, evidence that the apes actually have an intention to pretend [which is definitive of pretend acts in general, see Rakoczy (2006)] is unconvincing: Without anything like inferential measures of pretend action, it is difficult to ascertain from observations whether the chimpanzee intentionally pretends that a picture is food or simply responds to the picture as though it were real [as young infants sometimes do, see Deloache et al. (2003)]. It is similarly unclear whether the chimpanzee pretends the cuddly toy is eating, or rather responds to a caretaker's command to "feed the monkey" [as in Lyn et al. (2006)]. And whether a gorilla intentionally substitutes an object for a baby, or simply plays out instinctive motor routines designed to catalyze maternal behavior in the wild, needs to be established before pretend intent is attributed (Gómez and Martín-Andrade 2005).

In general, observations of pretend play in apes are rare, lacking any indications of inferential pretense, and often arise even in the absence of models of the serious behaviors to which they might refer. It appears, therefore, that pretense in apes may be most accurately described as the production of action schemas outside their usual behavioral context rather than anything obviously symbolic (Gómez and Martín-Andrade 2005). The symbolic use of objects in social interaction, and particularly in episodes of pretend play, appears to mark avenues of species divergence between humans and chimpanzees.

6 Coordinating with Norms

Conventional and institutional practice is normatively governed (Gilbert 1989). If one drives on the wrong side of the road, attempts to speak to an English person in French, or to take another person's property, there will be costs. Indeed, the very hallmark of normativity is the sanctions that apply for nonadherence, for instance, in the form of direct penalties (Richerson and Boyd 2005), social ostracism (Panchanathan and Boyd 2004), or simply the costs inherent to coordination failure (Bicchieri 2006). Conventionalized and institutionalized forms of coordination thus not only specify how people regularly coordinate but how they *ought* to coordinate. And when coordination is mediated by people and objects assigned with conventional status, there are ways those people and objects *ought* to be treated.

Young children appear to understand something of regulative social norms. They grasp the difference, for example, between conventional norms such as "children cannot go outside without clothes" and natural laws such as "children cannot turn

into fish" (Kalish 1998). They also correctly reason from deontic norms such as "if Anne wants to go outside, she ought to wear her coat", and understand that such norms may motivate behavior (Kalish and Shiverick 2004). In addition, they capably identify violations in normative agreements both between adults and between peers [such as agreements to swap toys, (Harris and Nunez 1996; Harris et al. 2001)].

With regard to status functions, clear signs of normative understanding have been found in the domain of children's games. Thus, when an object such as a building block is invested with the status function of "dice" in a game (having some red, some blue sides), children actively protest when a puppet joins the game, but then proceeds to build, exclaiming "no that's our dice!" (Rakoczy et al. 2008). In pretense games too, one study suggests that young children see pretend status as having normative consequences for action (Rakoczy 2008): In this study, a collection of objects such as clothes pegs were assigned the status of pretend "carrots", while one was assigned the status of pretend "knife". A puppet then entered and pretended to eat the "knife", leading young children to protest, "no, that's our knife!" However, further questions remain regarding young children's understanding that the norms associated with status operate *context-specifically*. For instance, in adult practice, using a playing card to fan oneself may be perfectly acceptable during a casual conversation. But this would be considered highly inappropriate within the context of a game of bridge. Similarly, a given card may be considered a high-value trump in one game but the lowest value card in another, and so it ought to be treated differently according to the social context. Whether young children understand that social norms operate relative to particular practices and contexts remains unclear.

We, therefore, ran two studies in order to establish whether young children understand the context-specificity of social norms in their joint pretense (Wyman et al. 2009a). Specifically, we investigated whether they might identify certain behaviors as norm violations when they were performed within a particular normative context (a game), but not outside that context. However, we also explored whether they might differentiate between different normative contexts (different games), by identifying actions as violations in one context but not in a different normative context. Lastly, in addition to their ability to identify norm violations, we investigated their motivation to actually enforce norms through their active linguistic protest.

In the first study, the child and an experimenter took an object with a conventional function (such as a pencil) and used it together in its conventional way (i.e., used it to draw with). They then assigned it a pretend status (such as "toothbrush") and proceeded to pretend with it. After this, a puppet entered and in all cases drew with the pencil. However, sometimes he declared an intention beforehand to join the game (saying "I'll play the toothbrush game too") and so his drawing ought to have been deemed inappropriate. In other cases he refrained from joining (declaring that he'd prefer to draw), such that his action ought to have been of no particular consequence. The result was that young children protested normatively when the puppet first joined the game, but then failed to play by the rules operative within it (they, for instance, exclaimed "No, you should brush your teeth!"). However, when the puppet performed exactly the

same action, without having first joined the game, children left him in peace, and sometimes actively consented (e.g., commenting "yes, let's draw").

In the second study, two *alternative* normative contexts were set up in the form of two different pretend games. This time, the child and adult took an object with no clear function (such as a stick). Then, over at "Bob the builder's house", the child and adult decided to place hats "just like Bob's" on their heads, and to pretend the object was, for example, a "toothbrush". Afterward they moved to a different location, and there at the "Zoo table" placed their "zoo-keeper hats" on and pretended the object was something different, such as a "spoon". Lastly, a puppet entered and in all instances performed the same action (such as pretend "tooth brushing"). However, sometimes he first moved to the zoo table and wore a zoo-keeper hat, so his action ought to have been observed as inappropriate. But at other times he first went to Bob's house and wore his "Bob hat" so his actions should have been unproblematic. The result was that children protested when the puppet did pretend tooth brushing while at the zoo table (and wearing the zoo keeper hat). However, they failed to protest when he performed exactly the same action at Bob the builder's house (and wearing a Bob the Builder hat). They, therefore, appear to understand the context-specificity of normative rules in their pretend games.

It is quite striking that 3 year old children identify the actions of a character as a normative violation when he has joined a particular context, but not when he performs exactly the same action outside it (the first study), or in a different context (the second study). And this understanding of context-specificity appears to be fairly flexible: they ably use not only verbal declarations as indications of entry into a particular context, but also movement between spatial locations, and the wearing of appropriate attire. Most impressively, young children not only identify normative violations, but actively police them through their verbal protests. Overall, this implies a relatively sophisticated understanding of social norms and their context-specificity, as well as some degree of personal commitment to regulating those norms.

The question of whether chimpanzee behavior is normatively governed, or whether chimpanzees have any normative awareness, is a challenging one. The most convincing signs of normative awareness in children are not simply their following such rules, but their verbal protest at violations of them (e.g., "No! You shouldn't do that"), and this is obviously not possible in nonhuman primates. However while more implicit methods of assessment must be relied upon, even these show no indications of normative regulation in chimpanzees (Tomasello 2009). As mentioned, chimpanzees do not wait for or try to reengage partners who cease to coordinate with them during a joint task (Warneken et al. 2006). But in other tasks involving norms of fairness and generosity, divergence in the behavior of children and chimpanzees is also evident. For instance, in "dictator games" (in which children must simply split a resource between themselves and another party), children tend to make fair, that is, roughly equal offers despite the fact that this leads to personal loss (Gummerum et al. 2008; Takezawa et al. 2006). Relatedly, in "ultimatum games" (in which offers may be rejected, such that

neither party receives anything), young children tend to reject low offers, apparently perceiving them as unfair (Sutter and Matthias 2007; Takezawa et al. 2006). In addition, as early as 7 years of age children indicate a general aversion to inequality, preferring an equal split, even to one in which they themselves would receive more (Fehr et al. 2008).

In contrast to these apparent concerns for fairness in children, chimpanzees show no preference for distributing equal amounts of food to themselves and a conspecific over retrieving that same amount of food for themselves only (Jensen et al. 2006; Silk et al. 2005). They act as "rational maximizers" in the ultimatum game, making low offers and rationally accepting any nonzero offers (Jensen et al. 2007). And they show no signs of inequality aversion (Bräuer et al. 2006). In sum, there are no indications yet that chimpanzee actions are governed by social norms. Normative actions and instincts appear to be human-specific.

7 Why Are Social Conventions and Institutions Human-Specific?

The question of why evolution has produced a conventional, symbolically mediated system of institutionalized cooperation in humans, but not in our primate relatives, is profound. Indeed, only a proximate explanation has been offered here, to the effect that social-cognitive differences between humans and chimpanzees support qualitatively different types of social interaction. This has resulted in social institutional practices in humans but not in our evolutionary cousins. Therefore, after summarizing the critical social-cognitive differences in human and chimpanzee social interaction, some speculations will be offered as to why these differences emerged in the first place. Proposals regarding the ultimate causes of inter-species divergence will be along three lines: (1) general competitive constraints on chimpanzee social-cognition and behavior, (2) the emergence of high-fidelity social learning mechanisms and group selection processes in humans, and (3) the emergence of a social egalitarian political organization in our evolutionary history.

Divergence in human and chimpanzee social-cognitive abilities is already apparent, when human toddlers in their second year of life begin to engage in collective intentional action defined by joint goals and commitments (Tomasello et al. 2005). The goal structure of collective intentional action enables the emergence of joint attention (Tomasello 2009). This acts as a "coordination device", by which children assess whether they and their partners are sharing attention to critical aspects of their environment in order to cooperate (Wyman et al. submitted). Joint attention thus seems to go some way for children in establishing the mutual expectations required for coordinating towards conventional forms of cooperative action. The joint goals and commitments entailed in instrumental cooperation are soon after employed in coordinating joint fictional activities in which children assign conventional and symbolic status to objects with others (Wyman et al. 2009b), and even police the norms that govern these collective fictions (Wyman et al. 2009a). The

structure of collective intentional practice thus provides an ontogenetic foundation for the development of conventional, institutional cooperation in the form of joint goals, status assignment, and normativity (Rakoczy and Tomasello 2007).

Chimpanzee coordination, by contrast, seems most accurately described in terms of the accomplishment of individual, parallel goals (Tomasello et al. 2005; Warneken et al. 2006). Without the joint goal structure of collective intentional cooperation, chimpanzees do not appear to use joint attention in their coordinated activity (Bullinger et al. in prep) and, in fact, do not develop joint attention abilities at all (Tomasello and Carpenter 2005). They, consequently, do not coordinate conventionally, engage in pretend play, assign conventional status, or engage in institutionalized forms of social interaction. And there are no indications of normative awareness in chimpanzees. So, a reasonable question at this point is why chimpanzees do not form joint goals and commitments in the first place.

One potential reason is that chimpanzee coordinative activity is in general too heavily constrained by competitive motives for joint cooperative goals to emerge. For instance, under certain conditions, chimpanzees apparently fail to understand visual attention in others. Firstly, they do not preferentially beg for food from a human who can see them over one who cannot [e.g., because their eyes are covered, or their back is turned: Povinelli and Eddy 1996]. Secondly, when a person who has witnessed food being hidden under one of two containers subsequently stares at that container, they fail to use this person's gaze to locate the food for themselves (Call et al. 1998). However, under conditions of social competition, the picture is quite different: when subordinate chimpanzees are paired with dominants in competition over food, they preferentially approach the stash that their competitor has not seen hidden (Hare et al. 2000). Similarly, they preferentially approach food that a dominant has seen placed, if he is subsequently switched with another dominant animal (Hare et al. 2001). In competitive situations, therefore, chimpanzees seem more than able to track the different events an individual has seen, as well as which individual has seen what.

Likewise, the ability of chimpanzees to understand communicative cues also appears to come under heavy competitive constraint. When food is hidden under one of two containers, despite being highly motivated to find the food, they are unable to use a clear pointing gesture in order to locate it (Tomasello et al. 1997). The reasons for this are somewhat unclear, but it is telling that when the human makes visually similar, but noncommunicative gesture toward the food (such as reaching for it in order to steal it), chimpanzees fare relatively well (Hare and Tomasello 2004). Importantly, it may not be the human's attempt to communicate *per se* that the animals are unable to understand. For example, when a person makes a communicative but prohibitive sign toward the food and vocalizes in prohibitive tone of voice, they easily infer its location and retrieve it for themselves (Herrmann and Tomasello 2006). This suggests that chimpanzees in competitive situations are able to use information about others' goals in order to infer important information about the location of their food. However, they are unable to grasp cooperative and helpful attempts to direct their attention toward the same reward.

Most tellingly, chimpanzee coordination itself is highly constrained by competition. When faced with the challenge of pulling with a conspecific to retrieve food on a movable tray, the strongest predictors of chimpanzees' success are the levels of tolerance they show in a separate feeding situation, and whether the food will be easily monopolizable after retrieval (Melis et al. 2006). One key reason, then, that chimpanzees do not appear to form joint goals and commitments may be that their social interactions occur within a framework of competitive motivations in which the danger of aggression is ever present, and the rewards eventually secured will be in dispute [see Hare and Tomasello (2005)]. That is, in environments pervaded by the threat of exploitation, it simply may not pay to have one's intentions and attention read by others (Tomasello 2009).

Without this framework of collective intentional action, it is then perhaps not surprising that chimpanzee cooperation is not normatively governed (Tomasello 2009). When individuals coordinate repeatedly with joint goals, joint attention, and joint commitments, mutual expectations that allow parties to predict the likely course of events in each cooperative scenario emerge. To the extent that these expectations come to be considered as legitimate (see Bicchieri 2006), jointly recognized standards of action emerge. Thus, cooperation takes on a normative dimension. Over time, these patterns of expectation may become generalized, such that new individuals assume the relevant roles and the duties these entail, despite their having been established prior to those individuals' engagement in the activity. These generalized, agent-neutral, normatively governed roles form the basis of institutionalized forms of cooperative activity. So without collective intentional action – and the mutual expectations and commitments this entails – cooperative norms and institutions apparently fail to emerge.

Once communities engage in institutionalized cooperation, further norms relating to social conformity may also come into play (Tomasello 2009). Social learning in the form of imitation of local practices allows youngsters in a community to bypass trial-and-error learning and benefit from the established knowledge of a community (Tomasello et al. 1993). And the signaling of group membership through conformist behavior (as well as symbolic marking) may allow individuals to identify in-group members, aiding selective imitation of their conventional wisdom as well as selective interaction with them (Boyd and Richerson 2008). In particular, if the effects of coordination failure are costly, it may pay to identify and interact with those who adhere to the same moral system.

But more generally, imitation and conformist learning – in which individuals copy the most commonly observed model – may lead to the coevolution of cultural as well as genetic traits (Richerson and Boyd 2005): The idea is that conformist biases may establish enough cultural uniformity and heritable variation within groups to outweigh the diluting effects of migration between groups. This results in relatively stable group traits, such that when competition for resources or direct conflict emerges, selection may begin to operate at the group level. If cooperative cultural adaptations result in fitness advantages to some groups, those cooperative practices and their related norms will spread, as will their genetic bases. Rapid cultural or "runaway selection" (Fischer 1930) for ever-increasing levels of cooperation may

then occur resulting in the evolution of cooperative "social instincts" (Boyd and Richerson 2006). These include, among other things, expectations that life will be structured by cooperative and moral norms, and learning systems designed to internalize those norms (Erdal and Whiten 1996). Genes and culture coevolve to produce ultra-sociality, hyper-cooperativity, and normatively governed institutional practices.

Cross-species differences in imitation capabilities may thus contribute to cultural divergence between chimpanzees and humans in two key ways. Firstly, the tendency of children, in contrast to chimpanzees, to copy actions rather than their results [see, for example, Call et al. (2005)] may represent a high-fidelity social learning mechanism in humans, particularly crucial for the acquisition of complex or conventional actions [that no individual may plausibly invent themselves, Tennie et al. (2009)]. The consequence appears to have been a "cultural ratcheting" process in humans. Particular skills and artifacts have been maintained cross-generationally with new modifications *accumulating* through time, rather than being lost and reinvented with each generation (Tomasello 1999). This process may go some way in explaining the massive discrepancy that exists in the quantity and complexity of chimpanzee and human material cultures [see Marshall-Pescini and Whiten (2008) for results in line with this]. Secondly, chimpanzee social learning mechanisms may have failed to produce the degree of cultural uniformity within groups necessary for selection processes to begin to favor cooperation at the group level.

However, group-level selection for cooperation presents an inherent "free-rider" problem: Once cooperation has become routine, it pays any individual to refrain from contributing but nevertheless to enjoy the reward, thus destabilizing group cooperation altogether. So key to the evolution of cooperation appears to be some punishment mechanism that penalizes and deters cheating (Boyd and Richerson 1992). Indeed, moralistic punishment may effectively stabilize group-wide cooperation, and if the form of punishment is severe enough, it may only have to be meted out rarely (Boyd and Richerson 2006). It also seems that, at least in theory, punishment can potentially stabilize any trait or norm (adaptive or otherwise), producing massive variation in the content of human conventional practices (Boyd and Richerson 1992).

Despite this, however, there is striking uniformity in the social norms that appear to have stabilized modes of early human social organization. In particular, it seems that moralistic punishment of social dominance may have led to the evolution of egalitarian social structure in human evolution, similar to that seen today in small-scale, mobile foraging groups (Boehm 1999; Erdal and Whiten 1996; Knauft 1991). In these societies, the development of social leveling mechanisms in the form of unfavorable social opinion [see also, Panchanathan and Boyd (2004)], social exclusion, and direct punishment appear to have focused quite specifically on regulating the actions of individuals who try to gain physical or political dominance over others. This shows up most clearly in cross-cultural norms against physical aggression, monopolization of sexually active females, and food sharing norms (Boehm 2008). And these norms seem to have resulted in modes of egalitarian organization that are critically divergent from the hierarchical and dominance-based systems that characterize chimpanzee social life (Knauft 1991). Part of the

puzzle of why chimpanzee's social-cognitive reasoning is limited in cooperative contexts and does not involve collective intentional cooperation may be that the overarching political structure of chimpanzee social organization simply is not conducive to this.

In line with this, modern day egalitarian societies also positively sanction quite specific forms of activity: cooperation, generosity, resource sharing, and aid (Boehm 2008). These behaviors are rewarded with favorable reputation, political alliances (especially in the form of marriage), increased opportunities for cooperation, and resource support in times of scarcity. In searching for the evolutionary home of collective intentionality, therefore, it seems important that the egalitarian political structures that appear to have characterized significant phases of human evolution (Knauft 1991) centrally involve mechanisms that curb social dominance by punishment and positively prescribe cooperation at the individual. It may be that this kind of political context constituted an evolutionary precondition for the emergence of institutionalized forms of cooperation such as cooperative hunting (Hill 1982), resource sharing (Gurven 2004), and allocare (Hrdy 2009) underpinned by collective intentionality.

8 Summary and Conclusions

A comprehensive account of the character of conventional, institutionalized cooperation and the reasons for its emergence in the hominin lineage will not derive from one particular discipline of research. A full picture will require insights from evolutionary thinking in biology, anthropology, psychology, linguistics, human and primate behavioral ecology, and sociology to name but a few key areas. Broadly, the contribution that developmental psychology can offer to investigations of human-specific forms of cooperation is unique in documenting some of the cognitive prerequisites and contexts in which young children begin to engage in collective intentional activity with a conventional and "proto-institutional" structure. And comparative psychological research can serve to pinpoint cognitive divergences between humans and chimpanzees that have plausibly contributed to cultural divergence in modes of cooperation. But this psychological perspective is especially critical to our understanding of conventional, institutional, and symbolic practice because these activities are governed by rules that have no existence outside our common recognition and acceptance that they exist: their ontological status and normative force are fundamentally dependent on our collective cognitions.

Collective intentional cooperation emerges in young children in their second year of life, as they begin to coordinate with others with joint goals and commitments (Tomasello et al. 2005). In these contexts, joint attention emerges in which young children not only monitor but share attention with others to aspects of their environment. Children then use joint attention to mediate these activities, indicating a concern with managing mutual expectations in their joint projects with others

(Wyman et al. submitted). Their coordination thus takes on a conventional character. It is not long before young children begin to incorporate objects into their coordinations and, together with others, to invest these with symbolic status in their fictional play (Wyman et al. 2009b). In these situations, their social interactions begin to resemble adult institutional practice in rudimentary form, involving status functions assigned by constitutive rules and social norms (Wyman et al. 2009a).

In contrast to Piaget (1932) who classified young children's games as *either* symbolic *or* rule governed, Vygotsky (1978) perceptively recognized the rule-governed basis of social pretense: A key observation was that "the development from games with an overt imaginary situation and covert rules, to games with overt rules and a covert imaginary situation outlines the evolution of children's play from one pole to the other" (pg 96). But this transition within the domain of young children's play may more broadly describe the general process by which children are enculturated into the social practices of their communities. Children indeed start out engaging in collective imaginings with others in their play, and these activities are governed largely by unarticulated norms that emanate from the imposition of pretend status via constitutive rules. But they must later come to grasp the more serious and widely recognized constitutive rules that define institutional practices such as marriage and exchange. This eventually entails taking part in the prescribed imaginings (Walton 1990), or "collective fictions" of their community, and consequently following normatively governed courses of action. The development from engagement in practices with overt imaginary content and covert rules to those with overt rules but covert – or less obvious – imaginary content describes children's progressive admission into conventional and institutional life.

That chimpanzees do not engage in social pretense may be symptomatic of, and simultaneously contribute to, an absence of institutional cooperation in their species. Without the framework of collective intentional action involving joint goals, commitments, and joint attention, there may be no cooperative foundation to support the assignment of conventional, symbolic status and rules of conduct either in play or in their more serious affairs. But without pretend play, there is no "developmental cradle", no proto-institutional activity in which chimpanzees can get an initial grip on the underlying structures of institutionalized cooperation.

However, disparities between children's and chimpanzees' propensities to form collective intentions only make sense against a broader background of species divergence in relative levels of competition and cooperation. Across several domains (namely, understanding visual attention, nonverbal communication, and coordination) chimpanzee social-cognition appears to excel in competitive contexts, and to be constrained in analogous but cooperative situations. This implies that chimpanzee social interaction in general may occur in contexts of competitive motivation. Against the potential threat of competitive exploitation, it may not pay chimpanzees to, for example, inform others about valuable resources in the environment, establish shared attention to those resources, or to commit to joint action in order to retrieve them. But since no other ape engages in institutionalized forms of cooperation, this competitive model may represent the phylogenetically primitive state that characterized the common ancestor to humans and chimpanzees. Therefore,

this simply raises further questions as to how it came to be that cooperative or "trusting" motivations ever emerged in the hominin lineage.

Both group selection theories (Richerson and Boyd 2005) and antidominance theories (Boehm 1999; Erdal and Whiten 1996) posit the emergence of moralistic punishment as critical to the emergence of cooperation in humans. However, group selection theories emphasize the function of punishment as an evolutionary stabilizing mechanism, rather than the content of what it stabilizes [see Boyd and Richerson (1992)]. Antidominance theories, by contrast, suggest more specifically that the initial evolutionary function of punishment was to police members of early hominin communities who aggressed others in acts of social dominance. By these accounts, the original social norms to emerge in evolution were those effecting sociopolitical egalitarianism, enforced by social subordinates with fitness interests in abolishing hierarchical social order (Knauft 1991). Such a context may have provided some respite from the threat of aggression and competition that appears to constrain chimpanzee social interaction, and a concomitant elaboration and variation of existent forms of cooperative activity.

If existing advantages accrued to especially effective cooperators [perhaps initially through mutualistic gain, see Roberts (2005)], selection may have come to favor those who not only coordinated their actions behaviorally with others, but coordinated their expectations through the mutual monitoring of attention. While these may seem like rather basic building blocks, coordinated actions based on mutual expectations and attention monitoring hold the seeds of collective intentionality. As cooperation with these characteristics becomes routine, expectations coordinated via mutual attention monitoring may come to be recognized as legitimate by the parties involved. This results in a "bottom-up" form of normativity (in contrast to the "top-down" community norms specifying *that* individuals cooperate), whereby they not only coordinate toward goals but also recognize mutually binding commitments to those goals. The deontic obligations and rights now inherent to joint activity come to define specific cooperative roles that persist through time. And, also by collective intention, both people and objects may be assigned symbolic status in public representations of these rights and obligations. In this way, the evolutionary emergence of collective intentionality may have given rise to conventional and institutionalized forms of cooperation in the human lineage.

References

Abelev M, Markman E (2006) Young children's understanding of multiple object identity: appearance, pretense and function. Dev Sci 9:6

Bicchieri C (2006) The grammar of society: the nature and dynamics of social norms. Cambridge University Press, Cambridge

Biro D, Matsuzawa T (2001) Use of numerical symbols by the chimpanzee (*pan troglodytes*): cardinals, ordinals, and the introduction of zero. Anim Cogn 4(3–4):193–199

Boehm C (1999) Hierarchy in the forest: the evolution of egalitarian behavior. Harvard University Press, Cambridge, MA
Boehm C (2008) Purposive social selection and the evolution of human altruism. Cross Cult Res: J Comp Soc Sci 42(4):319–352
Boesch C, Boesch H (1989) Hunting behavior of wild chimpanzees in the taï national park ivory coast. Am J Phys Anthropol 78(4):547–573
Boesch C, Boesch H (1990) Tool use and tool making in wild chimpanzees. Folia Primatol 54 (1–2):86–99
Boyd R, Richerson PJ (1992) Punishment allows the evolution of cooperation (or anything else) in sizable groups. Ethol Sociobiol 13(3):171–195
Boyd R, Richerson PJ (2006) Culture and the evolution of the human social instincts. In: Enfield NJ, Levinson SC (eds) Roots of human sociality: culture, cognition, and interaction. Berg Publishers, Oxford, pp 453–477
Boyd R, Richerson PJ (2008) Gene-culture coevolution and the evolution of human social institutions. In: Engel C, Singer W (eds) Better than consciousness? Decision making, the human mind and implications for institutions. MIT, Cambridge
Bräuer J, Call J, Tomasello M (2006) Are apes really inequity averse? Proc R Soc Lond B Biol Sci 273(1605):3123–3128
Brink I (2001) Attention and the evolution of communication. Pragmat Cogn 9(2):259–277
Bruell MJ, Woolley J (1998) Young children's understanding of diversity in pretence. Cogn Dev 13:257–277
Bruner J (1983) Child's talk: learning to use language. Norton, New York
Bullinger A, Wyman E, Melis A, Tomasello M (in press) Chimapnzees, coordination in a 'stag hunt' game. International Journal of Primatology
Call J, Carpenter M, Tomasello M (2005) Copying results and copying actions in the process of social learning: chimpanzees (*pan troglodytes*) and human children (*homo sapiens*). Anim Cogn 8(3):151–163
Call J, Hare BA, Tomasello M (1998) Chimpanzee gaze following in an object-choice task. Anim Cogn 1(2):89–99
Call J, Tomasello M (2007) The gestural communication of apes and monkeys. Lawrence Erlbaum Associates, New York
Call J, Tomasello M (2008) Does the chimpanzee have a theory of mind? 30 years later. Trends Cogn Sci 12(5):187–192
Campbell J (2005) Joint attention and common knowledge. In: Eilan N, Hoerl C, McCormack T, Roessler J (eds) Joint attention, communication and other minds: issues in philosophy and psychology. Clarendon, New York, pp 287–297
Carpenter M, Nagell K, Tomasello M (1998) Social cognition, joint attention, and communicative competence from 9 to 15 months of age. Monogr Soc Res Child Dev 63(4):1–143
Castoriadis C (1998) The imaginary institution of society. MIT, Cambridge
Clark H, Marshall CR (1981) Definite reference and mutual knowledge. In: Joshi AK, Webber B, Sag I (eds) Elements of discourse understanding. Cambridge University Press, Cambridge, pp 10–63
Deloache J, Pierroutsakos S, Uttal D (2003) The origins of pictorial competence. Curr Dir Psychol Sci 19(3):114–118
Erdal D, Whiten A (1996) Egalitarianism and machiavellian intelligence in human evolution. In: Mellars P, Gibson KR (eds) Modelling the early human mind. McDonald Institute Monographs, Cambridge, pp 139–150
Fehr E, Bernhard H, Rockenbach B (2008) Egalitarianism in young children. Nature 454 (7208):1079–1083
Fischer R (1930) The genetical theory of natural selection. Clarendon, Oxford
Flavell J, Flavell E, Green F (1987) Young children's knowledge about the apparent-real and pretend-real distinctions. Dev Psychol 23(6):816–822

Fouts RS (1972) Use of guidance in teaching sign language to a chimpanzee (*pan troglodytes*). Q J Exp Psychol B 80(3):515–522
Gardner RA, Gardner BT (1969) Teaching sign language to a chimpanzee: a standardized system of gestures provides a means of 2 way communication with a chimpanzee. Science 165 (3894):664–672
Gibson E, Rader N (1979) Attention: the perceiver as performer. In: Hale G, Lewis M (eds) Attention and cognitive development. Plenum, New York, pp 6–36
Gilbert M (1989) On social facts. Princeton University Press, Oxford
Gilby IC, Eberly LE, Wrangham RW (2008) Economic profitability of social predation among wild chimpanzees: individual variation promotes cooperation. Anim Behav 75(2):351–360
Gómez J-C (2007) Pointing behaviors in apes and human infants: a balanced interpretation. Child Dev 78(3):729–734
Gómez J-C, Martín-Andrade B (2005) Fantasy play in apes. In: Pellegrini AD, Smith PK (eds) The nature of play: great apes and humans. Guilford, New York, pp 139–172
Gómez JC, Martín-Andrade B (2002) Possible precursors of pretend play in nonpretend actions of captive gorillas (*gorilla gorilla*). In: Mitchell RW (ed) Pretending and imagination in animals and children. Cambridge University Press, Cambridge, pp 255–268
Gopnik A, Slaughter V (1991) Young children's understanding of changes in their mental states. Child Dev 62(1):98–110
Gräfenhain M, Behne T, Carpenter M, Tomasello M (2009) Young children's understanding of joint commitments. Dev Psychol 45(5):1430–1443
Greenberg J, Hamann K, Warneken F, Tomasello M (in press) Chimpanzee helping in collaborative and non-collaborative contexts. Anim Behav
Greenfield PM, Savage-Rumbaugh ES (1990) Grammatical combination in *pan paniscus*: process of learning and invention in the evolution and development of language. In: Parker ST, Gibson KR (eds) "Language" and intelligence in monkeys and apes: comparative developmental perspetives. Cambridge University Press, Cambridge, UK, pp 540–578
Gurven M (2004) To give and to give not: the behavioral ecology of human food transfers. Behav Brain Sci 27(4):543–559
Gummerum M, Keller M, Takezawa M, Jutta M (2008) To give or not to give: children's and adolescents' sharing and moral negotiations in economic decision situations. Child Dev 79 (3):562–576
Haight W, Millar P (1992) The development of everyday pretend: a longitudinal study of mothers' participation. Merrill Palmer Q 38(3):331–349
Hamann K, Warneken F, Tomasello M (in press). Children's developing commitments to joint goals. Ch Dev
Hare B, Call J, Agnetta B, Tomasello M (2000) Chimpanzees know what conspecifics do and do not see. Anim Behav 59(4):771–785
Hare B, Call J, Tomasello M (2001) Do chimpanzees know what conspecifics know? Anim Behav 61(1):139–151
Hare B, Tomasello M (2004) Chimpanzees are more skilful in competitive than in cooperative cognitive tasks. Anim Behav 68(3):571–581
Hare B, Tomasello M (2005) The emotional reactivity hypothesis and cognitive evolution. Trends Cogn Sci 9(10):464–465
Harris P, Kavanaugh R (1993) Young children's understanding of pretense. Monogr Soc Res Child Dev 58(1):1–92
Harris P, Nunez M (1996) Understanding of permission rules by preschool children. Child Dev 67 (4):1572–1591
Harris P, Nunez M, Brett C (2001) Let's swap: early understanding of social exchange by British and Nepali children. Mem Cognit 29(5):757–764
Herrmann E, Tomasello M (2006) Apes' and children's understanding of cooperative and competitive motives in a communicative situation. Dev Sci 9(5):518–529

Hickling AK, Wellman HM, Gottfried GM (1997) Preschoolers' understanding of others' mental attitudes towards pretend happenings. Br J Dev Psychol 15(3):339–354
Hill K (1982) Hunting and human evolution. J Hum Evol 11(6):521–544
Hill K, Barton M, Hurtado AM (2009) The emergence of human uniqueness: characters underlying behavioral modernity. Evol Anthropol Issues News Rev 18(5):187–200
Hrdy S (2009) Mothers and others: the evolutionary origins of mutual understanding. Belknap, Cambridge, MA
Huffman MA, Hirata S (2004) An experimental study of leaf swallowing in captive chimpanzees: insights into the origin of a self-medicative behavior and the role of social learning. Primates 45(2):113–118
Humle T, Matsuzawa T (2002) Ant-dipping among the chimpanzees of bossou, guinea, and some comparisons with other sites. Am J Primatol 58(3):133–148
Jensen K, Call J, Tomasello M (2007) Chimpanzees are rational maximizers in an ultimatum game. Science 318(5847):107–109
Jensen K, Hare B, Call J, Tomasello M (2006) What's in it for me? Self regard precludes altruism and spite in chimpanzees. Proc R Soc B 273:1013–1021
Kalish C (1998) Reasons and causes: children's understanding of conformity to social and physical laws. Child Dev 69(3):706–720
Kalish C, Shiverick SM (2004) Children's reasoning about norms and traits as motives for behaviour. Cogn Dev 19:410–416
Knauft BM (1991) Violence and sociality in human evolution. Curr Anthropol 32(4):391–428
Lewis D (1969) Convention: a philosophical study. Harvard University Press, Cambridge
Lillard AS (1993) Young children's conceptualization of pretense: action or mental representational state? Child Dev 64(2):372–386
Liszkowski U (2005) Human twelve-month-olds point cooperatively to share interest with and provide information for a communicative partner. Gesture 5(1/2):135–154
Liszkowski U, Carpenter M, Henning A, Striano T, Tomasello M (2004) Twelve-month-olds point to share attention and interest. Dev Sci 7(3):297–307
Liszkowski U, Carpenter M, Striano T, Tomasello M (2006) 12- and 18-month-olds point to provide information for others. J Cogn Dev 7(2):173–187
Lyn H, Greenfield P, Savage-Rumbaugh S (2006) The development of representational play in chimpanzees and bonobos: evolutionary implications, pretense, and the role of interspecies communication. Cogn Dev 21(3):199–213
Marshall-Pescini S, Whiten A (2008) Chimpanzees (*Pan troglodytes*) and the question of cumulative culture: an experimental approach. Anim Cogn 11:449–456
Melis AP, Hare B, Tomasello M (2006) Engineering cooperation in chimpanzees: tolerance constraints on cooperation. Anim Behav 72(2):275–286
Mitani JCC, Watts DP (2005) Correlates of territorial boundary patrol behaviour in wild chimpanzees. Anim Behav 70(5):1079–1086
Panchanathan K, Boyd R (2004) Indirect reciprocity can stabilize cooperation without the second-order free rider problem. Nature 432(7016):499–502
Peacocke C (2005) Joint attention: its nature, reflexivity, and relation to common knowledge. In: Eilan N, Hoerl C, McCormack T, Roessler J (eds) Joint attention, communication and other minds: issues in philosophy and psychology. Clarendon/Oxford University Press, New York, NY, pp 298–324
Piaget J (1932) The moral judgment of the child. Keegan Paul, London
Pika S, Liebal K, Call J, Tomasello M (2005) The gestural communication of apes. Gesture 5(1–2):41–56
Plotkin H (2003) The imagined world made real: towards a natural science of culture. Rutgers University Press, New Jersey
Povinelli DJ, Eddy TJ (1996) What young chimpanzees know about seeing. Monogr Soc Res Child Dev 61(3):1–152

Rakoczy H (2006) Pretend play and the development of collective intentionality. Cogn Syst Res 7:113–127
Rakoczy H (2007) Play, games and the development of collective intentionality. New Directions in Child and Adolescent Development (Special issue on "Conventionality") 115:53–68
Rakoczy H (2008) Taking fiction seriously: young children understand the normative structure of joint pretend games. Dev Psychol 44(4):1195–1201
Rakoczy H, Tomasello M (2006) Two-year-olds grasp the intentional structure of pretense acts. Dev Sci 9(6):558–565
Rakoczy H, Tomasello M (2007) The ontogeny of social ontology: steps to shared intentionality and status functions. In: Tsohatzidis SL (ed) Intentional acts and institutional facts: essays on john searle's social ontology. Springer, Berlin
Rakoczy H, Tomasello M, Striano T (2004) Young children know that trying is not pretending: a test of the "Behaving-as-if" construal of children's early concept of pretense. Dev Psychol 40 (3):388–399
Rakoczy H, Tomasello M, Striano T (2005a) On tools and toys: how children learn to act on and pretend with 'virgin objects'. Dev Sci 8(1):57–73
Rakoczy H, Tomasello M, Striano T (eds) (2005b) How children turn objects into symbols: a cultural learning account. Erlbaum, New York
Rakoczy H, Warneken F, Tomasello M (2008) The sources of normativity: young children's awareness of the normative structure of games. Dev Psychol 44(3):875–881
Rawls J (1955) Two concepts of rules. Philos Rev 64(1):3–32
Richerson PJ, Boyd R (2005) Not by genes alone: how culture transformed human evolution. University of Chicago Press, Chicago
Rivas E (2005) Recent use of signs by chimpanzees (*pan troglodytes*) in interactions with humans. [Original]. J Comp Psychol 119(4):404–417
Roberts G (2005) Cooperation through interdependence. Anim Behav 70:901–908
Rousseau J (1968/1762) The social contract. Penguin, London
Savage-Rumbaugh ES, McDonald K, Sevcik RA, Hopkins WD, Rubert E (1986) Spontaneous symbol acquisition and communicative use by pygmy chimpanzees (*pan paniscus*). J Exp Psychol Gen 115(3):211–235
Searle J (2005) What is an institution? J Inst Econ 1(1):1–22
Searle JR (1995) The construction of social reality. Free, New York
Silk JB, Brosnan SF, Vonk J, Henrich J, Povinelli DJ, Richardson AS et al (2005) Chimpanzees are indifferent to the welfare of unrelated group members. Nature 437(7063):1357–1359
Skyrms B (2004) The stag hunt and the evolution of social structure. Cambridge University Press, Cambridge
Sutter Z, Matthias Z (2007) Outcomes versus intentions: on the nature of fair behavior and its development with age. Ergebnisse versus absichten: Zur natur fairen verhaltens und seine entwicklung mit zunehmendem alter. J Econ Psychol 28(1):69–78
Takezawa M, Gummerum M, Keller M (2006) A stage for the rational tail of the emotional dog: roles of moral reasoning in group decision making. Eine buehne fuer den rationalen schwanz des emotionalen hundes: Rollen der moralischen argumentation bei der entscheidungsfindung in gruppen. J Econ Psychol 27(1):117–139
Tennie C, Call J, Tomasello M (2009) Ratcheting up the ratchet: on the evolution of cumulative culture. Philos Trans R Soc Lond B Biol Sci 364(1528):2405–2415
Tollefson D (2005) Let's pretend! Children and joint action. Philos Soc Sci 35(1):75–97
Tomasello M (1995) Joint attention as social cognition. In: Moore C, Dunham P (eds) Joint attention: its origin and role in development. Erlbaum, Hillsdale, NJ, pp 103–130
Tomasello M (1999) The cultural origins of human cognition. Harvard University Press, Cambridge, MA
Tomasello M (2009) Why we cooperate. MIT, Cambridge, MA
Tomasello M, Call J, Gluckman A (1997) Comprehension of novel communicative signs by apes and human children. Child Dev 68(6):1067–1080

Tomasello M, Carpenter M (2005) The emergence of social cognition in three young chimpanzees. Monogr Soc Res Child Dev 70(1):1–132
Tomasello M, Carpenter M, Call J, Behne T, Moll H (2005) Understanding and sharing intentions: the origins of cultural cognition. [Original]. Behav Brain Sci 28(5):675–735
Tomasello M, Kruger AC, Ratner HH (1993) Cultural learning. Behav Brain Sci 16(3):495–511
Vygotsky LS (1978) Mind in society: the development of higher psychological processes. Harvard University Press, Cambridge, MA
Walton K (1990) Mimesis as make-believe: on the foundation of the representational arts. Harvard University Press, Harvard
Warneken F, Chen F, Tomasello M (2006) Cooperative activities in young children and chimpanzees. Child Dev 77(3):640–663
Watts DP (1998) Coalitionary mate guarding by male chimpanzees at ngogo, kibale national park, uganda. Behav Ecol Sociobiol 44(1):43–55
Watts DP, Mitani JCC (2002) Hunting behavior of chimpanzees at ngogo, kibale national park, uganda. Int J Primatol 23(1):1–28
Whiten A, Goodall J, McGrew WC, Nishida T, Reynolds V, Sugiyama Y et al (1999) Cultures in chimpanzees. Nature 399(6737):682–685
Whiten A, Horner V, de Waal FBM (2005) Conformity to cultural norms of tool use in chimpanzees. Nature 437(7059):737–740
Wyman E, Rakoczy H, Tomasello M (2009a) Normativity and context in young children's pretend play. Cogn Dev 24:149–155
Wyman E, Rakoczy H, Tomasello M (2009b) Young children understand multiple pretend identities in their object play. Br J Dev Psychol 27(2):385–404
Wyman E, Rakoczy H, Tomasello M (submitted). Joint attention enables children's coordination in a 'stag hunt' game