# 1 Definitions, theories, and plan of the book

> If infant members of a mind-reading species give us the strong feeling that they are doing some kind of mind reading, they probably are.
>
> (Flavell, 1999, p. 32)

In a recent chapter, Meltzoff and Brooks (2001) introduced the magical Canadian ice hockey player Wayne Gretzky as the prototype or exemplary human mind reader because he is able to predict accurately where the puck will end up and hence he is already skating toward it before the puck is shot. My golden Labrador retriever Aquarius shows similar traits, however. When I play fetch with him he predicts accurately where an object will land, and hence is running toward the spot as soon as I lift up my arm into a certain direction in an attempt to throw it. Although both Wayne and Aquarius, when in the right situation, can predict accurately what the other will do, their predictions are based on different abilities. Whereas Wayne makes his predictions on where he thinks a teammate might direct the ball (based on mind-reading abilities, a knowledge of the rules of the game, and certain inherited skills from his expert hockey playing father), Aquarius does not make his predictions on mind-reading abilities. Aquarius has an innate ability to catch and retrieve things, and consequently will run toward the spot to which I direct my hand, arm, and ball, or where the ball may land or has landed before. Thus Aquarius relies on my actions, my observable behavior. Aquarius does not read minds. He never predicts that I may deceive him and throw the ball in a different direction. He does not understand that I can change my mind, or that I can make mistakes. No matter how often I play with him, he always responds to a predictable pattern of play and never understands my intentions in the absence of behavioral indices.

Although the young infant is neither a good skater nor a good fetcher, she is born with some specific abilities to predict what people can do. She quickly learns that people can change their minds and may make mistakes. These capacities are the result of some innate foundations or predispositions infants have, that facilitate their interactions with people.

For instance, infant understanding at birth that people are similar to self (e.g. like me) and different from inanimate objects prepares infants to interact socially with people and to identify with them. Such identification is not based on perceptual features only (e.g. size, shape, color, face, hands etc.) but instead is based on more complex properties that are unique to people. That is, there is evidence that from very early on, infants apply specific psychological principles to people. They have particular expectations of what people can and cannot do (Legerstee, Barna, and DiAdamo, 2000). Thus it seems that puppy dogs and babies are equipped with some rudimentary innate abilities; for Labrador retrievers it is to fetch sticks, but for the human infant it is the social cognitive ability to read minds.

In this book I will provide a general framework for thinking about infant social-cognitive development. In particular, I will be describing the *foundational abilities*, such as protoforms of Theory of Mind knowledge, including an awareness of emotions, intentionality and goal directed behavior in people, during the first year of life.

## Defining a Theory of Mind

By about 4 years of age, children produce a variety of internal state terms when describing people's actions, such as believing, thinking, and feeling (Bretherton and Beeghly, 1982; Bartsch and Wellman, 1995). It has been suggested that the use of these terms implies that children hold complex mental states that allow them to attribute internal representations to people (e.g. "John believes that the apple is in the cupboard," Bartsch and Wellman, 1995). Three-year-olds do not readily understand or talk about beliefs; instead, they focus on the person's desire (e.g. John wants an apple). Even 2-year-olds understand that people want or desire things, and that therefore they will act to get these things (Wellman, 1990). Consequently, Wellman (1990, p. 16) has argued that "before becoming belief-desire psychologists, young children are simple desire psychologists." Because these developmental changes – from primitive to complex understandings of emotions, desires, and beliefs – seem like actual theory changes, this phenomenon is called the infant's developing Theory of Mind (ToM) (Gopnik and Wellman, 1992). For instance, when watching people directing their attention and emotion toward objects in the environment, infants with a primitive understanding of mental states are aware that these cues may signal the person's *intention* to act on the object, but they do not understand that people may have mental representations about the object (e.g. that the person *thinks* that the apple is sweet). Although much work has been done to investigate the child's

understanding of beliefs and desires (Bartsch and Wellman, 1995; Flavell, Green, and Flavell, 1986; Flavell, Flavell, Green, and Moses, 1990; Lillard and Flavell, 1990; Schultz and Wellman, 1997; Wimmer and Perner, 1983), little is known about the relationship between Theory of Mind and intentionality and how an awareness of intentions in others develops in infants.

## Defining intentions

### *Socio-cognitive view*

Tomasello (1995) makes an analogy between the development of the various levels of Theory of Mind and the various levels of understanding of intentionality through which infants develop. He argues that during the first two years of life, infants progress from understanding other persons as intentional agents, to understanding that others have intentions that may differ from their own, and finally to an understanding that not all observable acts are intentional (accidental versus purposeful acts etc.). By the third and fourth year, infants' developing Theory of Mind goes through similar hierarchical levels: from understanding that other people have thoughts and beliefs, to understanding that these thoughts and beliefs may differ from their own, to an awareness that people may have beliefs that do not match reality. The difference in social cognition of the first two years versus that of the third and the fourth year of life is that during the first two years infants do not understand that people have thoughts (can represent things); they only understand that people are driven by concrete goals and purposes (have simple mental states).

Traditionally, philosophers and socio-cognitive psychologists have defined intentionality as actions or behaviors that are about things, e.g. that are directed toward a goal (e.g. Brentano, 1874; Merleau-Ponty, 1942; Searle, 1983). Some theorists propose that actions that are directed toward things are driven by mental states (e.g. the infant has a plan in its head before it is behaviorally executed); whereas others put forth a purely behavioral or perceptual explanation (e.g. the infant's behavior is a response to a particular stimulus).

Descartes proposed that an awareness of our mind through introspection is a basic, direct, and probably prewired ability of our mind, and so knowledge of the self as a mental agent is an innately given rather than a developing or constructed capacity, whereas classical cognitivists would propose it develops late, from nothing to something. This makes Descartes a continuous theorist in my book, because he views the development of mental states in infants as beginning at birth.

The Cartesian doctrine is an accepted view among many psychologists interested in "intersubjectivity" (Gergely, 2002). In terms of ontology (study of being) Descartes proposed the most influential division of reality: *res extensa* (extended substance) versus *res cogitans* (thinking substance, soul). The extended substance can be studied with the methods of physics while the soul needs a different treatment. However, Descartes (Cartesius is his Latin name) was also an interactionist, believing that there is a mutual influence of *res extensa* and *res cogitans* (mutual influence of mind and body). In contrast, monists believe that, for example, everything is physical or the soul does not really exist (behaviorists), or that the soul/mind is a result of the physical.[1] These theorists are the materialists; their philosophical position I call discontinuous.

Most cognitive developmental psychologists do not argue about whether the infant's behavior is driven by mental states. If they did, there would be no reason to study their existence. Instead, the debate surrounds the age of onset of an awareness of mental states. If it is true, that an awareness of people as intentional beings implies an awareness that their behavior is about things, then such an awareness begins early. Bruner (1999; see also Reddy, 2003) has argued that from birth infants are aware that they are the object of people's attention and that some months later they become aware that a third object (in addition to the infant) becomes the focus of attention of their communicative partner. Thus, from very early on in life, infants reveal that they are related to objects and that they perceive others to be related to objects. During the dyadic period infants interpret people's attention as an intention to communicate; if they don't, infants get upset. During the triadic period, infants interpret people's attention as an awareness of the external world, and may point to share interesting aspects of this world.

Thus, these authors argue that infants have simple mental states from birth that allow them to perceive people's behavior to be "about" things. If so, then the development of mental states is a continuous process and an understanding of more complex mental states is constructed with experience. These authors also argue that intentions are precursors to the development of a Theory of Mind later on.

There are others who argue that the behaviors I listed above do not reveal anything about the mental state of infants. That is because they believe that an awareness of intentions in others occurs toward the end of the first year when infants begin to use several means to achieve a goal

[1] Tomas Theo, personal communication, January, 2004.

(Piagetian stage 4). Becoming intentional themselves leads infants to perceive intentions in others as a result of biological abilities to perceive others "like me" (Tomasello, 1995).

Other discontinuous theorists differentiate between behaving intentionally and understanding intentions in others. More classically cognitive (Piaget, 1952; Perner, 1991) and prepared learning theorists (Barresi and Moore, 1996) propose that an understanding of the self as an intentional agent only lays *the foundation* for an understanding that the other is an intentional agent who has internal experiences, such as emotions, beliefs, and desires. These theorists argue that the infants' sociocognitive development is the result of innate biological processes (e.g. assimilation, accommodation, and interiorization) that prepares the infant to act intentionally around 8–10 months and to perceive others as intentional agents around 18–24 months. These discontinuous theorists propose that infants develop from a stage where they are viewed as little behaviorists whose behavior is elicited by environmental stimuli. This materialistic stage is followed by a mentalistic stage (often toward the end of the sensorimotor period, Piaget, 1954; Barresi and Moore, 1996; Corkum and Moore, 1998; Perner, 1991) when infants become little psychologists whose actions are driven by ideas in the mind.

The strength of the discontinuous positions is that intentionality is definitely present by 1 or 2 years of age. The three weaknesses are that (1) there is no discussion of the mechanisms that bring about developmental changes in behavior (e.g. how does the infant proceed from being a behaviorist to becoming a psychologist during the first year of life), (2) there is no explanation or description on what the *origin* of mental state awareness is (e.g. it is suddenly there), and (3) the role social interaction in the development of an awareness of mental states plays (Zeedyk, 1996; Legerstee, 2001a, b). Thus, discontinuous theorists adopt the stance that infants progress from being a behavioral organism during the first year of life, to a psychological organism thereafter, and are therefore void of any mental activity during the behavioral period.

### *Social view*

Whereas the cognitive and prepared learning views, whether of the continuous or discontinuous stance, emphasize the infant's own cognitive processes in the development of intentions and Theory of Mind thinking, social-interactionists argue that through interacting with people infants build representations that are important for Theory of Mind reasoning. Vygotsky (1962) for instance proposes that before infants are able to represent knowledge (intramental knowledge), this knowledge is represented

between the infant and the adult (intermental knowledge). That is, infants are particularly sensitive to species specific interaction patterns that facilitate this sharing of knowledge between two minds. The aspects of the interaction infants are sensitive to are mutual gazes and sharing of emotions during the dyadic stage, and communication about, and sharing attention to, objects during the triadic period (Adamson and Bakeman, 1982; Legerstee, Pomerleau, Malacuit, and Feider, 1987).

*Innate inter-subjectivity theorists* The social-interactionists can be divided into more nativist oriented theorists who argue that infants are born with an innate awareness of intentionality; 'as if' social interactionists who focus on parental interpretations of infant behavior 'as if' it were intentional; and dynamic systems theorists, who focus on how the system of the infant (endogenous and exogenous factors) combine to achieve a certain goal.

Those with a nativist orientation believe that infants have an innate capacity to perceive simple mental states in others. With experience and as a result of social interactions this awareness becomes more complex. Consequently, there is no shift in the awareness of mental states (e.g. from absence to presence of such mental states).

There is a large body of evidence indicating that infants from the beginning of life show a special sensitivity to communication and engage in bi-directional affective interactions with their caregivers that are characterized by a turn-taking structure during which both infants and caregiver participate in emotional sharing (Brazelton, Koslowsky, and Main, 1974; Tronick, 2003; Stern, 1985; Trevarthen, 1979). For instance, Legerstee et al. (1987) showed in a longitudinal study (from 3 to 53 weeks) that, already by 5 weeks, infants had specific expectations about the communicative behavior of their partners. Infants were presented with conditions where communicative people and interactive dolls responded contingently to the eye movements of the infants, but also with conditions where the person remained 'passive' and the doll remained immobile. Already by 5 weeks, infants expected people to communicate with them when in face to face situations. If they didn't infants became upset and began to cry. No such behaviors were exhibited in front of the immobile inanimate object (the doll). It has been argued that the infants' negative responses reveal a violation of an expectation that people in face to face situations communicate (Murray and Trevarthen, 1985; Stern, 1995; Tronick, 2003; Reddy, 1991; Hobson, 1990). This period in communicative development is referred to as revealing primary inter-subjectivity (Trevarthen, 1979; Tronick, 2003; Reddy, 1991; Hobson, 1990).

By about 6 months infants begin to look where others are looking and start to integrate object-focused attention into their play. Adamson and Bakeman (1982, p. 219) call this period in communication development of the infant the nonverbal *referencing* phase, when "gaze patterns, vocalizations, and gestures increasingly serve the referential function of introducing a new topic for discussion, a new message that the thing over there is what I want to communicate about, to comment on." This period where infants begin to communicate about objects and events in the environment has been called secondary inter-subjectivity (Trevarthen and Hubley, 1978; Stern, 1985).

Thus infants progress in communicative development from expressing their intentions in dyadic interactions early in development (either with people *or* objects) to expressing their intentions involving objects during triadic interactions during the second half of the first year (Bakeman and Adamson, 1984; Fogel, 1993). Toward the end of the first year, infants use points and vocalizations to direct people's attention to interesting sights (Legerstee and Barillas, 2003), and use others as social reference points (Baldwin and Moses, 1994; Baron-Cohen, 1991; Carpenter, Nagell, and Tomasello, 1998).

*As-if theorists* Although all social interactionists agree that social interaction plays an important role in the development of knowledge, not all perceive simple communicative intentions as originating at birth. Many social interactionists argue that infant behaviors acquire meaning, because parents act "as if" infants have minds. They attribute intentions to the smiles, vocalizations, and actions of their infants (e.g. Gergely and Watson, 1996; Schaffer, Collins, and Parsons, 1977; Snow, 1977; Vedeler, 1994), and interact in contingent ways to the various responses infants emit. Thus infant intentionality is a property of adult perception rather than of the infant's behavior.

*Dynamic systems theorists* Rather than focusing uniquely on the innateness of intentionality or how subjectivity is created by parents who treat infants "as if" they have intentions, dynamic systems theorists define behavior as mental, but also visual, muscular, neural, and contextual. These theorists argue that cognition does not always happen prior to action. Instead, they propose that in order to explain behavior, an examination of the changes that occur within each of these components (e.g. cognition and actions) is important. According to Fogel (1993) intentions are created within a communicative framework between parent and child. Infant development is not fixed to a genetic or maturational timetable (it is not linear), nor is it entirely predictable from adult guidance or

infant learning; rather new abilities emerge through the dynamic indeterminacy (behavior cannot be predicted from known laws) of self-organization (maintenance and development of the system arises from the mutual transactions and feedback processes between the components of the system), rather than being imposed on the system by some pre-existing plan (see Fogel, 1993; Fogel, 2001, pp. 55–59). Because development is seen as a nonlinear, dynamical, self-organizing process, infant intentionality can only be understood in the process of solving problems.

Some of the recent work of dynamic systems theorists support the idea of the close link between mind and body (see Lewis and Granic, 2000). For instance, emotions are said to be self-organizing products of mental and bodily processes that arise and develop in interpersonal interactions. This is evident in the ontogeny of communication where rituals develop between mother and infant during dyadic interactions through reciprocal coordination of actions, vocalizations, and emotional expressions and gestures (Fogel, 1993; Fogel and Thelen, 1987; Hsu and Fogel, 2003).

Thus rather than focusing on purely cognitive conceptions of the mind, ideas of nonlinearity and emergence are being explored when evaluating the intentions of infants.

*Integrative view*

In summary, there are various definitions of intentionality. Zeedyk (1996) proposes that theorists should opt for an integrated account of the development of intentionality. This would require an integrated definition of intentionality of course. This integrated approach needs to encompass both cognitive and social behaviors as well as personal and interpersonal behaviors. Zeedyk feels that the lack of an integrated approach has been counterproductive, and in order to advance in the field a more coherent account needs to be achieved.

## Intentions as precursors to Theory of Mind

Regardless of the controversy among theorists about the definition of intentions, the majority of them agree that an understanding of intentions in others is a precursor to the development of a Theory of Mind. A Theory of Mind is one of the most fundamental aspects of human development. In order to participate in social interactions, to understand early nonverbal behavior and emotional expressions, to predict goal-directed behavior of others, humans need to understand that they and other

people have mental states, that both possess information (in their minds) that can be predicted to some extend and also shared, and that the information two people have about a particular event may differ.

Until recently, little attention was paid to the infants' understanding of the social world. Consequently little was known about infants' fascination for how people think, feel, and emote. Before that, the focus was primarily on the child's understanding of the physical world. This research showed that infants as young as 3 months were aware that objects move as a whole and do not come apart; thus these infants understand the principle of cohesion. Somewhat later, between 3 and 6 months, infants begin to recognize that objects move on nonintersecting paths (principle of continuity) and that they cannot occupy the same space at the same time (principle of solidity). Infants younger than 6 months also realize that objects can make other objects move if and only if they touch; thus at that age infants are also aware of the principle of contact (see Spelke, Phillips, and Woodward, 1995 for a review).

The focus has now shifted from a predominant concern with the physical to the social cognitive development of infants in order to investigate infants' sense of people. Although an understanding of physical principles may facilitate an understanding of some aspects of people, such as an awareness of the occlusion and collision of their bodies (Poulin-Dubois, 1999), physical principles will not help in understanding people as psychological entities. When infants start to see others as psychological entities, they begin to understand that people are motivated by mental states.

As discussed earlier, whereas many social cognitive theorists are very clear that infants develop an awareness of simple mental states (intentions), they are not clear about the age of onset (e.g. at birth; around 9–12; or at 18–24 months of life). More importantly, they are less clear on what happens prior to the onset of intentions in infants. When questioning Tomasello (January, 2003 – personal communication) about the type of mental states infants had prior to 12 months, he stated that "For now, I have just simple-mindedly talked about understanding goals and intentions at one year as one thing and understanding thoughts and beliefs at four years as another. The latter are clearly 'mental states'. Whether or not the former are depends on your definition of 'mental state'. I don't think anything important rides on this definition." Although this may seem a glib answer, as I discussed in the beginning of this chapter "intentionality" is defined in various ways by various authors, depending much on their theoretical orientation, namely whether they emphasize biological (innate) versus cultural/environmental factors, or an interaction between the two in the development of an understanding of intentionality in infants (Zeedyk, 1996).

It would, however, seem essential that developmental psychologists provide a detailed account of how *the baby becomes linked up with the environment*. That is, do babies have a set of reflexes that make them react to external stimulation, or do they have innate structures or predispositions that allow them to recognize people as special categories in the world? In the following paragraphs I will discuss how some influential theoretical orientations deal with these questions. It has been argued that "intentionality" like other hypothetical constructs cannot be measured (Harding, 1982). This argument brings us back again to the way intentionality is defined. Regardless of whether one proposes a continuous or discontinuous view of the development of mental states in infants, if something called "development" exists, it should be fully described, whether this description entails going from simple structures to more complex structures or from the absence of mentalism to its presence.

Thus in this book I will investigate one of the most interesting and hotly debated questions about the development of social cognitive capacities in children, namely whether infants perceive people as sentient beings with emotions, goals, and intentions. Because I believe that the development of a Theory of Mind is a continuous process (rather than discontinuous), I propose that there are *precursors* to a Theory of Mind. The aim of the present book is to focus on these precursors; in particular, it seeks to determine when human children first become aware that people have minds and what the mechanisms are that promote such awareness. There is converging evidence from developmental and cognitive psychology to indicate that the precursors to a Theory of Mind can be found in infancy as a result of cognitive processes that are within the child but that social interaction is an important factor supporting Theory of Mind development.

## Theoretical speculations: onset of mental state awareness

### *Piaget's view*

According to Piaget (1952) the newborn baby does not have an awareness of the mental states of other people. Rather, Piaget designed a baby with reflexes that only reacts to incoming stimulation for the first months of life. After much reflexive action on the world (e.g. sucking on a blanket or the breast) and with the help of biological mechanisms of assimilation and accommodation, infants learn to discriminate between the two classes. It is at that moment that reflexes turn into action schemas and that cognitive structures develop which direct infants for the first time to act on (rather than being acted upon) the environment. Although for the