Childrens Early Understanding of Mind

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6 Theory of Mind and the Facts of Embodiment

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INTRODUCTION: ON MINDS AND CONSCIOUSNESS

Conceptual behaviourism is the thesis that behaviour can be the only observable basis for scientific psychology. This view held such sway in the past that psychologists in the vanguard of the cognitive revolution made the opposite mistake to the behaviourists, and they became conceptual cognitivists. They were so keen to promote a psychology of mental life that they were tempted to leave behaviour out of the explanation altogether. Cognitivists imported their own methodological strictures to be sure that they really were dealing with "pure" cognition. To study mental phenomena, for example to establish whether children or animals understand about beliefs or desires, it was thought necessary to eliminate any possibility of a behaviourist explanation.

One criterion adopted for "purely mental" phenomena is "intentional inexistence" (Chisholm, 1991). Psychological attitudes such as desires, hopes, wishes, and beliefs have objects, even though these objects do not necessarily exist, just as a child may believe that there are biscuits in the jar, even though the jar is empty. The unique characteristic of mental terms is that they can be related intentionally to nonexistent objects, for example, we can imagine fighting with dragons. Premack and Woodruff (1978) make use of the criterion of intentional inexistence in the "false belief" task. If the chimpanzee understands that another chimp has a false belief, or if it attempts to induce a

false belief in a conspecific by deception, then it must ascribe mental states to other chimps. Similarly, the child who understands false beliefs at about four to five years, according to Wimmer and Perner (1983), must have at least a glimmer that others have mental lives not unlike the child's own. Thus, one of the central assumptions that has been made in the recent literature on the child's "theory of mind" is that an understanding of mental states can only satisfactorily be demonstrated independently of behaviour.

Demonstrating that chimpanzees and children comprehend the desires of their conspecifics by the ascription of mental states, rather than directly through overt behaviour, certainly suggests that a capacity to represent such states exists. However, it is as well to bear in mind that these tasks are methodological instruments for cognitive psychology, devised specifically to bypass explanations based on behaviourist reductionism. Correct performance on the tests should not necessarily be conceived as a watershed, or graduation ceremony, affording admittance either phylogenetically or ontogenetically to the world of the mind. Nor does the fact that children below a particular age fail on tasks which require them to reason about other minds necessarily mean that they have no earlier means to understand other minds.

Although reasoning about minds may be related systematically to theorising about minds (which is what psychologists do), the child's understanding of other minds may be misconstrued if she is considered first and foremost to be a folk psychologist, rather than a person in a social world. Leekam (1993) offers an excellent taxonomy of the various theories of "theory of mind." What all these theories have in common is the assumption that minds are unobservable entities that can only be known inferentially, or by imputing mental states to others. Hence, it is argued, the child constructs a systematic, although naive, theory of mind as her knowledge of mental states slowly accumulates. My own position is that minds are not theoretical entities and that mind can be perceived directly in behaviour. Theorising is not the ultimate source of knowledge about minds, rather information for mental events is available in social relationships. In real life, minds are situated in bodies and mental events are made manifest in social behaviour. If individual minds are socially constituted, then minds extend to, and are observable in, the social relations that constitute them. Ecological theorists, such as Gregory Bateson (1972a), maintain that it is a fundamental epistemological error to separate the mind from the ways in which it is evidenced through the body, and through human relationships, in society. Likewise, Coulter (1979) speaks of the "transparency of mind" in an attempt to get away from the conception of mind as a purely private, unobservable, inner mental state. These views taken on particular pertinence in the context of infant development, where the mind and body can be considered as one indivisible entity.

It is interesting to note that the antithesis between observable behaviour and unobservable minds has also been repeated in the recent history of the study of consciousness. This is not surprising, since states of mind inevitably imply states of consciousness. A small diversion into ways of defining consciousness will help to situate the ecological approach to mind that I should like to propose in this chapter. Just as the rise of cognitive psychology reintroduced mental events as a legitimate object of study, so too has consciousness been reintroduced in place of mechanistic explanations for behaviour. Hannay (1990) and Humphrey (1992) distinguish three uses of the word consciousness. Originally the word derives from the Latin *con*, meaning "together with," and *scire*, meaning "to know." In the original Latin the verb *conscire* (from which came the adjective *conscius*) meant literally to share knowledge with other people. In time, the circle with whom the knowledge was shared became tighter and tighter until it included just a single person, the subject who was conscious. That is, consciousness shifted from being a matter of public knowledge to one of private knowledge. Most recently, there was a further shift of definition to having knowledge to which, by its very nature, no one else could have access (knowledge of one's innermost thoughts and feelings). That is, consciousness became equated with subjective experience.

As Humphrey (1992) points out, the meaning of the word has not only become narrower and narrower, it has turned round. As he says, it is rather like the word "window," which has changed its meaning from "a hole where the wind comes in" to "a hole where the wind does not come in." Consciousness has changed from "having shared knowledge" to "having intimate knowledge not shared with anyone except oneself." Humphrey suggests that there has been a further shift from using the word transitively "I am conscious of such and such a thing" to using it intransitively, simply: "I am conscious." Just as the definition of consciousness as an attribute of mind has slipped from the public to the private domain, the notion that mind is unobservable encourages its definition as a theoretical construct. The definition of mind I should like to stress for very young babies is its transitive and shared public aspect, rather than the intransitive, private one.

Another distinction that may prove useful is that between "primary" consciousness, based on perception and "higher-order" consciousness, or reflective self-awareness, in early human development. I am borrowing the distinction between "primary" and "higher-order" consciousness from Edelman (1989), although I am using it here in a modified form. According to Edelman, primary consciousness is the state of being mentally aware of things in the world—of having mental images in the present—higher-order consciousness includes recognition by a thinking subject of his or her own thoughts, actions, and emotions. It embodies a model of the personal and of the past, future, and present and there is direct awareness of mental

episodes. In essence, then, the distinction between primary and higher-order consciousness is one between consciousness of the products of perception (which, I will argue, may originate interoceptively or exteroceptively) and consciousness of mental events in themselves.

This chapter will pursue the argument that the embodied mind can be observed in human infants through their social behaviours, such as in imitation, in communication through joint visual attention, or in the comprehension of pointing. These phenomena reveal some direct understanding of other minds as expressed through behaviour and as mediated through perception. These capacities do not require that the infant has a theory that other people have minds, nor does the baby perceive behaviour and then impute mental states to others (nor do we as adults perceive disembodied minds). From the infant's perspective there is no duality between the bodily and the mental. From the stance of ecological realism that will be adopted here, the expressive behaviour of other bodies reveals the presence of other minds, even to babies. The essence of the ecological approach, as recounted by Gibson (1966), is that perception is a means of obtaining information about reality, and this theoretical stance can be extended to include social information revelatory of other minds.

But perception is not the whole story. Developmental changes can also be observed in the infant's understanding of her own embodiment which are consistent with acquiring representational knowledge of self. Eventually, as the false belief task demonstrates, the child does become able to reason about the mental lives of other persons. I will attempt to make some links between these different levels of understanding of other bodies and their minds.

CONSCIOUSNESS AND THE NATURE OF EMBODIMENT

Traditional developmental psychology attributed little, if any, conscious awareness to the young infant. The assumption was that the newborn is merely a reflexive organism, all hungry body and little mind, responsive but with only the most limited ability to perceive. The earliest demonstrations of selective attention by Fantz (1956) showed that even newborns have visual preferences. He found that neonates prefer to look at patterned rather than plain stimuli, and also that newborns prefer face-like patterns. Subsequent research exploiting the preference technique has shown that babies, in the first few days outside the womb, prefer the sound of their own mother's voice to that of a stranger, they prefer the smell of their mother's breast milk to the breast milk of another nursing mother, and recently it has been shown that three-day-old babies prefer to look at their mother rather than a

stranger (DeCaspar & Fifer, 1980; MacFarlane, 1975; Bushnell, Sai, & Mullin, 1989). Thus, even newborn babies discriminate important aspects of social reality from the outset. Such results certainly require a reappraisal of the perceptual abilities of newborn babies, with particular reference to their perception of persons.

Among the most challenging research of recent years has been the demonstration of imitation in newborn human infants. Neonatal imitation has now been shown for tongue protrusion, mouth opening, lip pursing, sequential finger movements, blinking, vocalisation of vowel sounds and emotional expressions (Field, Woodson, Greenberg, & Cohen, 1984; Kugiumutzakis, 1985; Maratos, 1973; Meltzoff & Moore, 1977; Reissland, 1988). Imitation is not reflexive. Newborns observe the model for several seconds and there is evident effort and progressive approximation to the model. Kugiumutzakis (1985) found imitation in many, but not all, neonates so long as the infants were in a quiet and alert state. Not all the models were imitated as statistically reliable levels: Among the facial models, tongue protrusion, mouth opening, eye blinking, and lip pursing were imitated usually after the fifth presentation. Among the acoustic models only the vowel sound "aah" and not the consonant "mmm" or the compound "ang" was reliably imitated.

Imitation in the newborn was called "participation" by Baldwin (1905), perhaps to emphasise the species recognition that it seems to imply. It has recently been shown that newborn infants imitate the dynamics (not the statics) of the acts they observe. Vinter (1986) showed that they need to see the act in progress in order to imitate it; they will not imitate if they merely observe a static protruded tongue. Toward the end of the first year of life, however, it is sufficient for the infant to see the end state (e.g. tongue protruded) in order to imitate it. That is, one-year-old infants can reproduce the dynamics of the movement given only the static end state. Newborn imitation also occurs within a relatively short reaction time, whereas Meltzoff (1988) has recently shown that, by eight months, babies are capable of deferred imitation over several days. By one year of age imitation can also take on symbolic properties; it is no longer merely literal, as in the neonate. Piaget (1962) showed this when his daughter tried to work out the modus operandi of the sliding drawer of a matchbox by moving her tongue in and out. Neonatal imitation is therefore the first level of a developing system of imitation, which comes to have the capacity for deferred and symbolic response. The thesis I wish to pursue here is that imitation in newborns is based on the operation of perceptual systems that give direct information about the correspondence between self and other. That is, the perceptual system specifies the equivalence between persons. In perceiving other persons the stage is set for perceiving other minds.

MECHANISMS AND MOTIVES FOR NEONATAL IMITATION

There are two important questions about neonatal imitation which will help develop our position further. How is neonatal imitation possible, especially when it involves parts of the body the infant cannot see, and secondly, why do babies imitate at all? The question of mechanism was first addressed by Sherrington (1906), when he distinguished between proprioception and exteroception. Proprioception is feedback that is specific to the activities of one's own body, whereas exteroception concerns the perception of the outside world. As elaborated by the perceptual psychologist, James Gibson (1964), proprioception is considered a general function, rather than a special sense, and it is normally a component of all perceptual systems. The argument I will elaborate briefly is that the mechanism of neonatal imitation depends on proprioceptive aspects of visual perception. That is, imitation depends on perceptual systems that provide information not only about one's own body, but also for the equivalence between self and other.

As to why infants imitate, Kugiumutzakis (1992) draws on evidence from neonatal preference for voice sounds, and other aspects of their sensitivity to sound and affective tone, to suggest that imitation reflects an innate motive for communication. He argues that newborns show an "innate inter-subjectivity" and also that they distinguish between self and others from the outset. Kugiumutzakis suggests that imitation is not a reflex act that lacks volition, since imitation clearly has the characteristic of selective and effortful behaviour. The variability and goal-seeking character of the infant's response suggests a proto-intentional act, which implies some conscious awareness of a goal. He also argues that it is true hetero-imitation, i.e. imitation of another person and not simply the cyclic repetition of activity, which was all the newborn infant was traditionally considered to be capable of.

Meltzoff and Borton (1979) have produced convergent evidence that there may be a perceptual basis for imitation in their studies of inter-sensory perception in babies aged one month. They have shown that babies can transfer information from oral touch to vision. In their study, infants first suck a smooth or knobbly pacifier, without having seen it, when it is inserted into their mouth. The pacifier is removed and they are then presented with two large models of the pacifiers on either side of the visual field. Babies prefer to look at the model of the same shape and texture as the one they previously had been sucking. This demonstrates that there is a mechanism that registers, at least in some basic ways, the correspondence between vision and oral touch.

Kuhl and Meltzoff (1982) have also shown that babies at three months can detect the correspondence between lip movements and speech sounds.

Babies prefer to look at whichever of two video-recorded speaking faces corresponds with the sound track played between the televised displays. The face mouthing "ah ah ah" is preferred when the sound track corresponds with it, whereas the face on the other side, mouthing "ba ba ba," is preferred when that sound track is played. The implication is that imitation may assist the infant to read the lips and voice of the social partner and assist in communication and the earliest aspects of language acquisition.

Neonatal imitation, therefore, seems to be based on the mechanisms of perception. Perception carries information for self and for the external environment and can be considered as if it were a phase of action, just as action can be considered as a phase of perception. Hence, perceiving the dynamics of tongue protrusion provides some of the necessary information for production of the action. Although memory is, in some sense, involved from the outset, it too develops. This is shown by the capacity for deferred imitation, which increases with age (Meltzoff, 1988), as does the capacity to reproduce actions having observed only their end states (Vinter, 1986). With those provisos we may wish to argue that neonatal imitation is evidence in newborns for primary consciousness of other persons, and that it is based on perception.

OTHER MINDS AND COMMUNICATION

Until now, we have not mentioned the infant's capacity for emotional expression and the role that it may play in early communication. The newborn can perform seven facial expressions, which are usually regarded as species-specific and universal (happiness, sadness, surprise, interest, disgust, fear, and anger). These facial expressions are reliably observed during standard hospital assessment procedures for newborns (Field et al., 1984). It is interesting, therefore, that newborns have been shown to be able to imitate happy, sad, and surprised facial expressions (but see Kaitz, Meschulach-Sarfaty, & Auerbach, 1988). They widen their lips when the model has a happy face, protrude the lower lip during modelling of a sad face, and open eyes and mouth wide during modelling of a surprised face.

Trevarthen has perhaps done most in recent years to study the role of emotional expression in early communication. He follows Sperry in arguing that consciousness is the highest-level organising principle of the mind and that it is present as a motivation for learning and mental development at birth (Sperry & Trevarthen, 1991; Trevarthen, 1990; 1992). Consciousness, he says, is most readily evidenced in the infant's responses to people. Trevarthen distinguishes innate primary intersubjectivity (infant's conscious awareness of mother, especially in relation to emotion) from secondary intersubjectivity (infant's conscious joint awareness with mother of the world of objects).

Primary intersubjectivity consists of the exchange of feelings, a common code of cooing noises, facial and hand movements, concentration, pleasure, and surprise, which manifest even in very early social interactions between the two-month-old infant and the mother (Trevarthen, 1990, p. 3): "The universal emotions are the natural bridge between minds at any age." Primary intersubjectivity, Trevarthen argues, can be thought of as a directly perceived, conversational consciousness where communication occurs through the dynamic, transient shifts of emotion, as revealed in emotional expression of infant and adult like. Once again, the innate perceptual abilities of the baby make possible the comprehension of such complex exchanges. Infants, Trevarthen argues, have the capacity for communication within them and this develops both for intrinsic reasons and through social interactions. Those properties of mind revealed through emotional expression are transparent to the infant precisely because they are embodied in emotional expression. This argument is applicable to the theory put forward by Hobson (this volume), who offers an extended discussion, based on Wittgenstein, of how mental states such as anger, grief, and joy are revealed in the expressions of the face. Emotional expressions are neither purely mental nor merely behavioural.

Trevarthen has shown, by various means, the effects on the infant of disrupting emotional engagement with the mother. For example, when a happily communicating mother–infant pair interact over a video-system it is possible to show the synchrony between their behaviours microanalytically. If the happily engaged infant is then shown the live video-image of the mother delayed by a few seconds, the baby becomes puzzled and withdraws. Trevarthen argues that emotional signalling in the young infant is primarily adapted to a loving and playful partner and that it is the confluence of emotions between infant and adult, in social interaction, that underlies social communication. For Trevarthen, then, social consciousness is primary to communication and the further development of the infant. The emotional and expressive capacities of young infants are considered to be species-typical ways in which mental events are manifest in systems of joint activity, in primary intersubjectivity.

JOINT VISUAL ATTENTION

According to Trevarthen (1992) the infant achieves secondary intersubjectivity, based on jointly construed meaning, the negotiation of conventional knowledge, common purposes, and communication through symbols, towards the end of the first year of life. These more advanced aspects of knowledge of the world and of other minds are nevertheless founded upon the direct awareness underlying primary intersubjectivity. Our own research on joint visual attention and the comprehension and production of manual

pointing in babies complements Trevarthen's work on the emotional foundations of intersubjectivity. Stated simply, joint visual attention concerns how an infant knows where someone else is looking, how a baby knows where someone else is pointing, and how babies produce pointing for other people. Joint attention concerns the foundations of referential communication; how babies share objects with other people. The definition of mind that might apply here is a transitive one of joint awareness of public objects.

There is no doubt that babies as young as six months are able to change their own line of sight to follow a change in the attention of another person (see also Baldwin & Moses, this volume; Baron-Cohen & Ring, this volume). Contrary to the traditional assumption that infants are totally egocentric and therefore unaware of other minds, babies will take a change in the focus of attention of their social partner as indicating a potentially interesting sight for themselves and they will turn to look for it. In our carefully controlled studies, an adult turns, slowly and deliberately, to look at one of several targets positioned around the room. Babies can find the target the adult is looking at and we have described several different mechanisms for this, which arise during the first 18 months of life (Butterworth & Jarrett, 1991). The earliest mechanism, certainly apparent in six-month-olds, we call the ecological mechanism. The mother's change of gaze signals the direction in which to look (to the left or to the right) but it does not specify the precise location within the visual hemi-field. However, if the target is sufficiently attention-worthy, it will single itself out. Hence, the attractive characteristics of the object that initially led the mother to turn and look, and which led the infant to turn in the same direction, finally complete the reference triangle. The minds of the mother and baby meet in the self-same object, in the world.

Later in development, by about 12 months, a new mechanism appears, which we call geometric, because the mother's gaze or pointing hand specifies not only the direction but also, rather precisely, the location at which to look. The geometric mechanism does not replace the ecological one. Under normal circumstances both processes collaborate in singling out the object of mutual interest. From a developmental perspective something has been gained, since the geometric mechanism allows joint reference even where one object has no intrinsically more attention-worthy properties than any other. Definite reference can be made again to allow communication and a meeting of minds in the self-same object.

One of the most striking phenomena we have discovered, however, is that the ability to look where someone else is looking or pointing is limited by the boundaries of the infant's own visual field. At 12 months, when the laboratory is stripped bare of targets, babies do not search behind them (Butterworth & Cochran, 1980). Instead, on the adult's signal the baby turns

through about 40° and, failing to encounter a target, gives up the search. Only at 18 months do babies succeed in searching in the invisible space behind themselves when the adult looks there (Butterworth & Jarrett, 1991). At the average age of 12 months, the baby begins to comprehend manual pointing, but this still does not extend the boundaries of joint attention. Grover (1988, see also Butterworth & Grover, 1988; 1989), showed that babies fail to search beyond the boundaries of the visual field even when the mother looks and points behind the baby.

These data suggest that the infant takes her own visual field to be held in common with others (which of course it is!). Perception necessarily originates at a particular viewpoint but, as the results show, the infant also perceives that others can have a perspective on a common space. Thus, the boundaries of the infant's visual consciousness are revealed by the joint attention task and, at the same time, the task shows that the infant is aware that others also perceive a world of objects. Objects serve as the public intermediaries between the infant and the adult. That joint visual attention does indeed serve the purposes of communication is revealed clearly in social referencing tasks, where the mother's emotional expression will influence the child's behaviour toward the object of joint attention. Where the mother expresses fear or disgust, the infant will avoid the object toward which the particular emotion has been directed (Bradshaw, Campos, & Klinnert, 1986).

Perhaps the clearest evidence that the infant is concerned with communicating comes from the study of manual pointing. Infants produce pointing at about 14 months and we know that this gesture bridges nonverbal and verbal communication. Pointing, with the typical extended index finger posture of the hand, is species-specific to humans (see Whiten, this volume, for further comparative evidence). In our most recent studies we have examined the production of pointing in babies. We use automated toys, either a toy truck that can move from place to place or remotely controlled doll figures that move their arms and legs. Babies find these objects very interesting and they will point at them. Noteworthy, for our argument about conscious awareness of other minds, they will often check that the adult has taken notice of their point. Checking reveals a concern for the effectiveness of communication (Franco & Butterworth, 1991). We were particularly interested to find that 14-month-old babies, when tested in pairs, also point for each other and check that their message has been received (Franco, Perruchini, & Butterworth, 1992). It seems unlikely that 14-month infants are theorising about each others' minds. It is simpler to say that they wish to communicate and that this necessarily entails some basic awareness of their success or lack of success, as revealed in the bodily orientation, facial expressions, and behaviours of the addressee.

William James (1947) argued that joint visual attention depends on expressive movements that lead unrelated minds to terminate in the same

perception. Objects, he said, are coterminous, mutual aspects of experience. Indeed, he argued that other minds are known only by virtue of the body's expressive movements and their effects on one's own perception. A change in another person's visual orientation, or manual pointing, signals to the infant the possibility of an object, just as the changes in emotional expression we have just been discussing may refer transparently to the feeling states that accompany them. James argues that minds have external space in common. Visual space, for instance, acts as a public location, as a receptacle for experience. Both perception and emotion have their perceptible objects within this publicly accessible space. Thus, it is possible to observe properties of mind, in their earliest manifestation, in the social interaction between persons and in relation to objects. Mind and its objects are transparently revealed in expressive behaviours whose purpose is to communicate.

SELF-CONSCIOUSNESS AND THE TRANSITION FROM DIRECT PERCEPTION TO REPRESENTATION

By the second year, the baby is entering the linguistic community and beginning also to show evidence of reflective self-awareness, or higher-order consciousness. Recognising the self in a mirror is revealed by the infant removing a surreptitiously placed dab of odourless rouge from the nose, using the mirror reflection as a guide. Rouge removal has been taken as a particular index of self-consciousness. Human infants solve the task at about 15 months, which suggests that the infants, by this age, have a visual image of their own appearance.

Gordon Gallup (1970) showed that chimpanzees and orangutans are the only primates capable of solving this task. I have argued elsewhere that recognising oneself in a mirror is actually a complex intellectual task and that interest in the mirror image may be based on different mechanisms at different ages, ranging from simple awareness of the contingency between their own behaviour and that of the mirror image to knowledge of the visual appearance of the face (see Table 6.1 and Butterworth, 1992). Rouge removal may require comprehension of the reflective qualities of the mirror, a concept of self, self-identification by means of memorised distinctive features, plus comprehension of the identity of the reflected image with self and attribution of the reflected image to the self. On the evidence of the mirror task, these abilities are restricted to two higher primates other than man. It seems possible that this marks both an ontogenetic and phylogenetic boundary between primary and higher-order consciousness of the embodied self, although it would be a mistake to suppose that mirror awareness is the only possible index of self-knowledge applicable to other organisms. Nevertheless Gallup (1992) has suggested that performance on the rouge

TABLE 6.1
Main Stages in Mirror and Video Self Recognition Tasks During Infancy[1]

Developmental Stage	*Age*	*Characteristics*
Unlearned attraction to images of others	3–8 months	Interest in mirror, touches, smiles, behaves "socially" to reflection
Self as a permanent object	8–12 months	Aware of stable categorical features of self, locates objects attached to body using mirror image, differentiates contingent from noncontingent video-recordings of self[a]
Self-other differentiation	12–15 months	Uses mirror to locate others in space. Differentiates own video-image from that of others[a]
Facial feature detection	15–24 months	Recognition based on self-specific features. Success on "rouge removal" tasks

[1] After Butterworth (1992).

[a] These are actually very conservative measures of infants' social awareness. Using contingent and noncontingent video-feedback, Trevarthen has found that infants as young as three months show signs of distress and disengagement when shown noncontingent video-feedback of their own interaction with their mothers.

removal task predicts performance of monkeys and apes on introspectively based social strategies and on tasks that require the imputation of mental states to others. If this is true, then the mirror task may be taken as an early marker for the transition from direct perception to representation of self and others and perhaps the beginning of a differentiation of "mind" from "body" as cognitive processes become recursive upon themselves. This argument will be pursued further in relation to the classic diagnostic test for a representational "theory of mind," the false belief task, (also known as the unexpected transfer task).

THE FALSE BELIEF TASK

So far we have argued that very young babies show awareness of embodied minds by direct perception. If we accept the Gibsonian position on perception, the question becomes: How does development progress from direct perception of embodied minds to the representation of mental states? On a Gibsonian account, the developmental pathway would have to be from information about other minds obtained through perception, to a representation that preserves the information originally derived from

perception. Furthermore, given the human capacity for symbolism and language, this information may be re-represented in different ways.

The unexpected transfer task ("false belief") is critical to this argument, since it supposedly gets at specifically mental states by incorporating the requirement of "intentional inexistence." To understand "misrepresentation" may require additional cognitive mechanisms to those of direct perception. However, it may not be necessary to argue that what is required is a theory of mind. Rather, a different type of representation may be necessary to ascribe false beliefs than for the ascription of true beliefs that can directly be observed in behaviour.

This argument can be illustrated through Wimmer and Perner's (1983) paradigm, where the young child is told a story, using props. The story concerns a child called Maxi who helps his mother unpack the shopping and places a bar of chocolate in a green cupboard, being careful to remember where he stored it, so that he can come back later and eat some. He then goes off to play. His mother then uses some of the chocolate in cooking and places the remainder in another, blue cupboard. Mother leaves the scene and Maxi returns. The child is asked where Maxi will search for the chocolate. Children of four years say that he will look for it in the blue cupboard, where it was most recently hidden, even though Maxi could not know this. Between four and five years, the child says Maxi will look for it in the green cupboard, where Maxi last saw it. They reveal knowledge of Maxi's false belief (there is, however, some evidence that children as young as three can solve similar problems under some circumstances: Bartsch & Wellman, 1989; Moses & Flavell, 1990). The younger child, who fails the test, egocentrically bases her judgment on her own knowledge of the visible movements of the object. She fails to take into account that some of these movements were not visible to Maxi.

The test depends on representing the information available to the visual perception of another observer. Understanding false belief is inferred from specifying the position of the object within a represented reality. It is striking that the task resembles, very closely, a series of physical search tasks devised by Piaget (1954) for assessing a baby's understanding of object permanence. According to Piaget, babies become able to search manually for an object hidden under a cloth at about 9 months, followed by mastery of visible movements of the object by about 12 months, and culminating at about 18 months, when the baby will search persistently for a hidden object after invisible displacements of the object. The stage IV task is particularly important since perseverative errors occur, where the infant persists in returning to the first place from which an object has been retrieved, rather than allowing for the perceived movement of the object to a new place. Piaget might have argued that the failure of four-year-olds and the success of five-year-olds on false belief tasks demonstrates a "vertical decalage"

between the achievements of stages IV, V, and VI of the sensorimotor stage in object permanence. Between four and five years the child successively masters the consequences, for another observer, of visible and invisible movements of an object in represented reality.

I have argued that babies in the stage IV age range can search correctly for objects hidden at successive locations. Errors in search are not inevitable; they are, at least in part, a function of the spatial conditions of testing (Butterworth, 1981). Correct search for objects hidden at successive locations and looking where someone else is looking both reflect the unexpected perceptual competence of the baby (see also Gopnik et al., this volume). What is crucial to search tasks is the infant's perception of the continuing identity of the object hidden at successive places; what may be crucial to joint attention tasks is perceiving a change in someone else's focus of visual attention as signalling the "permanent possibility of an object" to enable otherwise unrelated minds to meet in referential communication. So why do older children consistently fail on the unexpected transfer task, which requires specification of place from a viewpoint in a represented reality?

One crucial difference between object search tasks of infancy and the unexpected transfer task may lie in the representation of negative information. Joint visual attention and searching for hidden objects are necessarily positive, in the sense that the object is always present (although it may be hidden), and we may surmise that the spatial location information as to its whereabouts is iconically represented. That is, it is represented as it would be perceived. The unexpected transfer task requires the child to reason that, since Maxi did not see the movement of the object, Maxi would represent the object where it was first seen. That is, the child must be able to act as if the same object simultaneously exists and does not exist at two locations, depending on the perspective of each observer in the story. It seems possible that children may have no difficulty in the representation of positive beliefs as expressed through behaviour. However, the unexpected transfer task presents them with the requirement to represent the non-existence of the object somehow. The child must represent the place where the object is symbolically located if he is to take the perspective of Maxi successfully. In other words, the four-year-old specifies the true physical location (where the object is really located) and fails the task, whereas the five-year-old specifies the symbolic location (where the object does not exist) and passes.

On this analysis, passing the unexpected transfer task may not reveal the child's first understanding of mental events. It may, however, reveal the beginning of the ability to reason about "non-existence at a place," or intentional inexistence. Bateson (1972b) discussed the "mysterious step from the iconic to the verbal" in describing the differences between the signalling

systems of animals and men. The ability to solve false belief tasks may involve a first level of integration between an "iconic" system of representation, which is adequate for "positive representation," and for basic intentional communication and another "symbolic" type of representation, which can cope with "negative representation." That is, reasoning about the non-existence of objects at a place may require a symbolic (non-iconic) mode adequate to the task of simultaneously representing counterfactual (negative) and factual (positive) states of affairs.

Such an ecologically based developmental progression, involving the interco-ordination and hierarchical integration of iconic and symbolic representation, may still yield the conclusion that children have difficulties with unexpected transfer. The difference over previous accounts is that comprehension of false beliefs is not divorced from perception of true beliefs, nor does it distance the developing child from what is real about minds. Such an analysis raises the possibility that the problem for the child may be one of hierarchical co-ordination of different types of representation. This is not the same thing as constructing a theory that other people have minds, nor does it amount to introspection or simulation of other minds. Such a fine-grained analysis of the representational processes involved could enable us to reunite research on reasoning about mental life with the ecological tradition, which rightly insists that minds are embodied and in the world.

CONCLUSION

The evidence reviewed on imitation and joint attention in babies suggests some major conclusions. First, there is evidence for primary consciousness in human infants that is based on the direct perception of mental states as revealed in behaviour, emotional expressions, and in bodily and other forms of orientation to objects. Furthermore, human social communication may be of central importance to the development of specifically human consciousness, and for knowledge of other minds, both in its primary and higher-order forms. Joint visual attention and the production and comprehension of pointing necessarily entail a meeting of minds in processes of referential communication. Although it is possible to demonstrate a variety of perceptual and cognitive mechanisms that come into play during early development, none of them need entail postulating that the infant communicates through the intermediary of a theory of mind. If development does not begin by constructing the rudiments of a theory of other minds, it is hardly necessary to postulate that subsequent development is a matter of acquiring a theory of mind. The perceptual abilities of the infant play an important and hitherto neglected part in primary consciousness and in perceiving other minds, and this is sufficient to

provide the basic information for subsequent representation. The evidence from infancy may lead us to concur with Sperry and Trevarthen (1990) that: "Consciousness appears in the causal chain in the form of emergent properties in which motives and emotion-charged evaluations, coherent about a self and able to be communicated directly to others, play an essential part."

As Edelman (1988) reminds us, through language we may simultaneously experience primary and higher-order consciousness in interaction. The false belief task may well demonstrate the interaction of an initial, iconic form of representation and a subsequent symbolic form. We have argued that the origins of a representation of other minds may lie in processes of direct perception but the simultaneous representation of reality, within different representational media, may explain why children have difficulties, which have now been well documented, when reasoning about counterfactual states of affairs or about information not fully available to other minds.

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7 Early Understanding of Referential Intent and Attentional Focus: Evidence from Language and Emotion

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INTRODUCTION

Communication among adults is grounded in a theory of mind. As Grice (1957) and others (e.g. Clark & Marshall, 1981; Rommetveit, 1979) have made clear, we cannot make sense of communicative interactions without presupposing that the interlocutors possess mutual knowledge of relevant beliefs and intentions. In the case of children, recent research indicates that a rudimentary theory of mind is well in place by the early preschool years, as are a rich array of communicative skills (Moses & Chandler, 1992; Perner, 1991; Wellman, 1990). The present volume is centrally concerned with the origins of a theory of mind. One way in which we might profitably search for these origins is to examine the path of communicative development as a potential window on early understanding of the mental realm. Communicative development is a particularly rich arena for examining theory of mind development. Mature communicative skills depend on, and thus index, theory of mind abilities. Further, as communicative competence increases, children gain access to increasingly powerful sources of information about the mind. In this way communicative development not only reflects advances in mentalistic understanding, but also makes possible further enrichments in children's theories of mind.

In what follows we explore a variety of links between children's early communicative advances and their emerging theory of mind. We begin by describing the major communicative milestones of the infancy period. Next,