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The Cognitive Revolution in Children's Understanding of Mind

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Abstract
Bruner, in reassessing the cognitive revolution, argues for the centrality of 'meaning-making' in human activity, claiming that children learn to give meaning to what people do as they learn the language and social practices of their culture. The role played by the attribution of mental states to others has been studied intensely in the past decade in a new research area that has come to be known as children's 'theory of mind'. Researchers in this field who, unlike Bruner, see psychology as a natural empirical science, view the child as constructing a causal theory to explain and predict human action. They base their arguments largely on experimental observation of children's performance in laboratory tasks, especially the 'false-belief' task. In contrast, many researchers who take Bruner's view study the development of social understanding in naturalistic observation of children's interaction with peers and family members. In this article we examine the relations between these views and suggest that the real challenge of the cognitive revolution is to unite the two approaches, to achieve a causal, naturalistic account of the acquisition and elaboration of meaning-making.

It is almost 40 years since the birth of the cognitive revolution led to a new research era in developmental psychology. Enormous gains have been made since the 1950s in our understanding of children's minds, their conceptual and linguistic development, and their ability to process information. The past decade has seen rapid growth of a new research area that has come to be known as children's 'theory of mind'. It traces the development of children's ability to understand human activity by attributing mental states to people [Astington et al., 1988]. Children's understanding of belief, desire, and intention, this research shows, is acquired in a fairly fixed timetable. In addition, a number of collateral understandings, such as the understanding of pretense, plans, and emotions, are closely related to children's 'discovery of the mind' [Astington, 1993]. In this article we examine how the theory of mind, itself very much a product of the cognitive revolution, may help to clarify just what is involved in that revolution.

We begin with a few comments on the cognitive revolution. Bruner [1990] has re-evaluated that revolution in his book *Acts of Meaning*. The cognitive revolution, Bruner argues, had taken a wrong turn in siding with the computationalists, because computationalism – the computer metaphor – cannot allow for the essential human characteristic of 'making meaning', by which Bruner means the uniquely human ability to construe action in terms of agency and intentionality within a cultural context. He appeals to a view of psychology as one within the hermeneutical enterprise of mutual understanding, negotiated in large part in terms of a culture's 'folk psychology'. Bruner [1990] argues against the view [Stich, 1983] that a scientific explanation of human action must dispense with outmoded concepts such as those of belief and desire:

> The idea of jettisoning [folk psychology] in the interest of getting rid of mental states in our everyday explanations of human behavior is tantamount to throwing away the very phenomena that psychology needs to explain ... it provides the very means by which culture shapes human beings to its requirements [p. 14–15].

Indeed, Bruner's psychology requires us to investigate the nature and development of folk psychological concepts – belief, intention, obligation, responsibility, commitment, and so on. They can neither be abandoned in favor of their neural substrate, nor simply taken for granted as part of our social world.

In his review of Bruner's book, Shanker [1992] expresses reluctance to allow Bruner to stake out this middle ground between the computationalists and the social theorists. He identifies Bruner's type of 'folk psychology' as inescapably Cartesian. It sharply divides the bodily causes of behavior from the rational social interpretation of that behavior. As Shanker correctly notes, doing so will lead tough-minded theorists to accuse Bruner of sacrificing explanation for description. As Shanker [1992] puts it, Bruner's hermeneutical turn will be seen as:

> a failure to explain that which is of greatest importance to the psychology of action: viz. the causes of [action], rather than the reasons or descriptions which agents might offer of their [actions] [p. 57].

Criticism of Bruner's exclusive concern with the social construction of meaning had, in fact, been made by Sperber [1986] in his review of Bruner's [1986] earlier book, *Actual Minds, Possible Worlds*. Sperber argues that it is important that constructivists specify the abilities that allow children to engage in constructive interpretation. Are they innate abilities or are the abilities themselves constructed? Are they based on individual experience or do they depend on social interaction and language acquisition? Sperber [1986] emphasizes the importance of the innate component:

> To most cognitive psychologists, one thing is clear: in order to learn an ability, one has to have an ability to learn; the more basic abilities, the linguistic ones for instance, must be, to an important extent, genetically determined; the construction of abilities from within, or the internalization of culturally constituted abilities, can only take place on some well-developed innate foundation [p. 1308].

The analysis and description of this innate foundation, and of the ensuing processes involved in turning predispositions into knowledge and of turning sensitivities into concepts, is indeed one of the most important tasks facing cognitive developmental theorists and researchers.

But Shanker [1992], rather than trying to force Bruner back into the fold of the 'naturalizers', suggests that Bruner is on the right track but has not gone far enough. Shanker argues that mental states are 'attributions' to people from some point of view, rather than 'inferences' to the hidden inner experiences that cause actions. Attributions are part of the descriptive enterprise of characterizing actions in terms of one's favored 'folk theory'. We may attribute beliefs to another just as we attribute traits to another – both a considerable distance removed from how the behavior so described is actually caused. Shanker argues, contra Bruner, that people do not anticipate and judge one another through folk psychology but rather that it is people's judgment of one another that can be characterized in folk-psychological terms. The norms, rules, and procedures for such judgments are to be found, Shanker [1992] suggests, following Harré, not in the working of the nervous system but

> in the shaping of the activities of the whole person ... by socio-linguistic influences. ... a person acquires a fragment of the rules and conventions of their society, in accordance with which they form projects for action and choose the means for realizing those projects [Harré et al., 1985, quoted by Shanker, p. 62].

According to this view, people do not have beliefs or minds as part of their cognitive structures for generating behavior. Rather, they learn to think of their actions in terms provided by the culture's folk theory. Action is not generated by a rule but rather can be characterized by a rule, to cite a well-known assertion by Wittgenstein. Causal accounts of behavior are thus to be found only at the neurophysiological level or at the level of cultural convention, leaving no interesting or privileged role for psychology. Indeed, it may leave no role at all. And yet psychologists did not participate in the cognitive revolution to see their discipline disappear, or at best be divided up – part given to the neurophysiologists and part to the cultural theorists.

These are the very issues that arise in the current debate over children's 'theory of mind' – a research area in which developmental psychologists investigate the acquisition of folk psychology. Research on children's theory of mind provides an important test case for the beginnings of an understanding and use of one set of cultural representations, namely, concepts of the mind.

Children's Theory of Mind

Just what are children acquiring when they acquire a theory of mind? And what are the resources and mechanisms that make such acquisition possible? In 1988, in the preface to *Developing Theories of Mind,* we wrote, 'in this book psychologists are developing theories to account for children's developing theories of mind' [Astington et al., p. ix]. That is, we as psychologists hoped to provide a naturalistic empirical account of this aspect of cognitive development. We viewed children as 'little scientists', who, in the attempt to explain and predict their own and others' talk and action, infer such underlying causal states as beliefs and desires. Many (but not all) of the authors in that volume took a similar view in reporting experimental research in cognitive development. Of course,

we thought children were aided in the enterprise of constructing a theory of mind by the availability of appropriate mechanisms and by an appropriately supporting social environment. However, we did not give much attention to the social context or to the consequences of the acquisition of a theory of mind for children's social development.

In a recent article in this journal, Raver and Leadbeater [1993] point to some paradoxical conclusions regarding young children's understanding of other people that result on the one hand from theory-of-mind research, and on the other from research on children's social development. Theory-of-mind researchers credit children with an understanding of other people's beliefs at about 4 years of age, but not much earlier, based on performance on experimental tasks such as the well-known 'false-belief' task [Wimmer and Perner, 1983]. In contrast, social development research shows that 2- and 3-year-olds are in many respects competent participants in social interaction with their peers, siblings, and parents [Dunn, 1988; Zahn-Waxler and Radke-Yarrow, 1982]. They talk and play with others and are able to comfort, hurt, and trick them in ways that suggest they must have some awareness of others' mental states; indeed, they explicitly refer to such states, using terms such as *want* and *think* [Bretherton and Beeghly, 1982; Shatz et al., 1983].

We agree with Raver and Leadbeater that the paradox results partly from different methods favored by researchers from the two traditions. Theory-of-mind researchers generally rely on experimental observation, as, for example, in the false-belief task [Perner et al., 1987; Wimmer and Perner, 1983]. In false-belief tasks, the experimenter arranges that child subjects be made aware that they and another person have different information about a situation; the child is asked to predict what the other person will say or do in that situation. The situation may involve an object's being moved from one place to another, witnessed by the child but not the other person. Or it may involve a familiar container that has some unexpected content, seen by the child but not the other person. The other person may be an absent peer or may be a puppet or story character. If the child predicts that the other will respond on the basis of the other's knowledge of the situation and not on the basis of the child's own knowledge, we can infer that the child understands that different people may represent the same situation in different ways and that they each act and speak on the basis of their own representations. Theory-of-mind researchers have used similar tasks to assess children's understanding of desires, emotions, and intentions. However, most attention has been devoted to understanding of knowledge, belief, and perception.

Social development researchers, in contrast, generally rely on naturalistic observation, at least in the preschool years, using audiotape, videotape, or parental reports. Experimental intervention may be involved, but even then researchers aim to produce a setting much like a natural one, in which the child is directly involved. The focus is on social roles, conventions, and rules, and more on the mental states of intention and emotion than knowledge and belief, primarily because these are the focus of young children's interest and thus what they talk most about. However, in everyday life children do attempt to trick others or hide things from them. From such behavior we can draw inferences about their understanding of knowledge and belief. On occasion they may even make spontaneous reference to knowledge and belief, affording an even more direct basis for making inferences about their understanding.

It is when the two paradigms focus on the same mental state that we are best able to compare the two methodologies. For example, Raver and Leadbeater cite an instance [reported by Brown and Dunn, 1991]

in which a child under 36 months of age conducted her own version of a theory-of-mind task with her mother and a younger sibling. The child hid a favourite toy and asked her sibling to guess where the toy might be. At the same time, she indicated her awareness that her sibling and her mother held different beliefs, saying to her mother, 'I don't want *you* to guess!' [Raver and Leadbeater, 1993, p. 351, their emphasis].

The 2-year-old was actually playing with an older sibling and the interaction proceeded as follows:

[child wrapping Sib's toy car in a towel]
Child to Sib: Guess what's in here?
Guess what's in here?
[car falls out]
Mother to Child: What are you doing?
Child to Mother: I don't want you to guess this.
[Brown and Dunn, 1991, p. 255]

What is the basis for the inference that the child was aware that her sibling and her mother held different beliefs? Might she not have been indicating that she wanted to play with her sister, and not with the mother? Further, was she aware that the toy had fallen out of the towel? What does that awareness imply about her understanding of belief?

We use this example to highlight the difficulty of making inferences about children's awareness of others' mental states from naturalistic observation alone, especially from reports of isolated incidents. We do not want to suggest that children have *no* understanding of others' beliefs until they can pass false-belief tasks; indeed, later we will explicitly deny such a suggestion. Nor do we want to imply that naturalistic observation is not a useful enterprise. To the contrary, social interaction is undoubtedly the context in which children acquire their understanding of people's minds, and information regarding children's participation in such interaction is a vital source of data in any attempt to explain the development of this understanding. For example, in the study just cited, Brown and Dunn [1991] recorded naturally occurring conversations between six toddlers and their mothers and older siblings. The data were collected at 2-month intervals, for 2 hours each time, throughout the children's third year. The transcripts were coded for references to belief, desire, and emotion by the child and by the mother to the child, as well as for the pragmatic contexts in which these references occurred. Such detailed and careful investigation allows us to examine the relations between parent and child talk about the mind, as well as relations between children's talk about the mind and their social relations within the family. We need such information to inform our understanding of how children's social understanding, and specifically their theory of mind, develops.

A rich data set has come from naturalistic observations of children's ability to communicate with others, even prelinguistically. Infants, for example, can take turns in an exchange, establish shared reference, and engage in joint attention [Bretherton and Bates, 1979; Bruner, 1983]. Toddlers can sometimes take other people's point of view by providing the information they need in naturally occurring communicative exchanges [Shatz and O'Reilly, 1990]. Parental reports and transcripts of children's talk about their own and others' internal states are a further rich source of information [Bartsch and Wellman, 1995; Bretherton and Beeghly, 1982; Shatz et al., 1983]. Two-year-olds talk about people's desires and emotions, using terms such as *want, need, happy, sad,* and *mad,* and 3-year-olds refer to people's beliefs and knowledge, using terms such as *think,*

know, and *surprise.* Children talk about desire and emotion before they talk about belief, as reflected in experimental data showing that children pass tasks assessing their understanding of desires and emotions at about 3 years of age, but do not pass false-belief tasks until age 4 [Wellman, 1990]. Nonetheless, a discrepancy still exists between naturalistic and experimental observations.

Raver and Leadbeater [1993] claim that such methodological differences only partially account for the discrepancy between theory-of-mind research findings and those from more naturalistic studies of social development. More important, they say, are the different theoretical conceptions that motivate the two traditions. Again, we agree with them. However, we would point out that the term 'theory of mind' is used to refer both to a research area and a theoretical perspective and there is not a one-to-one mapping between area and perspective. Not everyone who studies children's theory of mind holds the view that children develop a theory about the mind [Astington, in press]; among those who do hold the view that theories of mind develop, few claim that the child has no theory at all before 4 years of age. Instead it is claimed that the theory undergoes an important change at about age 4, when children are first able to demonstrate explicit awareness of the representational nature of belief, indicated by successful performance on the false-belief task [Gopnik and Wellman, 1994; Perner, 1991].

An alternative point of view is that children's understanding of other people's mental states comes not from theory construction but as part of the process of enculturation, that is, the process of acquiring language and coming to understand social rules within a culture. Children internalize the folk psychology of their particular culture. This view is more commonly held by social development researchers, although again there is not a one-to-one correspondence between research area and theoretical perspective. In the debate over how children acquire a theory of mind, the enculturation or social constructivist view has not been ignored, although it has been less centrally represented [Astington, in press].

One example of this view is seen in Tomasello et al.'s [1993] answer to the problem of the acquisition of culture. They relate the evolution of a theory of mind to the evolution of culture. They point out that it is only because of the ability to ascribe ignorance to someone that we can make the pedagogic move to 'teach' someone something. Empirically, they show that only creatures with a theory of mind adopt such a pedagogic attitude. Furthermore, they suggest that it is only by virtue of the ability to ascribe second-order beliefs – that is, to recognize that people have beliefs about others' beliefs – that we can negotiate or collaborate in arriving at a mutual understanding.

A general enculturation perspective is developed by Bruner [1990] in *Acts of Meaning,* where he suggests that in their earliest years children learn to give meanings to what people do, as they acquire the ability to tell stories about themselves and other people. He shows how children come to use narratives to integrate what they and others think, feel, and do. They construe action in terms of beliefs, desires, goals, and norms. The narrative not only tells what happened, but tells it against a background of what usually happens or what ought to have happened, and from a particular point of view. That is, the construals are inherently perspectival – the 'same' happening may be recounted quite differently by the child who took the toy and the sister whose toy it is, or by the child who is helping his mother and the mother whose activity is interrupted.

Thus, in learning to talk, telling and hearing stories in everyday family life, the child learns what can be done and what cannot be done, and how people think and feel about events. The first stories report simple actions and events. But, before long, children be-

gin to insert mental states into their narratives in order to account for anomalies and misfirings. Thus, by the time they are 4 or 5 years of age, children can insert psychological states, such as mistaken belief, to account for someone looking for something but not finding it, for example.

The two accounts we have described are quite different – one an account of theory construction and the other an account of social construction. The first account, based mostly on experimental observation, is that children have constructed a theory about human talk and action. Beliefs and desires are constructs in the theory that are used to explain and predict human action. Given an intact brain and the necessary social experience, it is a construction that is more or less universal. Some might say that children have discovered the 'well-springs' of human talk and action. They have inferred the underlying causes of action, captured in their new mentalistic concepts of belief and desire. The second account, based mostly on naturalistic observation, is that the child has learned to participate in a kind of interpretive discourse, one that turns the 'well-springs' of action, whatever their underlying form, into cultural and rational forms. In the one case the child is seen as constructing concepts, in the other as internalizing social understanding.

Are these views importantly different? Certainly, the two views dictate different research programs. If the construction of a theory of mind is a universal human achievement, the central question becomes one of what makes this achievement possible. Fodor [1987] and others [Carey, 1985; Leslie, 1991; Macnamara, 1989] have proposed that children's understanding of mind is innate – that acquiring a theory of mind is similar to acquiring language. In other words, some specialized system for the representation of action in terms of intentional states is assumed to be universal, even if it takes somewhat different forms in different social contexts. Certainly, research with autistic children suggests that to lack a theory of mind is not merely to miss a piece of cultural knowledge but to miss out on some essential part of normal development [Baron-Cohen et al., 1993].

In contrast, those who view a theory of mind as a set of cultural norms will look across cultures and across social contexts for variability. Here the data are equivocal. Avis and Harris [1991] report that 4-year-old Baka children of the Cameroons understand false belief in much the same way as British preschoolers. In contrast, McCormick [1993] found that children in different cultures respond in quite different ways to misleading and partial information. The Tainae of New Guinea attribute actions to beliefs of the actors, while the Qechua of Peru attribute actions to the appearances of things themselves.

Within Western culture, children's false-belief understanding varies under different conditions. For example, if 3-year-olds are scaffolded by an adult's prompting questions, they can explain a puppet's action when it is premised on a false belief, before they are able to predict the action in the standard false-belief task [Bartsch and Wellman, 1989]. Similarly, Sullivan and Winner [1993] found that 3-year-olds show some understanding of false belief if they join with an adult in playing a trick on another person by switching the contents of a familiar box. This literature, and the cross-cultural literature just cited, indicate some of the ways in which social context may enhance or impede the ascription of beliefs.

Uniting the Cognitive and the Social Views

We thus have two perspectives – a causal cognitive one and an interpretive social one. Our view is that the two perspectives, the causal and the interpretive, are not incompatible. Indeed, they are two sides of the same coin. We would argue that theory of mind is a cultural invention, a quasi-theory, invented and passed on from the remote past. 'Cartesian man' who is indisputably a thinker and who is seen as acting on the basis of his beliefs may be no more a natural man than the much-disputed 'economic man'. Both reflect cultural ways of thinking that serve as norms for evaluating one's own talk and action and for interpreting the behavior of others. In this respect we are sympathetic with the interpretive, normative stance taken by Bruner, Shanker, and others. Moreover, these ways of construing behavior are occasioned by social interaction – by living in a social world.

We think it essential, nonetheless, to differentiate the conditions for learning from questions of what is acquired. Learning to construe behavior according to cultural norms depends on the availability of some essential, underlying abilities and competencies, such as the ability to 'hold something in mind' [Olson, 1989], the ability to 'decouple' schemata from their input-output conditions [Leslie, 1987], and the ability to 'embed' representations within other representations [Perner, 1991]; it may even depend on some innate concepts of mind [Fodor, 1987]. The moot question is whether or not these underlying abilities include something as specialized as the ability to recognize intention-in-action, as opposed to more general abilities such as the ability to recognize animacy. The account of just what makes the acquisition of such a conceptual system possible is an urgent theoretical problem [Olson, 1993; Russell, 1992].

The mistake, if there is one, is of confusing the tasks arising from these two perspectives. The interpretivist's error (if we may be so bold) is to assume that important cultural concepts can be acquired from participation in a social context simply because they are manifest there. At least since Piaget, we have known that the child has to construct not just the concepts for interpreting events but also the observables that the concepts represent. The child has to invent just what the culture offers; the child has to 'make what he finds' as Goodman [1984] would say.

The causal theorist's error (if we may be so bold) is to assume that children invent concepts of mind to solve practical problems that arise in the management of everyday social interaction. But concepts of mind are not postulated in a manner similar to that involved in Newton's postulation of gravity. Conceptions of the self and the mind are cultural ways of construal with important social consequences.

Proposals such as the one by Raver and Leadbeater [1993] to the effect that social understanding can precede an explicit 'theory of mind' seem to us to misrepresent the problem. It is not that the child is in possession of understanding at an early age but simply fails to express it in experimental tasks. Rather, we would insist that the younger child lacks understanding that the older child possesses, although not all social understanding of course. Even 2-year-olds understand something about what another is doing, trying to do, or wants. Still, the concepts the 2-year-old has available for the interpretation of social experiences are limited in a way that those of the 4-year-old are not. A genuine growth in social understanding occurs when children come to understand that they themselves, as well as others, can and in fact do on occasion hold false beliefs.

The difficulty lies in the correct diagnosis of the level of social understanding. Even 3-year-olds use expressions which, for older children, mark distinctive mental states or activities. This fact has sometimes been explained away as imitation of something said to the

child, or as individual precocity – after all, some 3-year-olds pass false-belief tasks [Perner, 1988]. However, one 3-year-old whom we were testing remarked spontaneously, on finding stickers in a crayons box, 'I thought they were crayons' and then a few moments later, when the stickers were back in the box and he was asked, 'What did you think was in the box before we opened it?' he replied, 'Stickers'! Another child who failed to distinguish what was said from what was meant on one trial, when faced with an ambiguous utterance – a critical test for such understanding – asked the experimenter, 'Do you mean this one?' In neither case, we suggest, is it appropriate to ascribe a full understanding of thoughts or meanings to the child. Rather, it is an indication of partial knowledge.

Consider how this could be the case. Social understanding cannot, contra Raver and Leadbeater, proceed via 'participation' without appeal to concepts. Understanding presupposes concepts, just as perception and action do. A statement cannot be an apology unless the speaker has, and applies, the concept of apology. Yet such concepts need not be verbal. Concepts have a complex internal structure and are put in place piece by piece. Thus, young children may have some concept for dealing with what they or another know without possessing all of the relevant knowledge. Naturalistic settings usually do not call into question all of the features of a concept, and in such cases partial knowledge or knowledge of prototypical cases can appear adequate. But to determine the precise boundaries of a child's concept, it is necessary to construct experimental tasks that put the strain on just those features likely to be critical and/ or absent. Astington [1988] showed that children readily recognize promises if all the conditions critical to promising are in place. Yet if one critical factor is altered, such as not keeping the promise, children think it no longer a promise. To test all of the constraints on a concept requires the construction of special tasks, hence the false-belief task.

We return, then, to the cultural theory with which the cognitive revolution began. What needs to be explained is the beginning of children's efforts at interpretation of their own and others' talk and action. As we suggested, that interpretation should be seen by the psychologist as a cultural way of viewing, not just the functioning of a mental organ. It is an interpretation of patterns of persons acting in the world, indeed patterns of actions in which the child may already be a participant. Yet, as we also suggested, these patterns of social interaction ultimately have to be explained in terms of the sets of concepts available and by appeal to the processes involved in the child's acquisition, elaboration, and reorganization of concepts.

Feldman [1992] at the end of a thought-provoking essay review in this journal titled 'The New Theory of Theory of Mind' asks, 'If the interpretive aspect of cognition were taken on as part of psychology, could it be a topic in the scientific study of mind?' [p. 116]. That is, can we give a causal explanation of interpretation? Feldman argues, as does Bruner, that in our everyday lives we are not concerned to explain and predict human activity but rather to understand and interpret it. Our folk psychology is not a theory to be used in quasi-scientific predictions of action.

Two separate questions are at stake here – whether folk psychology is interpretive or predictive and whether scientific psychology is so. The two questions need not have the same answer. The first question is descriptive. That is, what is folk psychology like, and how should it be investigated? The second question is prescriptive. If we grant that folk psychology is interpretive, can we study interpretation scientifically?

An interesting double level is present in this debate. At one level we are concerned with what children are acquiring and at another level we are concerned with how to explain this acquisition. Of course, in one sense we cannot separate the two levels since

what we explain and how we explain it are inevitably tied. Yet in another sense, one level of the debate neatly mirrors the other. What do children acquire – sets of concepts organized into a conceptual framework that we can think of as a theory, or the ability to function increasingly adequately as an interpreter of social interactions? Stated this way, the conflict disappears – the acquisition of critical concepts permits increasingly complex understanding of social interactions.

So are children little scientists constructing theories or little hermeneuticists understanding social situations? The answer is both. They acquire concepts in order to make sense of social situations. And are we, as psychologists, to be scientists or hermeneuticists? Again, the answer is both. If we are to understand social understanding, we, too, must come up with the set of concepts that explains how such social understanding is possible. In this way we can attempt to give a causal explanation of meaning-making. This is our answer to the question that Feldman posed.

It seems to us that the most promising route to this end would be collaborative efforts on the part of theory-of-mind researchers and social development researchers, using a combination of experimental and naturalistic methodologies. Indeed, projects of this sort have already demonstrated a relation between theory-of-mind development, as assessed by the false-belief task, and social behavior observed in a naturalistic setting [Astington and Jenkins, 1995]. Since children's false-belief understanding is associated with their natural behaviors in real-world settings, it is likely that false-belief tasks are in fact charting meaningful change in children's cognitive development. Dunn et al. [1991] have shown that children's performance on an experimental test of false-belief understanding was associated with some aspects of discourse and family interaction observed in a naturalistic setting 7 months earlier. Such data are important in our efforts to determine how social interaction might lead to new conceptual structures.

The child's theory may be interpretive – that is, the child may be learning a gloss on his or her own behavior and the behavior of others. However, the psychologist's account of that theory must be a causal one. Children may be learning to see and describe their own and others' behavior in terms of the folk theories of their cultures. We want to take advantage of this view. However, we do not want to do so at the price of abandoning the quest for a causal, naturalistic account of the acquisition and elaboration of these theories. The challenge of the cognitive revolution is to study construals and interpretations scientifically. In this way we can exploit both sides of the legacy of that revolution.

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