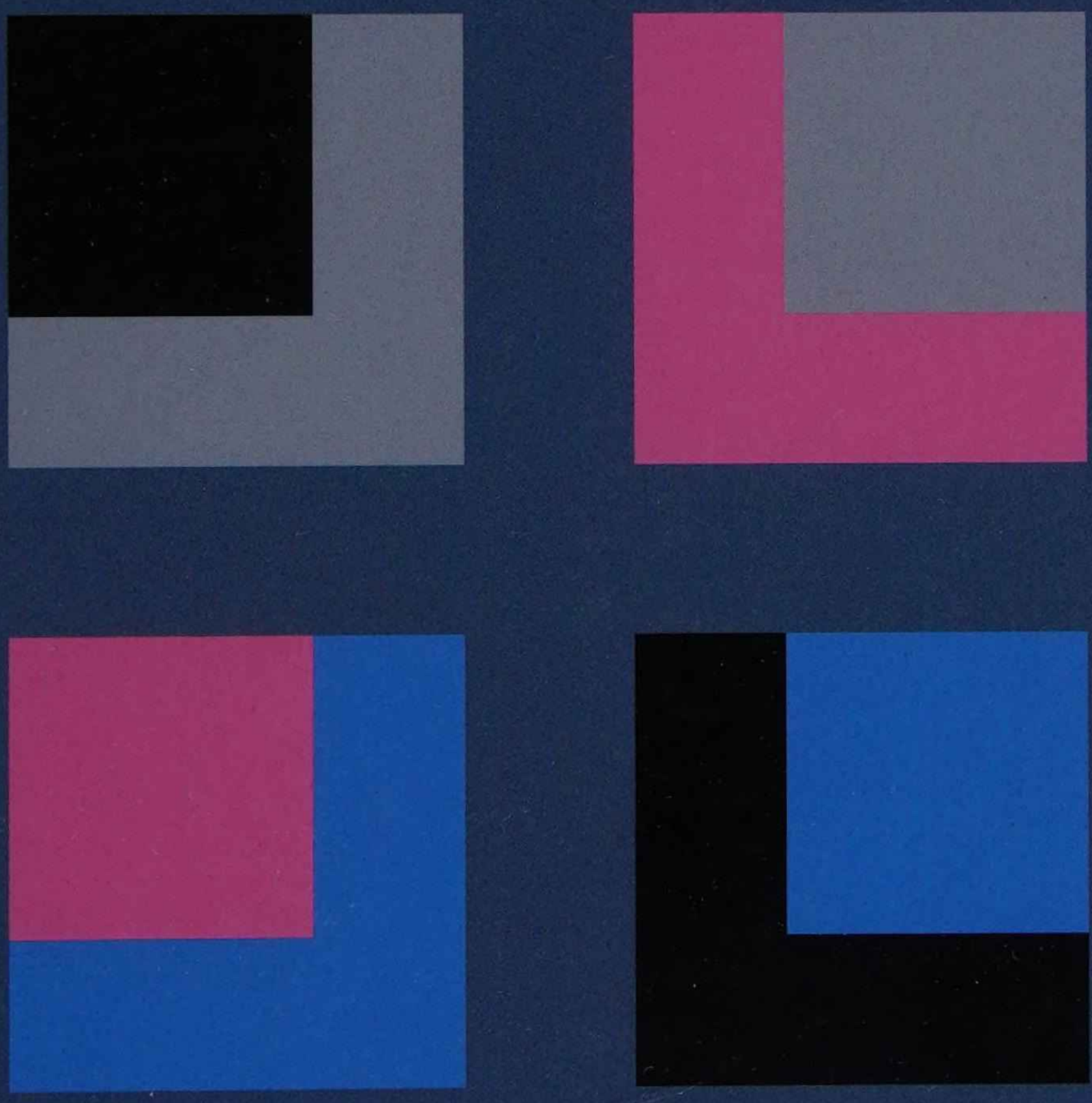
# The Intersubjective Mirror in Infant Learning and Evolution of Speech

Stein Bråten



Advances in Consciousness Research 76

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**Volume 76**

The Intersubjective Mirror in Infant Learning and Evolution of Speech
by Stein Bråten

# The Intersubjective Mirror in Infant Learning and Evolution of Speech

Stein Bråten
University of Oslo

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*To Else and to our children and grandchildren*

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# Preface (with acknowledgments)

In the last three decades or so a number of findings have contributed to a paradigmatic shift in our understanding of the nature, neurosocial support and cultural nurture of human capacities in early infancy and children's steps to speech. This has also invited questions about the sociocultural evolution and phylogenetic origins of prespeech and proto-conversation: When and how may precursory spoken languages have emerged? What can computer simulations of language evolution tell us, and what may we learn from primate studies? How is it that infants so soon after birth become so efficient in their speech perception and sociocultural learning? What is the path from infant imitation and simulation of body movements to children's absorption in narratives and reading of other minds?

In the present book on the evolution and development of (pre)verbal intersubjectivity, replies are offered in the light of recent infancy research and the mirror neurons discovery, studies of early speech perception, comparative primate studies, computer simulations of language evolution and imitation, and an early model of simulation of mind in conversation partners.

Laying out the background for questions about phylogeny and findings on ontogeny, Part I begins by pointing out the curious co-incidence that about the same time – 1921, 1922, 1923 – three seminal thinkers raised somewhat related questions about the nature of language and our relation to the world and others in it, while coming out with replies that differed. They were Martin Buber, George Herbert Mead, and Ludwig Wittgenstein. Complementing one another, they point in other directions than the seminal contributions by Freud and Piaget which were also published in the first quarter of the last century. The latter came to dominate the view of children's nature until almost the turn of the century when empirical infancy research and the mirror neurons discovery came to invite a paradigmatic shift. For example, infant learning by (m)other-centred participation which may be observed in human infancy and is probably backed up by a mirror system enabling such perceptual reversal, illustrates the very reverse of the egocentricity attributed as point of departure for child development by Piagetian traditions. While infant capacities for such learning by imitation, to be specified in Part III, are dependent upon cultural nurture, they suggest an innate foundation in the form of an adapted resonating system afforded by phylogeny and sociocultural evolution.

The discovery of "mirror neurons" (Fadiga et al. 1995; Rizzolatti & Arbib 1998) indicates that in the neurobiology of the primate brain there appears to be a ground for systems that could have lent themselves to such an adaptation: mirror

systems in humans that could support infant learning by virtual participation in the sound-producing gestures afforded by members of the speech community. This may be precursory of co-articulation later in ontogeny, for example, when two teenagers complete one another's utterances from participant perception of what the other is about to say. This is accounted for in terms of an early model of simulation of mind in conversation partners (Bråten 1973a, 1974), introduced in Part I and returned to in Part III. Action understanding from the evoked matching observation/execution discharge in the observer, has been pointed to by the discoverers of mirror neurons as a main function of a particular class of premotor neurons. Having provided evidence of a mirror neurons observation/execution matching system in the human brain, they point out that such a system may serve as a basis of inter-individual relations, including imitative behaviour and social motor learning (cf. Fadiga & Gallese 1997; Gallese *et al.* 1996; Rizzolatti *et al.* 1999, 2000, 2002, 2006). The discoverers have demonstrated inter alia that muscle activation in human observers reflecting the kind of motoric act that is being observed indicates the extent of the mirror system resonance evoked. Gallese and Goldman (1998) indicate that such a resonant mirror systems capacity may afford a precursory path to mental simulation of other minds. Rizzolatti and Arbib (1998) suggest that such a resonant mirror system could serve as the basis of inter-individual gestural communication, including phonetic gestures and, hence, play a role in the phylogenesis of speech. The issue of how such a resonant mirror system for virtual participation in other's activity may have been adapted in hominid phylogeny to subserve reciprocal interaction and understanding, was actualized by this discovery of 'mirror neurons' and independently by the identification of infant altercentricity (Bråten 1997a, 1998a). At the Delmenhorst symposium in 2000, organized by Gallese and Stamenov, the evolutionary implications for brain and language were pursued, including this question:

> (Q) In which epoch of hominid evolution would an adapted resonant mirror system enabling distant learning by virtual participation in the activity of adult models have afforded the most critical selective advantage?
>
> (Bråten 2002:274)

A speculative reply is ventured in part II, partly based on my comparative observations of infant-adult interaction in humans and in chimpanzees. In the latter connection I am indebted to Edward Moseid and Kristiansand Zoo and Wildlife Park (in the Southern Part of Norway) for opening their doors for my observations of chimpanzee and offspring interaction. My observations began in 1992 when one of the chimpanzee mothers there saved her previously near-rejected infant from suffocation and after that became a holding mother in Winnicott's sense. This is recounted in Chapter 5, and as illustrated there, I have records not

just of infants clinging to their mothers, but of offspring carrying their younger siblings, when allowed by the watching mother. It is striking how the infant, clinging to the mother's back, not only moves with her movements, but usually also adjusts the head to the mother's head direction, and thus appears to gaze in the same direction as the mother's gaze. Deprived of this advantage of protective and nurturing carrying and clinging, I submit, those hominid infants and parents who had the compensating capacity to warn and listen to warning signals and to teach and learn to cope by altercentric participation in the other, would come to have a critical selective advantage. This presupposes an adapted mirror systems allowing for perceptual reversal in face-to-face situations (which subjects with autism find difficult, returned to in Chapter 11).

We were given the opportunity to pursue such implications of the mirror neurons discovery at the symposium on "*Mirror neurons and the Evolution of Brain and Language*", in Delmenhorst, July 2000, resulting in proceedings with the same title by Stamenov and Gallese (Eds 2002). And then, proceedings of the Theory Forum symposium in Oslo, October 2004, on Foundations of (pre)verbal intersubjectivity in light of new findings, resulted in the collective volume *On Being Moved: From Mirror Neurons to Empathy* (Ed. Bråten 2007), constitute another pertinent source volume for the present book. In conjunction with the predecessor, the proceedings of the first Theory Forum symposium on *Intersubjective Communication and Emotion in Early Ontogeny* (Ed. Bråten 1998), they afford basis for much of Part III, devoted to children's steps from neonatal imitation to conversation and mind-reading.

Beginning with primary intersubjectivity as defined by Colwyn Trevarthen (1979), and the senses of self (and other) as distinguished by Daniel Stern (1985/2000), these intersubjective steps in speech acquisition and conversational development in ontogeny is outlined in Chapter 3. Here is emphasized Stern's 'staircase-logic', by which each lower layer continues to be operative and support higher-order layers. This is the same logic that we apply in distinguishing the steps from primary to higher order tertiary intersubjectivity in ontogeny (Bråten & Trevarthen 1994/2000, 2007). They permit a halting comparison with the cultural transitions in evolution as posited by Donald (1991), giving rise to questions about phylogeny pursued in Part II.

Chapter 4 opens with questions about language evolution and phylogenesis of imitative learning, and with descriptions of a number of connectionist models and computer simulation runs by which researchers have pursued such questions in artificial conditions from a varied set of assumptions – including whether or not Darwinian assumptions about natural selection may have been at play in (pre)linguistic evolution. Some connectionist models described concern the kind of mirror neurons support and adaptation required for perception and imitation in

face-to-face situation of such apparently simple acts as observing and re-enacting arm-raising or a hand sign, and which actually require a radical frame of reference shift entailing perceptual reversal.

This pertains to the hominin infant decentration hypothesis followed up in Chapter 5, concerning a phylogenetic basis for efficient cultural learning – in particular of gestural and (pre)speech language – from examining the role that this critical difference between hominin infants and offspring of other primates may have played: While offspring of other primates can cling by own force to the body of their quadrupedal mothers and enjoy the instructive and protective advantages of thus being carried around, infants of bipedal hominin mothers deprived of this advantage in order to survive would have to critically depend on communication from a distance by gestural and sound signals mediating warning and instructions. And what is more, much of this would have to occur in face-to-face interaction.

Chapter 6 examines some episodes of prosocial behaviour in great apes and toddlers. Some significant chimpanzee episodes of helping others have been reported by Frans de Waal. In the middle of the last century Anna Freud reported with her co-researchers some beautiful examples of altruistic behaviours by toddlers in wartime nursing homes and by three-year olds rescued from Nazi concentration camps. And, then there are my documentations of 11-month-old girls who reciprocate their caregivers' spoon-feeding and even share the sweet dessert with their caregivers.

As will be turned to in detail in Chapter 8, before their first year's birthday infants are able to reciprocate the spoon-feeding to which they have been subjected, and even reveal by their mouth-movements that they take a virtual part in the other's intake of food. Such occurrences will be accounted for in terms of a 'virtual other' mechanism (Bråten 1986/1988) operating as an altercentric resonant mirror system enabling the infant to feel a virtual moving with alter's feeding movements from alter's stance, leaving the infant with a procedural memory of having been a virtual co-author of the feeding, guiding the subsequent reciprocating re-enactment. This is *learning by altercentric participation*, defined as imitational learning by Ego's virtual participation in Alter's act from Alter's stance as if Ego had been facing the same direction or been hand-guided giving rise to shared temporal *vitality (affects) contours*, reflecting the manner in which the enactment is felt to be virtually co-enacted and the feeling that directs the co-enactment, enabling circular re-enactment from procedural memory of such virtual co-enactments. The term 'vitality contours' is Daniel N. Stern's (1999) term for such jointly experienced feelings that specify the movement contour, in contrast to discrete emotions. Consistently, the procedural memory left by such virtual co-enactment is here termed 'e-motional memory' (from the root sense 'out-of-motion' and the folk sense of 'being moved by'). In face-to-face learning situations this entails sensorimotor reversal of what has been seen done by the other – entailing a shift

from the other-centred frame of reference entailing resonance with what the model has been doing, to the self-centred frame of reference required for execution of the re-enactment, i.e., a shift from altercentric to egocentric body co-ordinates.

As for my prediction that neural cells or a neural system supporting such altercentric participant perception would be discovered, an impetus was afforded by John O'Keefe at a King's College Research Centre Workshop on the perception of subjects and objects in Cambridge, September 1992. Here, referring to evidence of so called 'place cells', he raised the issue of the relation between egocentric maps and allocentric maps in animals retrieving hidden foods. In conjunction with my virtual other postulate and with Trevarthen's having posited an alteroceptive capacity in infants (as a complement to their proprioceptive capacity), here were afforded stepping stones for my later identification of altercentric participation. At the Cambridge workshop, upon my presentation of the minimal organizational prerequisites for the formation of schematic means for simulating the other, the theory of mind advocate Jean Heal asked me whether I regarded the modes of felt immediacy and simulational mediacy to be mutually exclusive. I replied then in the positive. Today, in line with the intersubjective "staircase" outlined in Figure 3.1 and specified in the Part III, I would have been more nuanced in my reply: while verbal conversation (at the second order layer of tertiary intersubjectivity) occurs in representational mediacy and may entail reflective mind-reading, it may evoke also more empathic simulation of mind. And, then, that would clearly be supported by the underlying mode of felt immediacy, operative at the layer of primary intersubjectivity.

Part III is based on findings about the child's intersubjective steps to speech and simulation of conversation partners' mind and narrative contexts, afforded inter alia by infancy research, studies of early speech perception, and studies of children's conversation, private speech, and understanding of others' (mis)understanding. The sequence of the various chapters in this part adheres to these distinctions of primary, secondary and tertiary intersubjectivity:

(I) Primary intersubjective contact in a bodily and immediate sensory manner, beginning at birth and entailing inter alia imitation, embodied simulation of movements, protodialogue, and other mutual modes of affective attunement and engagements in the mutual mode of felt immediacy. These are the topics of Chapter 7.

(II) Secondary intersubjectivity, entailing shared attention to objects brought into play and for emotional reference, and inviting learning by imitation and other-centred participation, beginning at around nine months of age. This is elaborated and illustrated in Chapter 8.

(III.1) Tertiary intersubjective understanding in verbal conversation (from around 24 months) within a shared meaning horizon that also invite fantasy play with peers, engagements with invisible companions and inner dialogues, examined in Chapter 9.

(III.2) Tertiary intersubjective understanding of second order (from 3 to 6 years) entailing meta-understanding of others' understanding by virtue of theory or simulation of other minds, seen to be played out when conversational partners complete one another's aborted statements, illustrated in Chapter 10.

When there is a biological impairment of the altercentric capacity, as turned to in Chapter 11, this is inter alia reflected in difficulties in gestural imitation in face-to-face situations. For example, when subjects with autism are asked to "Do as I do" and understand the invitation, they have difficulties in matching the model's gesture, incapable of carrying out the required perceptual mirror reversal entailed by altercentric participant perception. Simple examples are raising arms, grasp thumb, or peck-a-boo (cf. Bråten 1998a; Whiten & Brown 1998). In this connection I thank Peter Hobson for his recent acknowledgment of my explanatory prediction of perceptual mirror reversal deficit in autism which I voiced in July and August 1994, respectively in Paris and Oslo.

The question about perceptual reversal as one of the topics for future research is returned to in the concluding chapter, concerned also with how the above intersubjective steps pertain to caregiver guidance. In connection with my lecture at a Marte Meo conference in 2002 and preparation for another one at a forthcoming International Child Development Program (ICDP) event I appreciate the informative manuals and material given me, respectively, by Maria Aarts and by Karsten Hundeide, both of whom I was fortunate to meet in Bergen in the late 1980's during my stay there as an invited guest professor in cognitive science.

I owe special thanks to Giannis Kugiumutzakis for making available to me his 1983 records of neonatal imitation in Crete, pertaining not only to the subject matter of Chapter 7, but illustrating – when I show the records to audiences – how they evoke unwitting mouth-openings in many of the spectators. Kugiumutzakis demonstrates that 1-hour-old newborns can imitate facial gestures and even try to come up with a resonant response, a prolonged and unstructured /a/, after he had uttered that sound. This was in a study of 49 Crete-born babies with a mean age of 25 minutes. Not all of them attempted to imitate, and two other sounds /m/ and /ang/ emitted elicited no imitation attempts. During the exposure to the facial or vocal gestures, the majority of the neonates appears to try with an observable effort to direct their attention to the moving parts of the experimenter's face. The newborns' relatively fixed initial gaze then changes to a more selective visual exploration, and with frowning accompanying the inspection of the moving part of the model's face (Kugiumutzakis 1998:72). What many in the audience do when watching the neonate preparing to imitate his wide mouth-opening is to open their own mouth – as if virtually coming to the neonate's aid. This illustrates what Adam Smith termed 'sympathy' and what I have come to term 'altercentric participation',

such as also illustrated by some of the recorded infants when they reciprocating their feeders' feeding.

In this interdisciplinary work, then, spanning from neonatal imitation and protoconversation to conversation and mind-reading, from neurosocial support of participant perception and learning to comparative studies of chimpanzees and computer simulations of language evolution and acquisition, I draw upon participation in many different life worlds and upon seminal contributions by pioneers in many of the pertinent scientific domains.

First and foremost, I have been fortunate to share in the lifeworlds of my children, Marianne, Stein Henning, and Kristin Elisabeth, and grandchildren, Karin, Jan Andreas, Kine, Johann, and Katharina. They have all provided a rich ground for every-day life participation, as well as splendid opportunities for video recordings, for example, of 11-days' old Katharina in a dialogue-like dance at the nursing table with her mother. And, then I am exceedingly grateful to the parents who have graciously allowed me to record their 11-month-olds in spoon-feeding episodes, complying with my request to leave the spoon with porridge on the table and which invariably invites their infants to pick it up and offer it to their feeders – to the parents' delight and surprise. Records of Emilie (11 ½ month), of Thomas (11 ¾ month), and of Oda of about the same age are presented here. When Irenäs Eibl-Eibesfeldt noticed my photos of Thomas reciprocating his big sister's feeding, he supplied me with his photos of a similar episode in an Amazonas tribe, allowing me to reproduce them in a textbook (Bråten 1998c) for which I am most grateful. I also thank my former student, Helga Sigurdbjarnadottr, for writing out for me the story about her son, Haukur, and his imaginary companion, recounted and translated in Chapter 9.

In view of the interdisciplinary scope of this book in the intersection of developmental, social and neural sciences it has been my good fortune – in addition to my own studies of preverbal and verbal intersubjectivity – to be able to draw upon first-hand knowledge afforded by pioneers who have broken new research grounds in many of the pertinent fields. Most of them convened at two Theory Forum symposia on Foundations of (Pre)Verbal Intersubjectivity which I chaired in the Norwegian Academy of Science and Letters, Oslo, 1994 and 2004. In these connections I would like to thank the following institutions: the Norwegian Academy for Science and Letters, and the Centre for Advanced Study (CAS), for providing housing and financial support (including prints of pre-proceedings), and the Norwegian Research Council, and the Department of Sociology and Human Geography, University of Oslo, for providing supportive environments and necessary grants. In conjunction also with pertinent contributions to the symposium on Mirror Neurons and the Evolution of Brain and Language, organized by Vittorio Gallese and Maxim Stamenov at the Hanse Institute for Advanced

Study, Delmenhorst, where we met in July 2000, seminal contributions to the proceedings of the above symposia provide major parts of the platform for the present book.

Some sections of the book, pertaining to my computer simulations and socio-semantic model of simulation of mind in conversation partners, refer as far back as to the early 1970's. In these connections I would like to acknowledge my debt to the early training afforded by my first university professor in logics and philosophy of science, Arne Naess, and by Kristen Nygaard, one of the designers of the *Simula* language which I used in my first computer simulation models of interpersonal communication in networks and dyads in the late 1960's and early 1970's. This came to influence my simulation of mind conversation model (Chapter 10), first presented in Norwegian in a sociosemantic treatise published in 1973 by Arne Naess in his edited Problems of Philosophy series, and in English the same year at a cybernetics conference in Namur.

More than a decade later I was afforded the opportunity to present at a Gordon Research Conference on Cybernetics of Cognition (at the invitation of Heinz von Foerster and Ernst von Glasersfeld) my postulate of an inborn virtual other which later permitted the derived expectation of mirror reversal during infant learning in face-to-face situations. I owe a special thank to Lynne Murray and Colwyn Trevarthen for being the first besides myself to pursue implications of the postulate in accounting for their findings on infant intersubjectivity in perturbed and unperturbed conditions. Trevarthen later wrote:

> "The efficiency of sympathetic engagements between persons signals the ability of each to [...] 'mirror' the motivations and purposes of companions, immediately. It requires a 'virtual other' representation of the kind that Bråten (1988, 1992) has described. Infants evidently have this."
>
> (Trevarthen 1998:16).

Complementary to the proprioceptive bodily self, an inborn *virtual other* with the operational efficiency (latin: *virtus*) of an actual other, invites and permits actual others to fill its space and complement the bodily self in the same coherent circular dyadic format. Sophie Freud and Lynne Hoffmann were the first to point of the clinical implications of my postulate, and the former immediately referred me to Anna Freud's seminal reports on prosocial behaviours in wartime children, for which I am most grateful and draw upon in several chapters.

While at the Centre of Advanced Study (CAS) at the Norwegian Academy of Science and Letters in the academic year 1996–97, pursuing inter alia implications concerning altercentric perception, I was privileged to have Carolyn Edwards, Sophie Freud, Michael Heimann, Ragnar Rommetveit, and Colwyn Trevarthen joining my group and to welcome also Paul Harris, Patricia Kuhl, Andrew Meltzoff and Shigero

Nakano for a shorter period or for workshops. For assisting me there in my neurocomputational simulations of egocentric and altercentric networks in perception I thank Anders Nöklestad, and I partly drew upon a study which I did with Rune Espelid ten years earlier at the Bergen Scientific Centre IBM. In this connection I am also indebted to my colleagues and students at the Department of Cognitive Psychology, University of Bergen, in particular Kjell Raaheim and Tore Helstrup.

Some parts of this book draw upon a rough draft on child development and cognitive science implications, with the working title "Born with the Other in Mind", which I patched together in 1991 after a devastating fire in our house, preventing me from making the draft ready for publishing. Yet I sent it to a few select contacts, and I treasure the memory of Colwyn Trevarthen's and Lynne Murray's inviting me to talk in Edinburgh and Cambridge, as well as the response letter from Daniel Stern at the time congratulating me on that work for being "a major contribution". Stimulating has also been the joint one day's lecture in Odense – the H.C. Andersen town – which Stern and I were asked to give in April last year. Important for the present work has of course been his revised definitions of the beginnings of the senses of self in light of recent findings, and his extension and application of my definition of altercentric participation.

I also appreciate the many fruitful comments and questions evoked by my opening lectures at world conferences (Childwatch 2005 and OMEP 2006), by my guest lectures, and by invited seminars in Norway and abroad. Of particular importance were the invitations by Giacomo Rizzolatti and Vittorio Gallese – in recognition of my prediction and early reference to their mirror neurons discovery – to give two seminars at their University of Parma neuroscience department (June 2000 and 2001) affording valuable responses to some of my lines of inquiry pursued in the present book. Important has also been the interview of Gallese and myself by Thomas Weinholdt and Lars T. Westlye qua the editors of the brain issue of *Impuls* in 2004 on implications of the discovery.

My special thanks go to the series editor, Maxim Stamenov, for his helpful suggestions and affordance of some of the guide lines. I am also indebted to my Norwegian editor, Liv Möklebust, for valuable comments to my Norwegian textbook on The Dialogic mirror in child and language development, which serves as a basis for some portions of the present book. I wrote in the preface to that book that the University idea of affording students paths into their respective sciences or humanistic disciplines easily crumbles unless they can be offered cross-disciplinary windows to some of the research questions pursued in the intersections and cutting edges of the various disciplines. Perhaps coming to serve as a supplement to disciplinary textbooks, the present book offers some cross-disciplinary windows to pre-verbal and verbal intersubjectivity and its mirror systems support in phylogeny and ontogeny.

Last, but not least, I would like to thank my wife, Else Reusch, mother and grandmother of our children and grandchildren, for contributing by drawing my attention to many of their feats, and for unfailing support and proof-reading whenever my word speller has broken down due to too many unfamiliar terms. To be on the safe side, a glossary of some new and specialized terms has been added.

*Oslo, April 13 2009*

## Note

As has been indicated above, key documentations and illustrations drawn upon in this book have been afforded by seminal contributions to three recent international symposia, respectively, in 1994, 2000, and 2004. The first and the third one took place in Oslo, Norway; the second in Delmenhorst, Germany. They resulted in these proceedings constituting key collective source volumes for the present book:

1. *Intersubjective Communication and Emotion in Early Ontogeny* (Ed. S. Bråten), Cambridge University Press 1998/2006;
2. *Mirror Neurons and the Evolution of Brain and Language* (Eds M. Stamenov & V. Gallese), John Benjamins Publishing Company 2002; and finally
3. *On Being Moved: From Mirror Neurons to Empathy* (Ed. S. Bråten), John Benjamins Publishing Company 2007.

In addition, the following sourcebooks deserve to be especially mentioned: Daniel Stern: *The Interpersonal World of the Infant* (Basic Books 2000/Karnac 2003, including his introduction to this paperback edition (pp. xi-xxxix); Daniel Stern: *The Present Moment in Psychotherapy and Everyday Life* (Norton 2004), in particular Chapter 5 (pp. 75–96) and the glossary (pp. 242-247); C. Knight, M. Studdert-Kennedy & J.R. Hurford (Eds) *The Evolutionary Emergence of Language* (Cambridge University Press 2000). And from my hand the sociosemantic treatise which anticipated the simulation version of the theory-of-mind approach in psychology and philosophy – Stein Bråten: *Tegnbehandling og meningsutveksling* (Scandinavian University Books/Universitetsforlaget 1973).

PART I

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CHAPTER 1

# From the last century history of ideas on children's nature and intersubjectivity

The conceptions of infants' nature as asocial and egocentric that came to dominate much of the last century's views of the point of departure for child development were advanced by Sigmund Freud and Jean Piaget in the first quarter of the last century. In the beginning of the 1920's, however, three seminal publication events occurring in philosophy pointed in other directions and offered divergent and pertinent perspectives on language, conversation and dialogue. First, in 1921 Ludwig Wittgenstein (1889–1951) publishes his treatise "*Tractatus logico-philophicus*" which came to serve as a partly modified point of departure for his later philosophical investigations of language, including children's path to and understanding of language. The following year, on another continent, George Herbert Mead (1863–1931) publishes an article in *The Journal of Philosophy* offering an account of the significant symbol, and presenting aspects of his philosophy of conversation and social psychology of perspective-taking which later came to be termed "symbolic interactionism". These two seminal thinkers share the fate that the numerous volumes that later came to be published in their names appeared posthumously, attesting to their lasting standing and influence. The third seminal thinker who appeared on the contemporary scene was Martin Buber (1878–1965), who in 1923 published his "*Ich und Du*", presenting in a succinct – almost poetic – form his radical philosophy of the I-You dialogue, claiming that in the beginning is the relation and that the 'inborn you' is realized in the You encountered by the child.

In a profound manner their respective works, while partly inconsistent, stemming from different frames of reference and pointing in different directions, offer complementary insights that are critical and pertinent to our present understanding of conversational understanding and, hence, to a topic of the present volume. Both Buber and Wittgenstein, opening their respective books with statements about the world, take a phenomenological stance and, in their different perspectives, insist on immediacy. To Buber, nothing intervenes between I and Thou in the dialogical I-Thou unit, it is immediate, unlike the I-It relations mediated by means and ends, by concepts and instrumental concerns. Unlike Buber, Wittgenstein later refuses to recognize the existence of any 'I', even in the relational senses defined by Buber.

After a succinct presentation of some of their ideas we turn to seminal contributions by the two ground-breaking thinkers, Freud (1911) and Piaget (1926), who for a long time came to dominate the prevailing conceptions of children's nature and whose model monopoly came to invite expert advices that sometimes contradicted what parents and care-persons felt to be experiencing in relations to their infant children.

## On Buber's distinction of I-You and I-It relations

In 1843 a work was published that held the promise of the coming of a paradigmatic shift in relation to predominant notions of an isolated mind, whether it be the Cartesian thinking I, revealed by 'cogito, ergo sum', or the Leibnizian monadic subject "without windows" to others, except as mediated by God's pre-established harmony. In this work, Feuerbach (1843) puts forth his theses about the I-You relation as essential in human belief and understanding, The essence of the human being is contained only in the union of human beings, anchored in the distinction of I and You. True dialectics is not found in the individual thinker's thinking with himself or herself, but in the dialogue between I and You. This is marked by Buber (1965) to be a Copernican revolution in the thinking of thought as a predicate of the human subject. To Feuerbach (1843:§ 62) this union of Man with Man is a divine union: "the union of I and Thou is God." While holding that both the I-You relation to God and the I-You relation to fellow man share the same basic relational character, Buber saw as a central concern to maintain the autonomous domain of the I-You relation.

In his essay "What is Man?", Buber (1938) turns to existentialist philosophy. In the philosophy of Kierkegaard (regarded also by Wittgenstein to be the eminent thinker of his century) a distinction is made between the immediate and mediate to which Buber came to adhere. He finds a definition of the essence of man and the notion of the individual as being open to the other. While for Kierkegaard that entailed mostly to be open to God, Buber came to include even Nature as a relatum in I-You relations. In "Either-Or" Kierkegaard (1843/1981:223–25) had compared the longing of the mystic for union with God to the daily longing of two lovers for the moment in which they may "breath out their love for one another and letting their souls melt together in a slow whisper." Buber finds such openness for the Other to be completely lacking in Heidegger's philosophy; the essential of the human union with the other appears to escape; the other resembles more the kind of objects which are encountered by being in the world. Heidegger's individual or self appears to Buber (1965:171) to be a closed system, devoid of the union of Man with Man which Feuerbach had disclosed.

Buber accepts a call to a chair in social philosophy in Jerusalem, fifteen years after he had published *Ich und Du*, which he began in 1916. According to his own postscript it was written "under the spell of an irresistible enthusiasm," and "impelled by an inner necessity" (Buber 1970:25, 171). When opening that slim volume to its first page, the reader may feel that almost poetic force in some of the first lines of declaration – whether they be read in German or in English, as translated by Walter Kaufmann. After the declaration that basic words when being spoken establish a mode of existence follows this qualification:

> "Basic words are spoken with one's being.
> When one says You, the I of the word pair I-You is said, too.
> When one says It, the I of the word-pair I-It is said, too.
> The basic word I-You can only be spoken with one's whole being.
> The basic word I-It can never be spoken with one's whole being."
>
> (Buber 1923/1970:53–54)

A defining characteristic of the I-It relation is the way in which others are made into objects for scrutiny and reflective analysis; mediated by concepts and means-ends concerns they are related to and processed as detached objects in time, in terms of before and after. This is the mediate (*mittelbare*) mode of partial relations, essentially different from relating with one's whole being in an immediate (*unmittelbare*) manner in an I-You union, entailing a reciprocity that embraces You and I – in which no means-end concerns, no conceptions of time or instruments intervenes. And when I say You in such a union I do not just say the word with my tongue and voice, but with my whole being, opening for I-You dialogue in this immediate and mutually fulfilling relation.

## In the beginning is the relation: Language in "primitive" cultures

In the beginning is the relation (*die Beziehung*), Buber (1923/1958:20) claims, not the word, not the object, not any isolated mind or individual, but the relationship. Take languages of so-called "primitive" people whose forms of life depend less on objects than on acts felt in their immediate presence. The core terms of such a language, in their primal pre-grammatical forms, tend to designate the wholeness of a relation, a lived relationship of the original unifying relation, not the abstracted term as a product of analysis and reflection:

> "We say, "far away" (in German: "weit fort"; the Zulu has a sentence-word instead that means: "where one cries, 'mother, I am lost.'" And the Fugian surpasses our analytical wisdom with a sentence-word of seven syllables that literally means: "they look at each other, each waiting for the other to offer to do that which both desire but neither wishes to do." In this wholeness persons are still embedded like reliefs..."
>
> (Buber 1923/1970:69–70).

> What counts here is the way these sentence-words reflect the genuine original unity, the lived relationship. One may assume, Buber suggests, that relation concepts, and also conceptions of persons and things, have crystallized out of notions of processes of relation and states of relations and, thus, that the relational character of beings makes itself felt from the beginning and continues to be effective for a long time. Gradually, this would come to be reflected also when the primitive man, still in an unformed manner, would come to speak the basic relational word *I-You* even when he has not yet recognized himself as an I. One cannot find any notion of the experiencing subject or any '*cogito ergo sum*' even in the primitive function of cognition of the most naïve kind. And the original drive for self-preservation does not entail any I. It is the body, not any I, that wants to propagate itself by making for example tools. The I only emerge as an element from primal encounters when the vital relational words of I-acting-with-You (*Ich-wirkend-Du*) and You-acting-with-I (*Du-wirkend-Ich*) have been split and the particle reified and hypostatized. The basic word I-It, the other basic relational word in Buber's primary distinction, is made possible only by this recognition, by the detachment of the I. (Buber 1923/1970:73).

## In the beginning is the relation: The domain of child development

Even if we were to fully grasp the life of people in early human development we would only be afforded brief glimpses of the temporal genesis of the two basic word-pairs, Buber points out, while children's life offers more complete insight. His dictum, in the beginning is the relation, applies to the point of departure for child development. Even before birth there is in the womb a pure natural relation of bodily reciprocity, in which the life horizon of the infant to be born is uniquely inscribed in the carrying mother to become and, more than that; it appears as a primeval inscription. Buber (1923:26) refers to a pertinent saying in Jewish myth: "*im Mutterleib wisse der Mensch das All, in der Geburt vergesse er es*" (in the mother's womb man knows it all, at birth it is forgotten). And every developing child rests, like all becoming beings, in the "womb of the great mother – the undifferentiated, not yet formed primal world" (*Urwelt*) (Buber 1923/1970:76). While we may live in such a state during a night's sleep and detach ourselves in the morning to enter a personal life, our detachment is not sudden and catastrophic like for the newborn out of the bodily mother. The newborn is afforded some time, then, to replace the natural relational bond with a mental relational bond, while beginning to gain its world by seeing, listening, feeling and forming, while the originality of the longing for relation has maintained itself even in the earliest and dimmest stage. Unlike Freud, Buber appears to have realized that the infant's first priority is not that of nourishment, but of

seeking to establish relationship; there is an inborn readiness for realizing the longing for relation:

> "at times when there is obviously no desire for nourishment, soft projections of the hands reach, aimlessly to all appearances [...] towards the indefinite. [...] this motion will gain its sensuous form and definiteness in contact with a shaggy toy bear and eventually apprehend lovingly and unforgettably a complete body [...] it is the drive to turn everything into a You [...] Little inarticulate sounds still ring out senselessly and persistently into the nothing; but one day they will have turned imperceptibly into a conversation – with what? Perhaps with a bubbling tea kettle, but into a conversation. Many a motion that is called reflex is a sturdy trowel for the person building up his world."
>
> (Buber 1923/1970:77–78).

It is not as if the infant first sees an object and then establish a relationship with it. What is primary is rather the longing for relation, Buber emphasizes. The genesis of the thing-like object is a late product emerging out of the split of the primal encounters, when bounded partners are separated. For in the beginning is the relation – as a readiness to reach out to be filled, "the a priori of relation; the innate You." And this inborn You is realized in the You that the child encounters, coming to the fore quite soon, in a drive reaching for reciprocity.

The immediate I-You reciprocity of Buber has been questioned by Levinas (1999:103–106), who speaks of alterity in an asymmetric manner of the way of being for the other as something dreadful, entailing being a hostage, responsible for the wrong-doing of the other. Another traumatic aspect of intersubjectivity which may give rise to vicious circles of re-enactment is this: The child's capacity for participant perception may come to compel a child victim of abuse, before defence mechanisms set in, to virtually participate in the abuser's doings, leaving an 'e-motional' memory that may invite circular re-enactments later in life (Bråten 1999).

## Mead's social philosophy as a basis for understanding symbolic interaction

The year before Buber published *Ich und Du*, George Herbert Mead (1922) offers his account of the significant symbol in *The Journal of Philosophy*. Here he gives a succinct account of the comprehensive social psychology and philosophy he had been developing since the beginning of the century. This he had expressed in a series of lectures in social psychology at the University of Chicago, developing principles which later came to be termed "symbolic interactionism". As basic to human social organization, he voiced this claim: Communication involves participation in the other, entailing identification of the other with the self (Mead 1934:253). We are continually arousing in ourselves those responses which we call

out in other persons by our gestures, and especially, by our vocal gestures. By calling out in the other something we are calling out in ourselves, we are unconsciously putting ourselves in the place of others and acting as others act. For example, you may ask another person to bring up a chair and before the other has had time to react you may come to bring up the chair yourself. Thus, Mead points out, in this way you find in yourself the same tendency which the other person is being asked to carry out. Your request stirred up in you that same response which you stirred up in the other person. If we were to ask for a neurophysiological account, Mead replies that we ordinarily would have to assume a certain group of centres in the nervous system which are connected with each other and which express themselves in the action:

> "The complications are very great, but the central nervous system has an almost infinite number of elements in it, and they can be organized not only in spatial connection with each other, but also from a temporal standpoint. In virtue of this last fact, our conduct is made up of series of steps which follow each other, and the later steps may be already started and influence the earlier ones."
>
> (Mead 1934:70–71).

## When a vocal gesture becomes a significant symbol

What is special about a vocal stimulus, Mead held, lies in the fact that the vocalizer can hear what he or she is saying and, in so hearing, tends to respond as the other person responds to what is being said. If we exclude vocal gestures, or sign language of the hands, it is only by the use of mirror that one can reach the position in which one reacts to own gestures as other people respond, for example, the way an actor may be using a mirror to check whether his facial gestures may be adequate expressions in the context of the play for which he or she is preparing. No artificial mirror is needed in the case of vocal gestures or sign language of the hands. In the latter case, one sees oneself using the gestures which those who are deaf may be using, Of course, Mead points out, the same is true of any form of script, but according to him such modes have all been developed out of the specific vocal gesture, "for that is the basic gesture which does influence the individual as it influences others. Where it does not become significant is in the vocalization of two birds. Nevertheless, the same type of process is present, the stimulus of the one bird tending to call out the response in another bird which it tends to call out, however slightly, in the bird itself." (Mead 1934:67–68).

So, what does it take for the gesture to become a significant symbol? Springing from a social matrix, gestures are always found to inhere in or involve a larger social act of which they are phases, Mead points out. Their earliest origin lies in the

unconscious conversation of gestures. Conversation of gestures become conscious when gestures become signs, that is, when

> "[gestures] come to carry for the individuals making them and the individuals responding to them, definite meanings or significations in terms of the subsequent behaviour of the individuals making them; so that, by serving as prior indications, to the individuals responding to them, of the subsequent behaviour of the individuals making them, they make possible the mutual adjustment of the various individual components of the social act to one another, and also, by calling forth in the individuals making them the same responses implicitly that they call forth explicitly in the individuals to whom they are made, they render possible the rise of self-consciousness in connection with this mutual adjustment"
>
> (Mead 1934:69n).

It is the relationship of a vocal gesture as a symbol to such a set of responses in the individual who makes the gesture, as well as in the other explicitly responding to it, that makes of that vocal gesture what Mead calls a "significant symbol":

> "A symbol does tend to call out in the individual a group of reactions such that it calls out in the other, but there is something further that is involved in its being a significant symbol: this response within one's self to such a word as "chair" or "dog" is one which is a stimulus to the individual as well as a response. This is what, of course, is involved in what we term the meaning of a thing, or its significance."
>
> (Mead 1934:71–72).

Now, Mead's identification of the way in which we call up in ourselves the other's response to the verbal act we are in the process of producing, may also, with some modification, be applied to preverbal domains. As we shall see, when for example the caregiver in the process of feeding the other opens his or her mouth as the spoonful of food is offered to the other's mouth in the process of opening to the food, this could be described in Mead's terms: the caregiver calls up in himself or herself the receiving mouth response of the recipient, and in this case we may add: this calling up of the other's response is even manifested in a way for others to see: the feeder opens his or her own mouth in the process of affording food. Mead's term 'perspective-taking' does not quite suffice to designate the evoked bodily movements involved in such a phenomenon. It entails what will be referred to as altercentric participation; that is, properly or virtually moving with the other's move from the other's stance, as if sharing the other's bodily centre when calling up the response in oneself. As we shall see, now even the neurophysiological system appearing to support such feats may partly be described in terms of the so-called "mirror system" discovered by Rizzolatti and his co-researchers (cf. Rizzolatti & Arbib 1998; Stamenov & Gallese (Eds) 2002).

## Wittgenstein on meaning, language games and children's language learning

It may appear strange to include Wittgenstein in a chapter devoted also to Buber and Mead. Unlike their concern with inclusion of actual others, respectively in the I-You union or through perspective-taking by virtue of taking the other's attitude, Wittgenstein (1921) has been attributed in his *Tractatus* to almost take a kind of solipsistic stance. But later he came to emphasize linguistic meaning to emerge from usage in interplay contexts.

In the Cambridge milieu, *Tractatus* came to create a stir and invite an interpretation with which he himself differed, namely that statements about the world could be reduced to elementary-logical formulations and operations. His concluding declaration about that which cannot be clearly stated had to be silenced was taken to support a program for logical-positivist reduction. And his claim about the unity of ethics and aesthetics, which cannot be expressed, only shown, was ignored, apparently in line with his declaration in the preface about that we can speak, we can speak clearly, while we have to be silent about that which we cannot speak about (Wittgenstein 1921:7). But as pointed out by Janik and Toulmin (1973:216–27, 219), we ought to appreciate that to Wittgenstein "the unsayable alone has genuine value" and that the ethical and aesthetical which cannot be stated but may be shown, are the essentials.

Thereby, Wittgenstein declares a kind of duality or complementarity, albeit of another kind than that which Buber declared. Both were probably indebted to Kierkegaard's ideas in *Either-Or* about the immediate versus the mediate. But while Buber maintained the immediacy of the I-You union, neither 'You', nor 'I', and certainly not any I-You relation is of any concern to Wittgenstein. While he conceived of reality as consisting of phenomenological objects, including his own body or the bodies of other people, he held that the immediate experience afforded by such objects could not be transcended (cf. Cook 1994:104–108). In his *Tractatus*, he viewed ordinary language as a phenomenological language, allowing for truth-functional propositions that can be analyzed in terms of explicit phenomenological propositions. Later, in his "methodological reassessment" he restricted his phenomenological claim: ordinary language propositions do not refer to entities that transcend sense-data (Cook 1994:104–108). Moreover, he no longer held his picture theory implying that the pictorial character of a proposition entails an agreement in form. While according to *Tractatus* propositions could have sense by picturing the world by virtue of a hidden logical form, Wittgenstein later, in his *Philosophical Investigations* (PI), declared this to be an error when developing a usage theory of meaning:

> "Every sign *by itself* seems dead. *What* gives it life? – In use it is *alive*."
>
> (PI:§ 432)

## How language comes alive for children

As we shall see, Wittgenstein had a lot to say about how language comes alive to children in their acquisition of language, not by evoking images, nor by their holding pictures of word meanings in their head, but by the way in which they hear words being used. Almost as if they were listening to a piece of music, they learn to grasp what is going on in order to make use of it even though they are unable to answer the strange question about what is the meaning of a given word. Such a question would not be posed about a piece of music, so why should it about language in use? Thus, Augustine's account of his own entry into language would have to be qualified, even partly rejected:

> When they (my elders) named some object, and accordingly moved towards something, I saw this and grasped that the thing was called by the sound they uttered when they meant to point it out. Their intention was shown by their bodily movements, as it were the natural language of all peoples: the expression of the face, the play of the eyes, the movements of other parts of the body, and the tone of the voice which expresses our state of mind in seeking, having, rejecting, or avoiding something. Thus, as I heard words repeatedly used in their proper places in various sentences, I gradually learnt to understand what objects they signified; and after I had trained my mouth to form those signs, I used them to express my own wishes
>
> (Augustine's *Confessions*: 1.8. (translated by Anscombe in PI 1967:2n)).

The first paragraph of *Philosophical Investigations* (PI:§ 1) is opened by the above quoted childhood recollection by St. Augustine, and used by Wittgenstein to illustrate a particular view of language and world meanings which he qualifies as partly a misconception: He questions the presentation of all words as names, and the meanings of words as objects and as point of contact with extra-linguistic reality (cf. Hacker 1996:327). If language acquisition is seen the way in which St. Augustine describes it, primarily in terms of nouns like "table", "chair", and "bread", we are invited to entertain the following idea: Every word has a meaning, correlated with the word and which is the object for which the word stands. Instead Wittgenstein invites us to think of language by way of this example: someone is sent shopping, given a slip marked "five red apples". In the shop, the drawer marked "apples" is opened containing colour samples matching the label "red", and for each of the numbers in the series of cardinal numbers up to five, one red sample after the other is taken out of the drawer.

> "It is in this and similar ways that one operates with words. – "But how does he know where and how he is to look up the word 'red' and what he is to do with the word 'five'? – Well, I assume that he *acts* as I have described. Explanations come to end somewhere. – But what is the meaning of the word "five"? – No such thing was in question here, only how the word "five" is used."
>
> (Wittgenstein PI:§ 1).

In this way Wittgenstein introduces his theory of meaning: to ask for the meaning of words is to ask about how they are used. If we were talking about colour shades which not everyone knew how to name I could say "I know what this colour is called", but it is not easy to say when the child knows which colour is meant by the word "blue". But what does it takes for a child to ask for the name of a colour? The child must learn to use the colour names before it can ask for the name of the colour, and such usage presupposes the child's ability to participate in language games.

Wittgenstein declares that with the term 'language game' he means to emphasize that the speaking of language is part of an activity or a form of life. He lists a number of examples, such as: Giving and obeying orders, reporting an event or voicing an assumption about it, inventing or predicting a story, making a joke, translating from one language to another, asking, thanking, cursing, greeting, praying (PI:§ 23). He even uses the term 'language game' for the whole, consisting of language and the activities into which it is woven ("*das Ganze: der Sprache und der Tãtigkeiten, mit denen sie verwoben ist*") (PI:§ 7). This includes the processes by which children learn to use their native language, such as the process of learning how to use the colour 'red' or repeating words for colour as used by someone else by virtue of becoming language games participants.

## On Buber, Mead and Wittgenstein transcending Leibnizian monads

What lessons, then, may we draw about the workings of the mind and language in social interaction and developmental contexts from these three seminal thinkers – each of them arising from and referring to different philosophical and cultural traditions? Five pertinent points of relevance to the present inquiry may be succinctly listed.

First, Buber's dictum, in the beginning is the relation, invites us to be open to the possibility that relational and reciprocal characteristics, which we usually attribute to verbal conversation, may also be found in the forms of more primitive dialogues involving the preverbal mind. And here Mead enters the picture with his distinction of conversation by gestures, and by his insistence of the a priori of the interpersonal and his refusal to view the developing mind as a monad locked in a cell, limited by the boundaries of the skin.

Second, both Buber and Mead emphasize the experiential and essential part played by the Other in the workings of the developing mind. While to Mead interplay with significant others comes to give rise to generalized others in a mediate sense that allows for perspective-taking, Buber stresses the immediate manner in which the innate You is realized in the You the child comes to encounter. There is a readiness in the infant to reach out to be filled by the actual other by virtue of the a priori of

relation which Buber terms the "innate You", inviting comparison with the postulate of the inborn "virtual other" (Bråten 1988, 1992a; Bråten & Trevarthen 1994/2000; Trevarthen 1998).

Third, when Wittgenstein stresses the use of words in the social context of language games, this is consistent with Mead's point that when gestures become a significant symbol they spring from a social matrix and are always found to inhere in or involve a larger social act of which they are phases.

Fourth, Wittgenstein's advice in *Philosophical Investigations* that we should not ask about words' meaning, but rather notice how words are used in terms of language game behaviours, has far-reaching implications when seen in conjunction with Mead's account of significance in terms of perspective-taking. This concerns the way in which we, when making an utterance, call up in ourselves the other's response to what we are saying, and how our saying or gesture acquires significance by virtue of our own reacting to what we do by virtually placing ourselves in the shoes of the listener. When complemented by what we have found listeners and viewers to be capable of, namely to co-articulate and take a virtual part in the production of the gestural or speech act that is being attended, Mead's operational definition of the sociability to take the other's stance in responding to what ourselves are doing may even be extended and applied to contexts of care-giving and altruistic acts (albeit not in the focus of Mead or Wittgenstein).

Fifth, Wittgenstein's draws attention to what is phenomenologically given by bodily behaviour and movements, seeking to avoid the traps of Cartesian dualism, while Buber replaces the mind-body dichotomy with another distinction: between the immediacy of the I-You union, and the mediate I-It relation in which even the other person becomes an object for reflection and means-end concern. While Mead's world of relations is mostly of the latter kind, in which others are incorporated in such a reflective and generalized sense, he recognizes what he terms "conversation of gestures" in a pre-symbolic and more immediate sense (cf. Mead 1934:61).

Thus, in the first quarter of the last century these three penetrating and path-finding philosophers published contributions that have served to redefine the ways in which we think about the nature of human relations and language. Even though they have pulled and pointed our orientations in mutually inconsistent and complementary directions, they have changed our horizon for posing questions about the foundations of conversation. Mead spoke of perspective-taking, Wittgenstein insisted upon what is immediately given and came later to speak about language games as forms of life, and Buber introduced the primary distinction between I-You and I-It relations. All three extend the boundaries which are usually drawn in attempts to define the human mind, and offer alternatives to Leibnizian monads and Cartesian dualism, inviting us instead to consider live ecological and relational contexts and situations of interaction.

## From Leibnizian monads to Piaget's self-regulative mental structures

Mead offers such an account of the I and Me arising as aspects of the Self as a process through the infant's encounter with significant others. But unlike Buber's immediate I-You reciprocity, this account brings Mead into a mediate present that involves the mediation of the generalized other. The child acquires the symbolic keys to such mediate intersubjectivity through playing and gaming with significant others. But how does the initial pre-understanding of the other in an immediate sense come about, required for this subsequent genesis of mediate understanding through the generalized other?

A reply to the above question is offered in this book which supplements Mead's view by attributing to the young developing mind an innate companion space with a virtual other by virtue of which such an immediate pre-understanding of the actual other can come about (Bråten 1988, 1992a). The account of protoconversation offered in Chapter 7 entails a reply also to a question that Leibnizians of our times have a hard time to deal with (cf. Maturana & Varela 1980), namely: if conceived as monads, how can two subjects or actors engage in intersubjective relations of interaction in mutual attunement? Leibniz' monads were in attunement by virtue of God's pre-established harmony. In modern versions communication and consistent behaviours arise through the mediation of internalized language and norms of a common culture. But such internalization of means for mediate understanding presupposes an initial immediate pre-understanding during the socializing events of interaction through which the means can be acquired in the first place. Accounts of how subjects can achieve intersubjectivity by virtue of shared acquired means of understanding call upon an account of how subjects in the first place are able to engage in mutual immediate understanding.

While Descartes uses the predicate cogito to infer that the thinking subject exists as a monadic ego, Leibniz does the reverse. To Leibniz everything is contained in the monadic subject, not in the predicate. Everything that happens to an "individual substance", or a "complete being" – past, present, and future – is already virtually included in its nature. Each monad has a certain self-sufficient autonomy, which makes them, "so to speak, incorporeal automata" (*Monadology* 9, 18, 57). An individual substance cannot be made out of two, nor can it be divided in two. There is commencement, transformation, and perishing. A substance will come about only through creation, may undergo transformation, and will perish through annihilation. Each individual substance, each monad, is the source of its own internal activity. In this way Leibniz, while denying the possibility of communication between monads, except through God's mediation, originates the idea of operational closure of cognition. It was to be followed up by Kant in his consideration of the self-organizing nature of organic purpose, and by Piaget who describes mental structures in terms of auto-regulation and finds that intelligence organizes itself by

organizing its world. The idea of the operationally closed nature of cognition can be recognized in cybernetic ideas of self-organizing systems, for example in the biological principle of autopoiesis introduced by Maturana and Varela (1980). Operational closure entails that no formative or in-formative organizational elements that are involved in the self-recreation of the system comes from the outside of the system. It is able to recreate itself and maintain stability through the recursive operations of its own elements constituting the system and its boundary – even when transforming itself from less to more complex states of organization.

This means that an operationally closed system is closed with regard to its self-reproducing mechanisms that maintain its organization, or, as Piaget would say, its structure. Piaget describes mentality structures to be self-regulative in this double sense: First, their compositions do not go outside their own boundaries. Second, they do not make any appeal to anything outside the boundaries. In other respects they are open, interwoven as they are in domains of ecological, biological, social, and personal life processes. Outside causal agents may even play the role of perturbing or destroying the system. If they were to play a formative role, however, in the maintenance of some system, this system would per definition not be a self-organizing system. That is why Piaget, for example, insists upon the process of assimilation. Only when outside elements are transformed into system-internal elements through the process of assimilation, can they play a part in the auto-regulation of the system.

In such terms Piaget could state that intelligence organizes itself by organizing its world. The account afforded in this book invites this complement: the dialogic mind organizes its world through dialoguing with the other – actual or virtual. The self-organizing dyad of the mind recreates itself across the domains of intra- and interpersonal immediate understanding, complementary to domains of mediate understanding. This is implied to occur without any fancy or linguistic mediation on the part of the young infant. The actual other fills the inner companion space in a reciprocal mode of felt immediacy, while the primary form of the dialogical maintains itself.

## From Freud's attribution to infants of 'normal autism'

This differs from Freud's (1923) tripartite distinction of mind. In his work *on the Ego and the Id,* he offers his definition of the architecture of the troubled and striving human mind in terms of ego, super-ego and id, with id adhering to a pleasure principle and ego attempting to cope with reality while bowing to the socialized normative demands of super-ego. Here he extends and elaborates upon his basic distinction of two forms of mental organization which Freud (1911) had advanced

earlier: the pleasure principle and the reality principle. In his exemplification of pure adherence to the pleasure principle Freud refers to the human infant. He posited that the mental organization of the human infant operated by virtue of the pleasure principle, and that only gradually, in the course of child development towards adolescence and adulthood did the reality principle take over. Thus, he attributed to the infant to be closed off from reality, including social reality, and resorted to metaphors to make his point. In a footnote he compared the human infant to a bird's egg, closed off from social reality by a shell, and needing only warmth and nutrition in order to grow. Borrowing the term "autistic" from Bleuler, he thus attributed to the human infant the characteristic that later came to be termed "normal autism", and which came to be reflected in psychoanalytic theory of child development, and which even was adopted by Piaget (1926), in conjunction with his own attribution of egocentricity, in his pioneering work on the language and thought of the child.

From his clinical perspective on the human mind Freud considered the infant to be dominated by the pleasure principle in an autistic-like manner before the realistic principle takes over later in ontogeny. In a footnote to his classical paper on two principles of mental functioning, Freud (1911) points out that the dominance of the pleasure principle really comes to end when the child has achieved complete detachment from his parents. And then he adds this metaphor to illustrate what it means for the baby to live only according to the pleasure principle:

> "– A neat example of a psychical system shut off from the stimuli of the external world, and able to satisfy even its nutritional requirements autistically (to use Bleuler's term) is afforded by a bird's egg with its food supply enclosed in its shell; for it, the care provided by the mother is limited to the provision of warmth."
>
> (Freud 1911, Standard Ed. XII:220n)

Elsewhere, in his paper on narcissism, when writing about "our observations and views on the mental life of children and primitive people", Freud (1914:475) uses the metaphor of the amoeba and the pseudopodia which it puts out to illustrate "the original libidinal cathexis of the ego, from which some is later given off to objects; the object-cathexes, […] which can be sent out and drawn back again." While Freud emphasizes that a unity comparable to the ego cannot exist in the individual from the beginning, the auto-erotic instincts do. At the outset the sexual instincts are attached to the satisfaction of the ego instincts, and the persons concerned with the child's feeding, care, and protection become the child's first sexual objects, i.e., in the first instance the mother or a substitute for her:

> "We say that a human being has originally two sexual objects – himself and the woman who nurses him – and in doing so we are postulating a primary narcissism in everyone, which may in some cases manifest itself in a dominating fashion in his object-choice"
>
> (Freud 1914/1989:554 in *The Freud Reader*).

In *Das Es und Ich*, Freud (1923:638–639) points out that at the very beginning object-cathexis and identification are indistinguishable from each other. Later on object-cathexes proceed from the id, which feels erotic trends as needs. As for ego's object-identifications, mother-identification and father-identification, the effects of the first identifications made in earliest childhood will be general and lasting. As for questions about human beings' higher nature, such as entailed by religion and morality, Freud replies in terms of the super ego or ego ideal:

> "here we have that higher nature, in the ego-ideal or super-ego, the representative of our relation to our parents. When we were little children we knew these higher natures, we admired them, and feared them, and later we took them into ourselves."
> (Freud 1923:643).

With respect to social feelings, Freud regards them to rest on identification with other people on the basis of having the same ego ideal. As for social sense, he saw that as having been acquired phylogenetically out of the father-complex, which he elaborated upon in his *Totem and Taboo.*

## From Piaget's attribution of an egocentric perspective

In his work on the language and thought in the child, influenced *inter alia* by psycho-analytic thinking, Piaget (1926/1959) makes these distinctions:

| | Non-communicable thought | Communicable thought |
|---|---|---|
| Undirected thought | *Autistic though* | *(Mythological thought)* |
| Directed thought | *Ego-centric thought* | *Communicated intelligence* |

(Piaget 1926/1959:45)

From his concern with the cognitive and moral development of children's minds, Piaget here attributed to the normal child autistic and egocentric modes of thought from the outset, awaiting a long period of decentration before the onset of communicative thought and the intersubjective ability to take others' perspectives. Like Freud, he referred to Bleuler's (1912) proposal about autistic thought.

As for imitation, Piaget accepts the view voiced by Janet and Baldwin, namely that early imitation entails a confusion between the I and not-I, between the activity of one's own body and that of other people's bodies:

> "At his most imitative stage, the child mimics with his whole being, identifying himself with his model. But this game, though it seems to imply an essential social attitude, really indicates one that is essentially ego-centric. The copied movements and behaviour have nothing in them to interest the child, there is no adaptation of the I to anyone else; there is a confusion by which the child does not know that he is imitating, but plays his game as though it were his own creation."
> (Piaget 1926/1959:11–12).

These points are repeated in his book on Play, Dreams and Imitation in Childhood. Even though Piaget refers to many episodes in which for example exposure to head movements invites semblant movements by infants, for him this just attests to infants' confusion of own point of view with that of the other, i.e., confusion of the other's external movements with those of the ego (Piaget 1946/1962:74). Such 'perceptual tethering', which came to be controlled for in Meltzoff's and Moore's (1977, 1989) study of neonatal imitation of head rotation, rather resembles what in the present book is considered to be manifestation of 'participant perception' but which – in contrast to the attribution of egocentrism – rather is seen to entail altercentric participation in the other.

Piaget had some trouble accounting for deferred imitation which he had observed in a 16-month-old girl, and assumed that "it must have involved some representative or pre-representative elements":

> "At 1; 4 (3) J. had a visit from a little boy of 1; 6, whom she used to see from time to time, and who, in the course of the afternoon got into a terrible temper. He screamed as he tried to get out of the play-pen and pushed it backwards, stamping his feet. J. stood watching him in amazement, never having witnessed such a scene before. The next day, she herself screamed in the play-pen and tried to move it, stamping her foot lightly several times in succession."
>
> (Piaget 1946/1962:63).

The episodes Piaget describes may perhaps have looked something like these portraits (Figure 1.1):

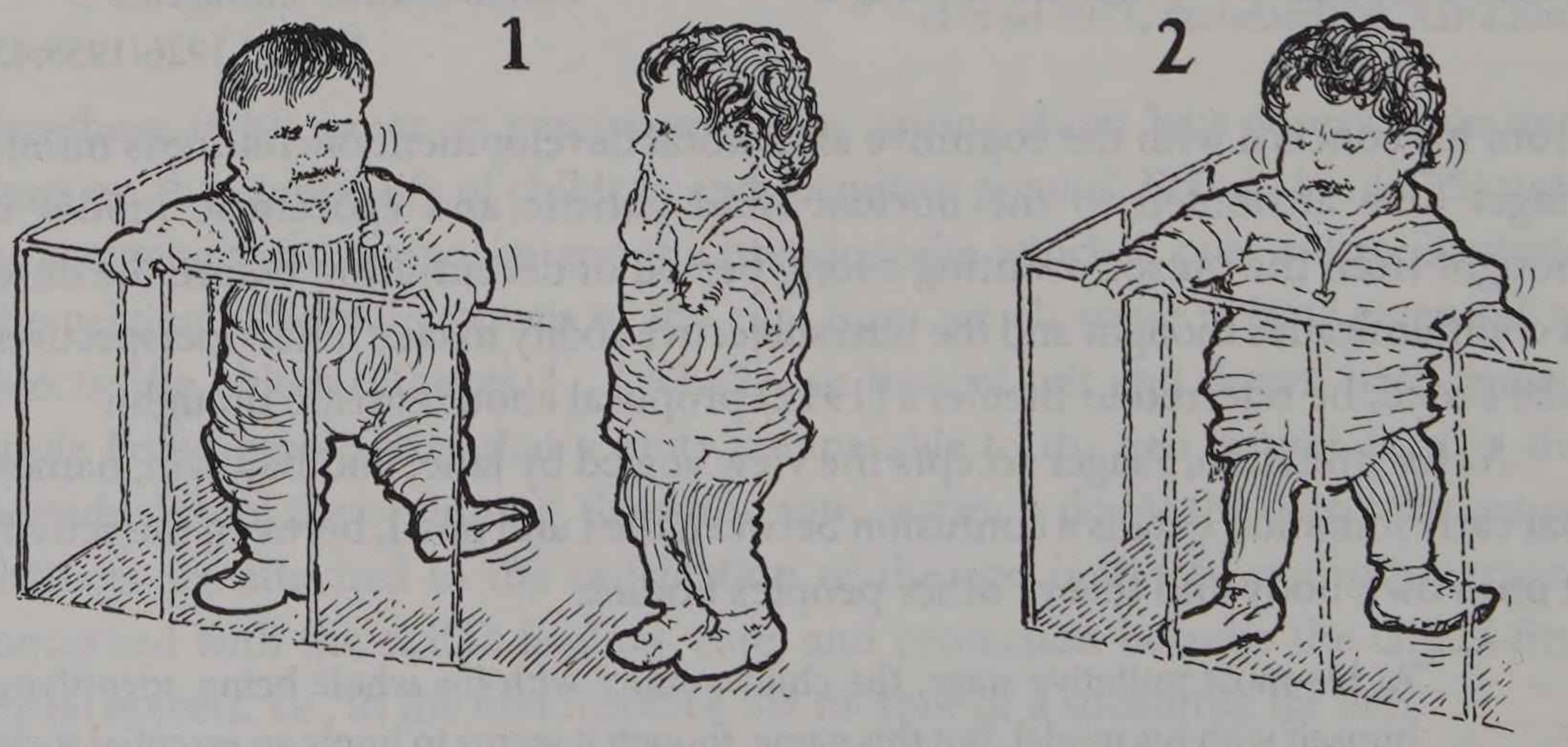



**Figure 1.1.** This episode (2) entailing deferred imitation by the girl (about 16 months) who the day before (1) had seen her boy visitor's stamping and struggling to get out of the playpen, is reported by Piaget (1946/1962:63) without quite explaining how her deferred imitation could come about, assuming that it must somehow have involved some (pre)representative element.

While Piaget wondered if some sort of representative or pre-representative element may have been at play here, we shall see in Chapter 8 that this explanation may now be offered in terms of other-centred participation: Watching the boy, the girl unwittingly engages in a virtual participation in the boy's movements as if she were operating from his centre and being a virtual co-author of his trying to get out. Her sharing what Stern (1985/2000) terms the vitality affects contours of his stamping and screaming, as if she had been doing the screaming, pushing and stamping with him, leaves her with an e-motional memory (or what Fogel (2004) would have termed a 'participatory memory'), inviting her circular re-enactment on the next day (cf. Bråten 1998a:110). Yes, this is the result of her identifying herself with her model, to repeat Piaget's terms, but certainly not in Piaget's sense that "the copied movements and behaviour have nothing in them to interest the child"; on the contrary, she virtually participates in his effort and re-enacts from e-motional memory of her social engagement and empathy with her guest.

When introducing the topic of internal speech and preparation for social language, Piaget points out how the solitary talker invokes imaginary listeners, just as the child invokes imaginary playfellows. He asks whether it is certain that adults always use language to communicate thought and, then, what about silent speech:

> "...a large number of people, whether from the working classes or the more absent-minded of the *intelligentsia*, are in the habit of talking to themselves, of keeping up an audible soliloquy. This phenomenon points perhaps to a preparation for social language."
>
> (Piaget 1926/1959:1–2).

Piaget considered repetition (echolalia) as one of the characteristics of children's egocentric speech. They love to repeat the words they hear, to imitate syllables and sounds, even when they do not understand their meanings. True, but why term this 'egocentric'?

## Freudian and Piagetian views yielded some strange advices to parents

In the above ways, these two path-breaking thinkers came to define the views on the point of departure for children's development of language and understanding – views which have prevailed almost as a model monopoly throughout most of the last century. Looking, as it were, on infants from a distance in terms of their ideal rationalistic standard of adult behaviour, both Freud and Piaget not just overlooked the possibility of mutual intersubjective attunement in early infancy and childhood; such early social and communicative behaviour is simply denied by their theories. As will be illustrated below, their views led to some rather

strange advices to parents – often in conflict to what parents and care-persons felt themselves.

## Object Relations Theory from Freud

In his early writings Freud (1911) conceives, as we have seen, of the infant to be born without capacity for contact with the outside world, and purely driven by the pleasure principle. In a footnote to his paper on two principles of orientation, he indirectly compares the infant with a bird's egg, reduced to search for food and warmth. The term "normal autism" came into use, which implied that for human infants it is normal to be incapable of communicative relations to others. This is maintained in Object-Relations Theory which emerged from Freud's psycho-analytic teachings: communication arises later in ontogeny upon the formation of relations to others, described as object-relations, that is, in terms of the other as an object of sex, or as "a love-object". Such object relations, however, were not attributed to early infancy. In a metaphor from biology early mother-infant connectivity in this tradition is described by Margaret Mahler (1986) in terms of "symbiosis" with the mother in the "autistic orbit" of the baby.

Another representative of the object-relations tradition came to break away from the above view, however, and points to a path towards subject-subject relations. Winnicott (1953) recognizes the capacity in 4-to-12-month-olds to re-create interplay with the parent – with a dummy, a thumb, a piece of cloth, or some other "transitional object". He regards this as the first creative act in the intermediate phenomenological space between the baby and the mother. This may be attributed to the infant's companion space – whether filled by the mother or some other actual other, or by the piece of cloth imbued with 'life' by virtue of the infant's virtual other. While seen by the detached observer to be a piece of cloth, it has now been actualized for the baby as a virtual companion. Winnicott compares this to the way in which adults use a canvas, ballet shoes or some other means in their self-creative expression and communication. This perspective opens for a dialogical view of the human mind, and relates to the intersubjectivity perspective of recent infancy research.

## Piaget's theory of ego-centricity requiring de-centration in order to allow for sociability

It has now been mostly forgotten that in his theory of cognitive development in children Piaget (1926/1959) originally, like in the psycho-analytic tradition, attributed to children's thinking an autistic mode prior to their turning communicative. More central to his theory is, however, the claim about *ego-centricity*. This means that the infant is regarded as incapable of taking others' perspectives;

everything is regarded from the infant's self-centred perspective. In the course of infancy, however, a sort of "Copernican revolution" occurs according to Piaget and Inhelder (1969): things and people come to be perceived as objects with enduring characteristics. In this theory a long period of *de-centration* is required before the child is able to take others' perspectives. By "de-centration" is meant a shift of the singular ego-centre of the child's self-regulating circle so that the perspective of others be assimilated and brought to cross the periphery of the ego-centric circle. Thereby it transforms itself in a way that enables the more mature child to relate to others as subjects in mutual subject-subject relations, mediated by representations of others.

In this view, then, the capacity for reciprocal subject-subject engagement is denied to the human infant. In virtue of its attributed non-communicative and egocentric nature, subject-subject reciprocity is only to be expected at the peak of development of the maturing individual. This view contrasts not only with the phenomenological experiences of parents and care-persons, but as we shall see, is refuted by the recent findings and discoveries in empirical infancy research inviting a radically different perspective.

## Some strange advices to parents and care-persons influenced by Freudian and Piagetian views

The perspectives on the infant's nature and on child development advanced by Freud and Piaget came to be dominant paradigms which – with some exceptions, such as Donald Winnicott and Anna Freud – became frames of reference for practical advices to parents and care-persons.

When confronted with parents and care persons who experienced their children to differ from the prevailing view, educators and doctors, psychoanalysts and advisers could be imagined to have responded in these ways, and which some last century parents may attest to:

- "It may look like the newborn baby is imitating you, but it is just a coincidence or mere 'reflex'.
- "If the baby looks like smiling at you, such a grimace is most probably caused by stomach pain. You are still only, as it were, in the "autistic orbit" of the baby."
- "If you think you are sharing a sort of affective understanding with your baby, do not be misled by your wishful imagination: this is just a sort of *symbiosis* in which *only you* communicate, not the baby who is yet to acquire such an ability."
- "If you feel like your 2-month-old baby is trying to talk to you and engage in a reciprocal dialogue-like manner, please, remember that what you take to be the baby's contributions to the interplay is due to *your* anticipations and doings, not the baby's who is yet to acquire the necessary prerequisites for preverbal dialogue. You are just playing the baby like an instrument."

- "If you wish to comfort your crying baby who has been tucked away for the night in a separate room, do not yield to that temptation; the baby has to get rid of the *mother fixation* in order to replace the *pleasure principle* by the *reality principle* and turn social."
- "If you think that your 10-month-old baby is trying to comfort you by putting its dummy in your mouth, do not be misled: The baby is just *confusing your mouth with the baby's own*".

Today, in view of what we know about infants' social nature and communicative abilities, the above constructions and pseudo-quotations sound incredible. You may find, however, similar statements in earlier textbooks and books of guidance, including Dr. Spock's (1961) advice to mothers to be tough and avoid coming running when there is crying the first year, so as not submitting to the baby. Academically educated parents, today 50 years of age or so, attest to how they were trained to accept such views, and to disbelieve or keep silent about their own phenomenological experiences and inclinations. This illustrates the power of what Kuhn (1970) terms a scientific paradigm and what I term a model monopoly (Bråten 1973c). Even the prominent proponent of the intersubjectivity perspective in sociology, Jürgen Habermas (1984:69), submitted to Piaget's model monopoly, asserting that "cognitive development signifies in general the decentration of an egocentric understanding of the world."

## Recent findings on primary intersubjectivity confirm parents' experiences

As will be elaborated in part III, already in the first weeks of life human infants have been found to be capable of mutual subject-subject attunement in an immediate sense. This is documented by film and video records and analyses in recent infancy research. For example, Mary C. Bateson (1971, 1975) and Trevarthen (1974, 1986) discovered how infants – 6 or 8 weeks old – engage in proto-conversation with their mothers, exhibiting finely tuned inter-coordination of movements and expressions and the kind of turn-taking and rhythmic synchrony which we may recognize in verbal conversation partners later in ontogeny.

Before birth the baby has experience of moving with the mother's body and of feeling the rhythm and listening to the melody of her immediate cultural environment. But such pre-natal experiences do not prepare for the kind of variety of movements and finely tuned synchrony of expressions and gestures exhibited in early face-to-face contact. In spite of that newborns – even in the first hour after birth when they are especially alert – are able to engage with adults in forms of communication

that involve what we term "imitation": they can take after and mimic the adult's gestures and expressions of feelings.

If the adult is patient enough to allow the baby time we may see how the newborn scrutinizes the face of the adult model before attempting to come up with a semblant gesture when imitating facial expressions and gestures in the adult. The younger the baby, the more time and effort is required for such re-enactment. It has now been established beyond doubt that even the newborn baby has this capacity (Meltzoff & Moore 1977; Kugiumutzakis 1983/1998). This was partly anticipated by Darwin.

Darwin (1872) raises the question about the possibility of some common inherent ground for emotional communication in children. Reporting on how his son (6 month) once immediately took after his nurse's sad expression, Darwin speculates about the possibility of an innate ground for imitation of facial gestures. About 100 years later, laboratory results should confirm his speculations. Here is Darwin's report:

> "It is however extremely difficult to prove that our children instinctively recognize any expression. I attended to this point in my first-born infant, who could not have learnt anything by associating with other children, and I was convinced that he understood a smile and received pleasure from seeing one, answering it by another, at much too early an age [4 months] to have learnt anything by experience [and then Darwin continues later in the text:]
> When a few days over six months old, his nurse pretended to cry, and I saw that his face instantly assumed a melancholy expression, with the corners of the mouth strongly depressed; now this child could rarely have seen any other child crying, and never a grown-up person crying, and I should doubt whether at so early an age he could have reasoned on the subject. Therefore it seems to me that an innate feeling must have told him that the pretended crying of his nurse expressed grief; and this through the instinct of sympathy excited grief in him."
>
> (Darwin 1872/1955:358).

Two decades later, James Mark Baldwin (1891, 1992) re-formulates in terms of motor attitudes Darwin's principles of emotional expressions and introduced the concept of self-repeating circular reaction (which Piaget (1946/1962) adopts and adapts): Motions that are felt to be pleasant are re-enforced through adjusting repetitions. Discarding a report from Preyer (1887) about imitation in 3-month-olds, Baldwin presents his model of manual gestural imitation in one of a series of articles in *Science*. More than eight decades later an article appeared in the same journal on neonatal imitation of manual and facial gestures, reported by Meltzoff and Moore (1977).

With this begins a revision of the story of infant behaviour and child development that was written and maintained in the beginning and throughout most of the last century stemming from the views of Freud and Piaget on infants as asocial, non-communicative, and egocentric. As will be illustrated and specified in Part III and elsewhere in this book, we may now correct that long prevailing paradigmatic view in light of documentations from the laboratory, the home, and the field on how

- newborns are able to affectively engage in dialogue-like and dance-like interplay with others (cf. Figure 1.2);
- infants are born with a capacity for participant perception of what others are doing or trying to do;
- infants soon attempt pre-speech and show perceptual attunement to speech patterns in the community into which they are born;
- even before their first year's birthday infants may reciprocate spoon-feeding and even show by their mouth movements that they mirror the patient's intake of food;
- such matching resonance is likely supported by a mirror neurons system adapted in phylogeny.

Such and other findings (documented in Bråten (Ed.) 1998; (Ed.) 2007), and in Stamenov & Gallese (Eds) 2002) serve to illustrate the very reverse of the asocial and egocentric nature attributed to infants and toddlers by Freud and Piaget. And as has been indicated, parents and caretakers have experienced such phenomena as a natural part of their everyday life of care-giving activity. There is nothing special or unusual about the mutual interplay depicted in the below illustrations (Fig. 1.2). In fact, most infants are ready for and actively seek for some sort of interpersonal contact already in the first hour after having been born. If the mother is not available for such intimate contact, others – male or female – may step in and be sought out by the newborn baby. That fact that neonates can imitate facial gestures of the adults to whom they are exposed even during the first 45 minutes after birth (Kugiumutzakis 1983/1998; Meltzoff & Moore 1983), to be turned to in Chapter 7, is further evidence of such early readiness for what Stern (1985:151n) adequately termed 'interpersonal communion'.

In the last quarter of the last century findings began to accumulate which jointly came to invite a paradigmatic shift confirming the everyday life experiences of parents' and caretakers' who had not been blinded by the academically mediated previous attributions with roots in theory. In the next chapter we shall turn to two such keynote findings initially occurring independently of each other: The mirror neurons discovery and the identification of altercentricity in human infants.

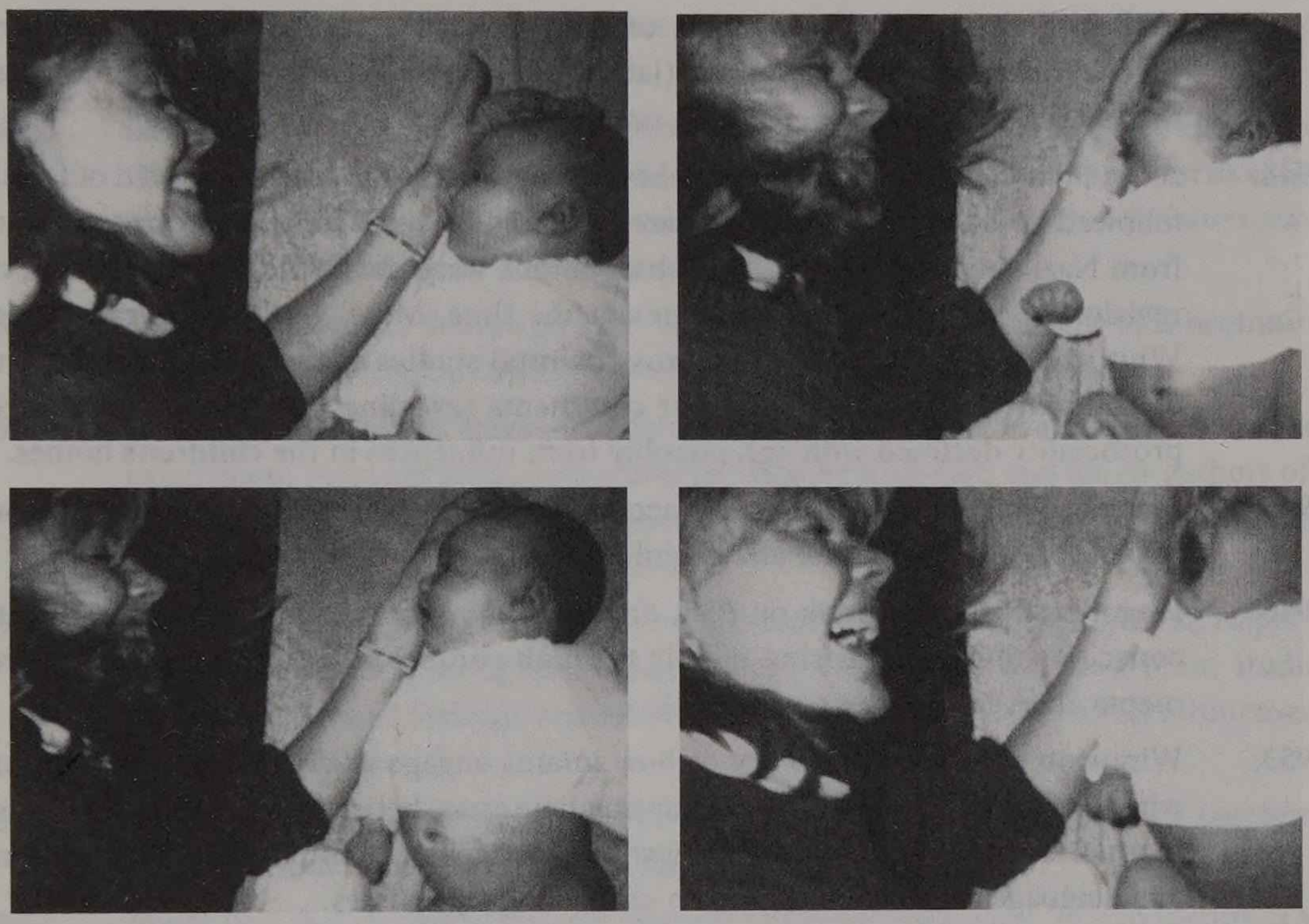


**Figure 1.2.** Newborn girl (11–days) at the nursing table in mutually attuned and dancing-like interplay with her mother (Recorded by the author 1990 (reported by Bråten 1998/2004:29; 2002:275)).

## Note: Some last century publications pertinent to a current paradigmatic shift

1895: In a series of *Science* articles and in a book, Baldwin proposes a model of imitation in terms of *circular* reaction: movements felt to be pleasurable are repeated (while he rejects reports on imitation before 9 months of age). He points to the evolutionary impact of imitative learning on population distribution (later termed the Baldwin effect) as a complement to Darwin' theory of evolution. Three decades earlier, Darwin had recounted in his book on *The Expression of the Emotions in Man and Animals* how his son (6 months) took after his nurse's sad expression and wondered if this reflected an innate capacity for imitation.

1911: Freud attributes the pleasure principle to infants as closed off from reality in the metaphor of a bird's egg. This idea of the child's "*autistic orbit*" is later adopted in object-relation theorists' conceptions of mother-child *symbiosis*, e.g., by Margaret Mahler (1986).

1922: G.H. Mead presents his account of symbols being significant by virtue of perspective-taking.

1923: Buber publishes *Ich und Du* positing an innate You realized in the meeting with the other.

1926: Piaget proposes his theory of cognitive development, adapting Baldwin's notion of circular reaction and attributing to children's minds autistic and ego-centric

modes of thought prior to onset of communicative modes – with 'egocentric speech' disappearing at school age (later contested by Vygotsky who demonstrated that manifestation of inner speech continued).

1944: Anna Freud reports on prosocial behaviour in war-time toddlers deprived of family, followed up by report on mutual care exhibited by six 3-year-old orphans rescued from Nazi extinction camps. Her observations were mostly neglected, evoking no revision of the prevailing paradigms at the time. More than four decades later, Whiting & Edwards report from cross-cultural studies of the prosocial behaviour of children (3 to 10 years) on four continents revealing that in 3 of 10 cultures prosociality declined with age, possibly from influences in the children's homes.

1945: Merleau-Ponty presents his phenomenological and between-bodies-oriented theory of perception, applied inter alia to children's relations with others.

1946: Piaget publishes his book on *Play, dreams and imitation*, giving examples of unconscious imitation "arising merely through confusion between external movements and those of the ego" (p. 74).

1953: Winnicott proposes his theory of how infants engage in creative communication with a "transitional object" in the intermediate space between the baby and (absent) mother. In his *Philosophical Investigations*, Wittgenstein emphasizes that meaning and language learning emerge from use in language games.

1957: Liberman presents his motor theory of speech perception, later to be modified and finding support in the light of the mirror neuron discovery four decades later.

1972: Rommetveit specifies the complementarity of the speech act, including the listener's reconstruction of what the speaker intends to make known, and lays out the following year the architecture of intersubjectivity in linguistic contexts in his book *On Message Structure*.

1975: Grice anticipates in his *Logic and Conversation* the theory version of Theory of Mind in terms of how the speaker's intention is grasped. Two years earlier Bråten had anticipated the simulation version with his model of how conversation partners simulate one another.

1974: Trevarthen reports his discovery of conversation-like interplay between mothers and two-month-olds, independently discovered also by Mary C. Bateson who introduced the term "*protoconversation*".

1977: Meltzoff & Moore report in *Science* their discovery of neonatal imitation of facial and manual gestures, later replicated independently by other infant researchers, including Heimann in Sweden and Kugiumutzakis on Crete (with even 20-minute-olds).

1978: Trevarthen & Hubley define *secondary intersubjectivity* entailing object-oriented joint attention occurring before or around 9 months of age, supported by the innate motivational basis for "*primary intersubjective*" attunement which Trevarthen had found to be operative soon after birth.

1985: Stern presents his book on *The Interpersonal World of the Infant*, positing the sense of an emergent self (and other) to be operative from birth, and introducing a "staircase logic" applied to child development. While questioning at that time primary intersubjectivity to be operative from birth he changed his view 15 years later in the light of the subsequent findings of adaptive oscillators, mirror neurons

and infant altercentricity (as expressed in the new introduction to his paperback edition 2000).

1988: Leslie defines the theory version of the Theory-of-Mind, and Astington, Harris and Olson present a source book on children's Theory-of-Mind, including Harris's simulation/imagination version. Two years earlier Gordon had specified the simulation version of the Theory-of-Mind, advocated also by Goldman.

1992: Kuhl et al. report in *Science* on early speech perception in 6–month-olds beginning to limit their perceptual fields to vowels of the ambient speech culture.

1992: Di Pellegrino, Fadiga, Fogassi, Gallese & Rizzolatti report the original macaque-experiment that later leads to the identification by Rizzolatti and his co-authors of a mirror neuron system in the human brain, such as reported on the basis of a magnetic stimulation study by Fadiga et al. (1995).

1994: Damasio publishes his *Descartes' Error*, followed up by *The Feelings of What Happens* (2000) and *Looking for Spinoza* (2003), emphasizing inter alia how brain studies reveal background feelings, resembling what Stern (1985) terms 'affect attunement' and 'vitality contours'.

1996: Bruner publishes his book on *The Culture of Education*, emphasizing the emerging recognition of infant intersubjectivity.

1997: Predicting that its neural systems support would be discovered, Bråten identifies altercentric participant perception with reference to independent recordings by Eibl-Eibesfeldt and by himself of infants feeding their big sisters while opening their own mouth in the process.

1998: Proceedings of the first Theory Forum symposium on *Intersubjective Communication and Emotion in Early Ontogeny* is published, inviting a paradigmatic shift, as does the *Trends in Neurosciences* article on 'Language within our grasp' by Rizzolatti & Arbib who report on the identification of a mirror neurons system in the human brain and point at implications.

2000: The above is followed up by a symposium on *Mirror Neurons and the Evolution of Brain and Language* yielding proceedings edited by Stamenov & Gallese, and four years later by another Theory Forum symposium on Foundations of (pre)verbal intersubjectivity in light of new findings, yielding the proceedings edited by Bråten *On Being Moved: From Mirror Neurons to Empathy*.

CHAPTER 2

# Recent related findings making a difference

## Mirror neurons and participant perception

Towards the end of the last century two independent findings were reported which contributed to invite a revision of predominant conceptions of how we can connect. The first one was the discovery of mirror neurons, found in the macaque monkey brain (cf. Figure 2.1 (bottom)), and identified as an adapted mirror system in the human brain (Rizzolatti & Arbib 1998). Here was found a direct motoric link of participant perception between communicating individuals without any high-level cognitive mediation (cf. also Fadiga & Craighero 2007:207). Independently, participant perception was found to be exhibited in Amazonas and in Norway by human infants who could not only reciprocate their caregivers' feeding in face-to-face situations (cf. Figure 2.1), but who revealed by their mouth-movements – by what Eibl-Eibesfeldt (1997) terms co-movements (*Mit-Bewegungen*) – their altercentric participation in the other's food intake (Bråten 1996, 1998ab). Such participatory feats are likely to be subserved inter alia by a mirror neuron system (cf. Bråten 1998a:122–123; Trevarthen 1998:46; Bråten in Bråten & Gallese 2004:102–103; Ferrari & Gallese 2007:81–82).

### When feeding situations invite participant perception

Regard the human infants illustrated in Figure 2.1 who are feeding their companion. What else do they do, if unwittingly? Each of the infant feeders opens their own mouth as the recipient of food opens her mouth. For example, when reciprocating his sister's spoon feeding the Oslo-boy Thomas (11 3/4 months) opens his own mouth as his sister receives with her mouth his afforded spoonful of food (cf. also the photo record in Fig. 8.2, Chapter 8, this book). Such virtual moving in sympathy with the other's activity is manifested across cultures. The Yanonami infant also opens her mouth when extending the morsel to her big sister, and even tightens own lips as the recipient takes in the afforded food by closing her mouth. So, here we see demonstrated that while the infants are feeding their big sisters, they manifest by their mouth movements that they also take a virtual part in their older sister's intake of food as if they were co-authors of her eating.

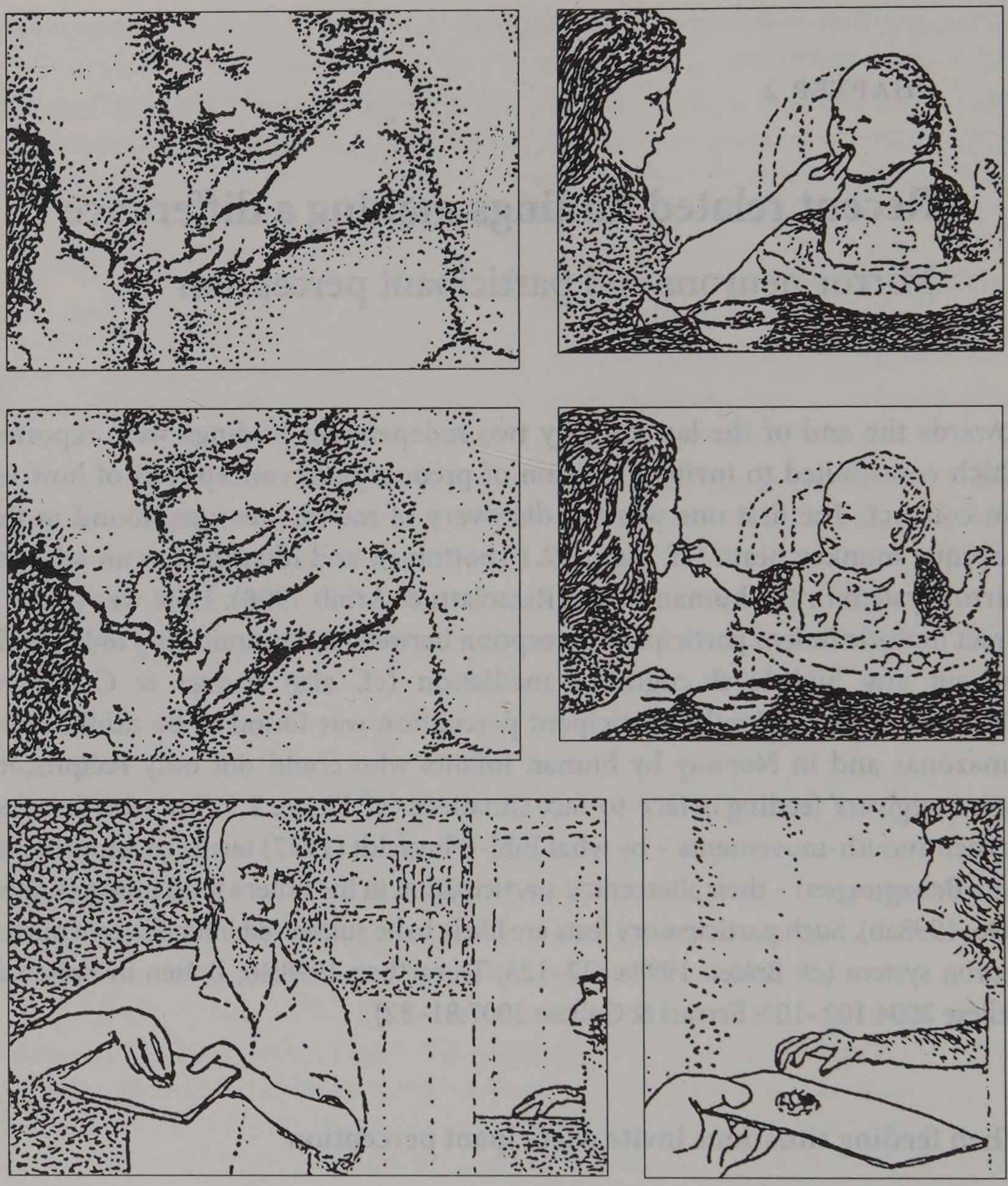


**Figure 2.1.** Food grasping and feeding situations inviting participant perception.

(*Top left*) Yanomami infant feeding her sister (drawing after photos by Eibl-Eibesfeldt 1979, 1997:486)

(*Top right*) Oslo boy (11 ¾ months) reciprocating his sister's spoonfeeding (after photos by Bråten 1996)

(*Bottom*) The key experiment revealing mirror neurons firing in the macaque brain upon observing the experimenter grasping a piece of food, and when the macaque is doing the grasping (drawing after video presented by Rizzolatti at a Delmenhorst conference in 2000; cf. also the illustration in Bråten (Ed.) 1998:122, adapted after Di Pellegrino et al. (1992), who also picture activation profiles of premotor neural cells in the two situations, and which later came to be labelled 'mirror neurons').

This way of virtually participating in the other's activity, as if co-enacting that activity, is in no way unique for these infants. As adults we may exhibit the same when feeding a baby or a sick person, unwittingly opening our mouth as we put the spoon in the recipient's mouth. Like the infants, we are not only feeding the other, we are virtually participating in the other's preparing-to-eat-movements. Somehow, when virtually moving with the other, in the other's shoes, as it were, one is moving from the bodily centre of the other, not one's own, and then, in the case of imitation, in order to re-enact those movements, proprioceptively executed within one's own body-centred frame, the altercentric co-ordinates have to be inverted into ego-oriented co-ordinates.

Thus, a virtual-alter mechanism, complementary to the biological or bodily ego, enables the infant to feel a virtual moving with alter's feeding movements from alter's stance, leaving the infant with a procedural memory of having been a virtual co-author of the feeding, informing or guiding the infant's subsequent reciprocating re-enactment. So this is infant learning by altercentric participation, and it does presuppose that the infant understand in an matching-operational sense alter's goal- and object-orientation, albeit not in an abstract reflective or cognitive sense. The object- and target-oriented direction of alter's activity, such as feeding, is implicitly understood by virtue of the infant's altercentric participation in the other's act evoking a matching feeling in the watching infant.

These findings do not fit the egocentric and cognitivist attributions in Piaget's theory of child development. In contrast to the Piagetian attribution of an *egocentric* point of departure for children's development of language, requiring decentration as the child matures, we have now found evidence of infant capacity for *altercentric* mirroring and self-with-other resonance in an intersubjective matrix operative soon after birth (Bråten 1998a; Bråten & Trevarthen 2007; Stern 2000, 2004, 2007; Trevarthen 1998). Recent infancy research has uncovered that infants are able to engage in interpersonal mirroring and reciprocal attunement with adults and elder siblings from the outset, exhibiting bodily attuning to one another's emotive expressions and gesture- and sound-producing movements. We have found an inborn capacity for attunement to others' gestures and for reciprocal face-to-face interplay, and a nurtured pre-verbal competence entailing other-centred participation that comes to be supportive also in verbal conversations.

## Identification of infant learning by other-centred participation

It is the same capacity which makes the infant such an efficient learner, manifested for example by the infant's co-enactment or re-enactment of a mouth movement,

that also underlies conversation partners' ability to complete what the other is about to say: their inborn capacity for participant perception, as if being a virtual co-author of what the other is doing or saying. Such re-enactment, co-enactment or pre-enactment entails altercentricity, as if unwittingly being in the other's centre, the very reverse of the egocentricity attributed by Piaget. Daniel Stern (2004) gives this definition in the glossary of his book on *The Present Moment in Psychotherapy and Everyday Life*:

> "**Altero-centered participation** (Braten 1998b) is the innate capacity to experience, usually out awareness, what another is experiencing [...] as if your center of orientation and perspective were centered in the other. It is not a form of knowledge about the other, but rather a participation in the other's experience. It is the basic intersubjective capacity that makes imitation, empathy, sympathy, emotional contagion, and identification possible..."
>
> (Stern 2004:241–242).

And what is more, it helps to explain the efficient cultural learning capacity shown by children even in the first year of their life, evidenced for example by the way in which infants can reciprocate the spoon-feeding which they have been afforded. When spoon-feeding, caregivers often unwittingly open their own mouth as the mouth of the infant or patient begins to open to take in the afforded food, reflecting how they identify with the patient's performance, virtually participating in the patient's preparation or effort to eat. Not only adult caregivers do this. Above and in Chapters 6 and 8, this book, episodic video records of infants, between 11 and 12 months, will be referred to. When allowed to take the spoon full of food in own hand, they reciprocate the caregiver's spoon-feeding and sometimes open their mouth as they clumsily offer the spoonful to the caregiver's opening mouth. Such accompanying mouth movements deserve the German label for 'with-movement' or 'moving with' which is used by Eibl-Eibesfeldt (1997) to describe what his recorded Yanomami-infant does when offering a morsel to her big sister's mouth, and tightens own lips as her sister's mouth closes on the offered morsel. And the complexity of what the Norwegian infant boy does (as illustrated in Figure 2.1 (right)), breaks radically with the auto- and ego-centric assumptions in Freudian and Piagetian traditions, which then would have required a long developmental period of decentration before such social learning and intersubjectivity could have emerged.

What the infant who reciprocates spoon-feeding demonstrates is *learning by altercentric participation*, defined as imitational learning by Ego's virtual participation in Alter's act from Alter's stance as if Ego had been facing the same direction or been hand-guided giving rise to shared temporal *vitality (affects) contours*, reflecting the manner in which the enactment is felt to be virtually co-enacted and the feeling that directs the co-enactment, enabling circular re-enactment from

procedural memory of such virtual co-enactments. The term 'vitality contours' is Daniel N. Stern's (1985, 1999) term for such jointly experienced feelings that specify the movement contour, in contrast to discrete emotions. Consistently, the procedural memory left by such virtual co-enactment is here termed 'e-motional memory' (from the root sense 'out-of-motion' and the folk sense of 'being moved by'). In face-to-face learning situations this entails sensorimotor reversal of what has been seen done by the other – entailing a shift from the other-centred frame of reference entailing resonance with what the model has been doing, to the self-centred frame of reference required for execution of the re-enactment (i.e., a shift from altercentric to egocentric body co-ordinates).

Such participatory feats by infant learners and verbal conversation partners as if being a virtual co-author of what the companion is doing or saying are enabled by their capacity for altercentric participation in the companion. And as anticipated in 1997 and repeated the following year (Bråten 1998a:123) the neural systems support of such a capacity for participant perception was expected to be uncovered, making a difference with respect to understanding others in an immediate sense, not mediated reflectively by concepts or symbols.

## Can I understand you without drawing upon symbolic or conceptual representations?

When asked about what enables you to understand what your partner in conversation is doing or saying, until quite recently most of us would have replied: Besides sharing with my partner a common language and frame of reference I have to draw upon symbolic or conceptual representations in order to make sense of what my partner is doing or saying. With certain exceptions, such as Naess' (1953) empirical and user-oriented semantics, Wittgenstein's (1953) emphasis on usage, not meanings, Merleau-Ponty's (1962) phenomenology of perception, and Maturana's (1970) on the neurophysiology of cognition, the following would have been the standard reply in philosophy of language, cognitive science, educational and cognitive psychology and social sciences concerned with language and communication: Understanding requires mediation by conceptual and symbolic representations. Based on how my computer simulations of communication in social dyads and networks in the late 60's and 70's entailed the use of typified internal representations, I had shared such a belief. But, then, when studying moral dilemma-processing through dialogue in the laboratory, used as reference systems for computer simulation attempts, I sometimes noticed rapid exchanges of utterances, even sentence-completion, which appeared to be too immediate to allow for mediation by interpreting representations of any higher second-order reflection. And then, in

cybernetic biology, Maturana (1970) gave me cause for reflection when he insisted that self-referral cognitive organization can do without representations, which is rather the observer's attribution. That started my quest for revealing and identifying the kind of dyadic mental organization that would allow for what Buber terms 'I-You dialogue' in presentational immediacy as distinct from representational mediacy (Bråten 1986/1988; 1988ab), and ten years later I was ready to predict that the neuro-social support of such immediate understanding by virtue of what I termed 'other-centred' perception would be discovered in the form of an altercentric neural system, perhaps even altercentric neurons. When I made this prediction in a CAS lecture in the Norwegian Academy of Science early 1997 I did not yet know that a crucial discovery had been made by Giacomo Rizzolatti and his group at the University of Parma physiology institute based on single neuron recordings in a macaque experiment (Di Pellegrino et al. 1992) depicted in Figure 2.1 (bottom). It was Fuster's (1995:185) book on *Memory in the Cerebral Cortex* that drew my attention to it in the autumn 1997 while I was completing my chapter for the collective volume which I then was editing, and which thus came to contain an adapted portrayal of that key note experiment (Ed. Bråten 1998:122 (Fig. 5.5)) with this index term: "premotor unit activation by sight of motor activity". Later I could state in a collective volume dedicated to the phylogenetic implications of the discovery: "A neurosocial bridgehead has now been found that is likely to support the intersubjective arch of virtual (other) participation" (in Stamenov & Gallese (Eds) 2002:290).

## On the discovery of mirror neurons

What Rizzolatti and his group, including inter alia Fadiga, Fogassi and Gallese, had found was that premotor neurons in the macaque's brain fired both when the macaque grasped a morsel and when the macaque saw the experimenter grasp the morsel, but not when the morsel was pushed towards the macaque. Later such premotor neurons were adequately labelled "mirror neurons" and a mirror system was identified to be operative in the human brain, with implications pursued inter alia by Rizzolatti and Arbib (1998). In view of the identification of a mirror neurons system in the human brain, involving a brain location where also Broca's area is to be found, we may now offer this succinct reply to the above question about understanding without drawing upon symbolic or conceptual representations:

> Yes, when your mirror neurons system and perhaps even accompanying muscle movements are evoked by what you see your partner is doing as if you were about to do it yourself, your resonant mirroring affords or reflects an immediate understanding of your partner's doing.

Such resonant and matching mirroring entails your comprehending and identification with what the other is doing, irrespective of whether or not that in turn gives rise to a reflective interpretation mediated by conceptual and symbolic representations. That is why the title "Language within our grasp" on the article by Rizzolatti and Arbid is so to the point when we consider the affinity between the term 'grasp' and the terms 'comprehend'/'prehend' (and in German '*greiffen*'/'*begreiffen*') which both capture the mental understanding and the bodily prehension.

Mirror neurons were first found in macaque monkeys to discharge in the ventral premotor area F5 both when another is observed grasping a piece of food and when the monkey is grasping the piece by itself (cf. Fig. 2.1 (bottom)). Thus, these neurons discharge both when the monkey executes a goal-related action and when it observes another individual performing a similar act in front of it (Fogassi 2000). What were discovered here were neurons that subserve a system that appears to match the act perceived done by another individual with a semblant, internally generated enactment in the perceiver (cf. contributions by Rizzolatti, Fadiga, and others in Stamenov & Gallese (Eds 2002), and by Ferrari & Gallese, by Hari, by Fadiga & Craighero in Bråten (Ed. 2007). Experimental evidence suggests that such a system exists also in humans, in the brain region that contains Broca's area which not only serves speech, but appears to come active during execution and imagery of hand movement and tasks involving hand-mental rotation (cf. Figure 2.3 later in this chapter).

The first evidence of a mirror system existing in humans was provided by Fadiga et al. (1995) who stimulated the motor cortex of normal human subjects by using transcranial magnetic stimulation (TMS). While these data indicate that an action execution/observation matching system is operative in humans, they do not afford information on the underlying circuits, which was later provided by positron-emission tomography (PET) experiments (Rizzolatti et al. 1996b; Grafton et al. 1996), as well as by a neuromagnetic study (Hari et al. 1998; cf. also Hari 2007). All activations were in the left hemisphere. And there is a growing consensus that F5 is the monkey homologue of Broca's area, or parts of it (Rizzolatti & Arbib 1998). Identifying such a mirror neurons system enabling observed enactment to be matched to semblant, internally generated enactment in the observer of that enactment, Rizzolatti and Arbib refer to a Liberman's (1993) motor theory of speech perception implying a close link between the production and perception of speech. This is consistent with what is portrayed in Bråten's (1974) conversation model of how the listener takes a part in the speaker's production process (turned to later in this chapter, as well as in Chapter 10), and which could entail the operational subservience of such a mirror system.

## More in detail on what led up to the discovery of a mirror neurons system in the human brain

It was in the beginning of the 1990's that the crucial experiment was carried out in the laboratory of the neuroscience research group headed by Giacomo Rizzolatti at the University of Parma. The startling outcome was reported by Di Pellegrino et al. (1992) as a first step of a discovery with far-reaching phylogenetic and ontogenetic implications, including questions about neurosocial support in a number of social and intersubjective domains, including the various layers of intersubjectivity in all its forms. As examined in Part III, this may range from infant imitation and learning to empathic identification and understanding of others' intentions in contexts of performance and conversations. What was found in this first experiment with single neurons recordings of nerve cells in the macaque brain's motor cortex (in the F5 area associated with hand and mouth movements) was that a subset of neurons responded both when the macaque performed the action of grasping a morsel and when the macaque saw the experimenter grasp the morsel. The radical implications are obvious: independent of cultural bridges or any conceptual or linguistic comprehension which we usually believe is being drawn upon when there is some sort of implicit or empathic understanding of what another person is doing or intending, here the Parma-researchers reported indications of an immediate bridge of identification with what the other is seen to be doing as if the observer were doing it by itself. The same premotoric neurons were firing in the macaque when the macaque was doing the grasping and when the macaque was seeing the experimenter doing the grasping.

In the symposium on mirror neurons and the evolution of brain and language, organized by Gallese and Stamenov in 2000, Giacomo Rizzolatti gave an opening talk and video presentation on the mirror system (Abstract in Preproceedings edited by Gallese & Stamenov, July 2000:9. Cf. also Rizzolatti, Craighero & Fadiga in the proceedings edited by Stamenov & Gallese, 2002:37–59). Here he told about the surprising class of visuomotor neurons that has been recently discovered in the monkey's premotor cortex, and which they had labelled 'mirror neurons'. That label is adequate in view of their finding that these neurons discharge both when the monkey makes a particular action and when it observes another individual (monkey or human) making a similar action. In the first part of his talk Rizzolatti succinctly specified the physiological properties of mirror neurons. They form a cortical system matching observation and execution of goal-related motor actions. In the second part of his talk he referred to EEG/MEG recordings and brain imaging experiments revealing a similar matching system also in humans. He pointed out the mirror system includes several parieto-premotor circuits and that different actions activate different circuits according to the observed action.

In a *Scientific American* article, Rizzolatti, Fogassi, and Gallese (2006) recount how their background inquiries almost by chance led to the mirror neuron discovery. It stemmed from their beginning to study how commands to perform certain actions are encoded by the firing patterns of neurons in this area of the macaque monkey's motor cortex. They were recording the activity of individual neurons in the brains of macaques, affording a rich repertoire of stimuli for the monkeys. As they performed various actions, such as grasping for a toy or a piece of food, the researchers could see distinct sets of neurons discharged during the execution of specific motor acts.

> "Then we began to notice something strange: when one of us grasped a piece of the food, the monkeys' neurons would fire in the same way as when the monkeys themselves grasped the food. At first we wondered whether this phenomenon could be the result of some trivial factor, such as the monkey performing an unnoticed movement while observing our actions. Once we managed to rule out this possibility and others, including food expectations by the monkeys, we realized that the pattern of neuron activity associated with the observed action was a true representation in the brain of the act itself, regardless of who was performing it."
>
> (Rizzolatti et al. 2006:32).

Such serendipity is not an unusual phenomenon in science and in this case, extraordinary rich in its fruitful implications. The above wording, however, "true representation in the brain of the act itself" may call upon a qualification. In contrast to higher-order conceptual representation, "true representation" may here be read to mean motor representation or even motor simulation, not a figurative representation of the act sketched out as such, such as may have been evoked in the brain of an artist making a portrayal of the grasping. What was directly evoked by sense impressions in the macaque was rather premotoric nerve cell activation for doing the same act as if the macaque were virtually executing the act being observed.

And then, as referred to earlier, the first evidence of the existence of a mirror system in the human brain was afforded by a report on a transcranial magnetic stimulation (TMS) study carried out by Fadiga, Fogassi, Paveci and Rizzolatti (1995) on motor facilitation during afforded action observation. The rationale of this experiment was recounted by Rizzolatti, Fogassi and Gallese (2000): The motor cortex of normal human subjects was stimulated. If the observation of an action activated the premotor cortex like it did in monkeys, then it was expected that TMS should induce during action observation an enhancement of motor-evoked potentials (MEP's) recorded from the muscles that would have been active when and if the observed object grasping action had been executed by the observer. That was found to occur: during the observation of grasping movements a selective increase of MEP's was observed in the muscles that the subjects used for grasping objects.

While indicating a system in humans entailing action observation and action execution matching, the above findings invited questions about the underlying circuits. That was partly provided by positron-emission tomography (PET) experiments carried out by Rizzolatti et al. (1996b) and by Grafton et al. (1996). These PET-studies revealed inter alia activation in the inferior frontal gyrus (area 45) of the left hemisphere in subjects observing the experimenter grasping an object. Follow-up neuromagnetic studies have been carried out by Hari et al. (1998) with a focus on the temporal dynamics of the human mirror-neuron system, opening also for a contribution by Broca's region, which is not only activated upon speech, but also upon hand or finger movements. For example, the relative timing of Broca's area and the motor cortex was similar when the subject did finger movements and when she imitated or observed another person's finger movement. Furthermore, pertaining to degree of discharge, the Broca's region and the motor cortex were activated about twice as strongly during on-line imitation as compared to self-paced execution and passive observation (Hari in Bråten (Ed.) 2004:11; cf. also Hari 2007).

In an interview in the brain issue of *Impuls* 2004, Gallese points out that several brain imaging papers published during the preceding five years clearly showed that imitative behaviour activates the mirror neuron system. This occurs not only when the imitated action is very simple:

> "as in the case of the Iacoboni et al. experiment (1999), where subjects had to raise their index finger, but also when the action is totally novel and highly complex, as in the case of subjects who never practiced guitar playing [were] required to imitate chords with their fingers (Buccino et al., 2004b)."
>
> (Gallese in *Impuls* interview of Bråten & Gallese 2004:104).

And then, as recorded by Fadiga et al. (2002) in a study of humans listening to verbal stimuli, motoric resonance is evoked: upon for example listening to speech when the perceived word strongly requires tongue movements for its articulation there is an increase of motor-evoked potentials recorded from the listeners' tongue muscles (Fadiga & Craighero 2007:106). In his account of electrophysiological approaches to motor representations in humans, on the first day of the Delmenhorst symposium, Fadiga (2000) raised the question of whether there is a high-level motor representation involved, or a more direct, low-level resonating mechanism. What happens in our brain when we look at motor actions made by others, he asked? Are biological actions perceived in the same way as on-biological moving stimuli? There is growing evidence that brain processing of visually perceived biological motion peculiarly involves motor centres. In this direction point neurophysiological data on monkey premotor cortex, brain imaging studies in normal human subjects and, finally, data coming from clinical studies. Fadiga

distinguished between the hypothesis about a "high" level reservoir of motor representations that are addressed in order to categorize the observed action, and a second hypothesis that the motor system

> "rather automatically resonates, even with the participation of low level motor structures, "pragmatically" following step-by-step the observed action as if it was performed by the observer."
>
> (Fadiga in Preproceedings Eds, Gallese & Stamenov 2000:15)

In his Delmenhorst talk Fadiga presented some neurophysiological experiments in support of the latter alternative, indicating that in normal human subjects a motor resonant activity is evoked when they are watching actions performed by other individuals. Although with relevant differences, both cortical and spinal levels resonate during action viewing suggesting that "the observer's motor system pragmatically "simulates" what other people are doing." (Fadiga 2000:15). Thus, while the mirror neurons discoverers use the term "representation", as we saw above, this term invites translation in the dynamic terms of the mirror neurons affording a "direct internal experience", and therefore to entail understanding in an immediate sense of another individual's act or intention by virtue of an internal simulation of the observed act.

And then, as pointed out by Ferrari and Gallese (2007:74), simulation is not necessarily the result of a willed and conscious cognitive effort aimed at interpreting the intentions implicit in the overt behaviour of others, but rather basic functional brain processes subserved at the sub-personal level by mirror neurons which enable embodied simulation as an automatic, unwitting and pre-reflectional functional mechanism. This enables us, without cognitive and reflective mediation, to be unwittingly attuned to others' intentions (cf. also Gallese 2005; Ferari & Gallese in Bråten (Ed.) 2007:73–88).

In a *Science* article on "Parietal Lobe: From Action Organization to Intention Understanding", Fogassi et al. (2005) report how they had studied inferior parietal lobule (IPL) neurons when a monkey performed motor acts embedded in different actions and when it observed similar acts done by the human experimenter. They specify how most such neurons coding a specific act (e.g., grasping) showed markedly different activations when this act was part of different actions (e.g., for eating or for placing). Furthermore, many motor IPL neurons were found also to discharge during the observation of acts done by others, warranting the label 'mirror neurons'. These neurons fired during the observation of an act, before the beginning of the subsequent acts specifying the action. As for the visual properties of mirror neurons in the inferior partietal lobule (IPL) they report that they studied 41 mirror neurons in a visual task in which the experimenter performed, in front of the monkey, the same actions that the monkey did in the motor task, that is, grasping to eat and

grasping to place. All the 41 neurons discharged both during grasping observations and grasping execution – some neurons discharged with the same strength regardless of the motor act following the observed grasping. But here is a significant point telling about how mirror neurons discharge even reflects the relevance or importance of the observed act: The majority of neurons differed in their activation depending on whether the observed grasping was followed by bringing the object to the mouth or by placing the object in a container. They discharged vigorously when the monkey observed the experimenter grasping a piece of food and subsequently bringing it to his mouth, while the neurons' discharge was much weaker when, after grasping an object, the experimenter placed it into a container. (Fogassi et al. 2005:663–664).

Here is their interpretation in terms of reading the intention of other with regard to the inferior parietal mechanism:

> "When an individual starts the first motor act of an action, he or she has clearly in mind what the final goal of the action is to which the motor act belongs. […] The action intention is set before the beginning of the movements and is already reflected in the first motor act.
>
> This motor reflection of action intention and the chained motor organization of IPL neurons have profound consequences on a fundamental cognitive capacity, that of understanding the intention of others […] Because the monkey knows the outcome of the motor act it executes, it recognizes the goal of the motor act done by another individual when this act triggers the same set of neurons that are active during the execution of the act.[…]
>
> Because the discriminated motor act is part of a chain leading to the final goal of the action, the neuronal property allows the monkey to predict the goal of the observed action and, thus, to "read" the intention of the acting individual."
>
> (Fogassi et al. 2005:665–666).

The above invites the question: Has such "reading of intention" really been documented here? May it not be the other way around? By virtue of knowing the end of the pertinent action, from episodic memory of having previously executed such a chain of acts leading to the goal (hence realizing the intention), the pertinent (mirror) neurons are activated upon observation of the act in its context of eating or placing (?). The statement "Because the monkey knows the outcome of the motor act it executes, it recognizes the goal of the motor act" need not imply the capacity to attribute a goal orientation. It may simply be due to recognition of a well-known act, similar to the way in which the macaque monkey will resonate with grasping mirror neurons activation when seeing the experimenter grasp a piece of food hidden behind a screen, because it has previously seen the experimenter grasp a visible piece of food, and because it has been allowed itself to grasp the same object.

## On perceptual reversal and frame of reference transformation

In the proceedings from the Delmenhorst conference, Rizzolatti, Craighero and Fadiga (2002) list the functional roles of the mirror system in humans, specifying action understanding, imitation, response facilitation without action meaning understanding, and response facilitation with action meaning understanding. Towards the end or their article they describe an experiment done by Craighero et al. (2002) on hand action preparation influencing the processing of hand pictures. Typical human participants were instructed to prepare for grasping with their right hand a bar, oriented either clockwise or counter-clockwise, and then upon exposure to a picture of the right hand as seen in the mirror, to grasp it as fast as they could. The right hand picture was in two versions: one of them a mirror image of the hand as achieved in grasping the bar oriented clockwise, the other when oriented counter-clockwise. When there was congruence between the prepared hand posture and the orientation of the hand picture, reaction time turned out to be faster than when there was incongruence. This may pertain to the difference between egocentric perception and altercentric perception, explored with respect to processing speed in neurocomputational simulations of "egocentric nets" and "altercentric nets" exposed to a hand-sign (Bråten 2000b, returned to in Chapter 4, this book). Furthermore, it invites the question of the possible role played also by cerebellum (cf. Figure 2.2).

At the same conference, at the end of the second day, a neurocomputational model was presented by Aude Billard and Michael Arbib, simulating learning by imitation (which will also be returned to in Chapter 4, this book). The model builders specified inter alia how a frame of reference transformation from eccentric perception of the model to "egocentric" execution by the imitator was required. This was consistent with the account I gave early on the third day of infants learning to reciprocate their caregiver's spoon-feeding, entailing a reversal from altercentric participation in what the feeder was doing to own body-centred execution of such spoon-feeding. And then, to complicate matters, there is activation of both body-centred and other-centred frames of references when an infant reciprocates the caregiver's spoon-feeding while virtually participating in the recipient caregiver's mouth movements for food-intake: That entails the activation in the feeding subject of two parallel frames of reference: the body-centred frame of co-ordinates pertaining to own act execution, such as spoon-feeding, and the complementary other-centred frame of reference "for Ego's virtual participation in Alter's execution (such as altercentric participation in Alter's complementary food-intake)" (Bråten in Stamenov & Gallese (Eds), 2002:283). To this we shall return later in this chapter and, again, in the next chapter as well as in Chapter 8.

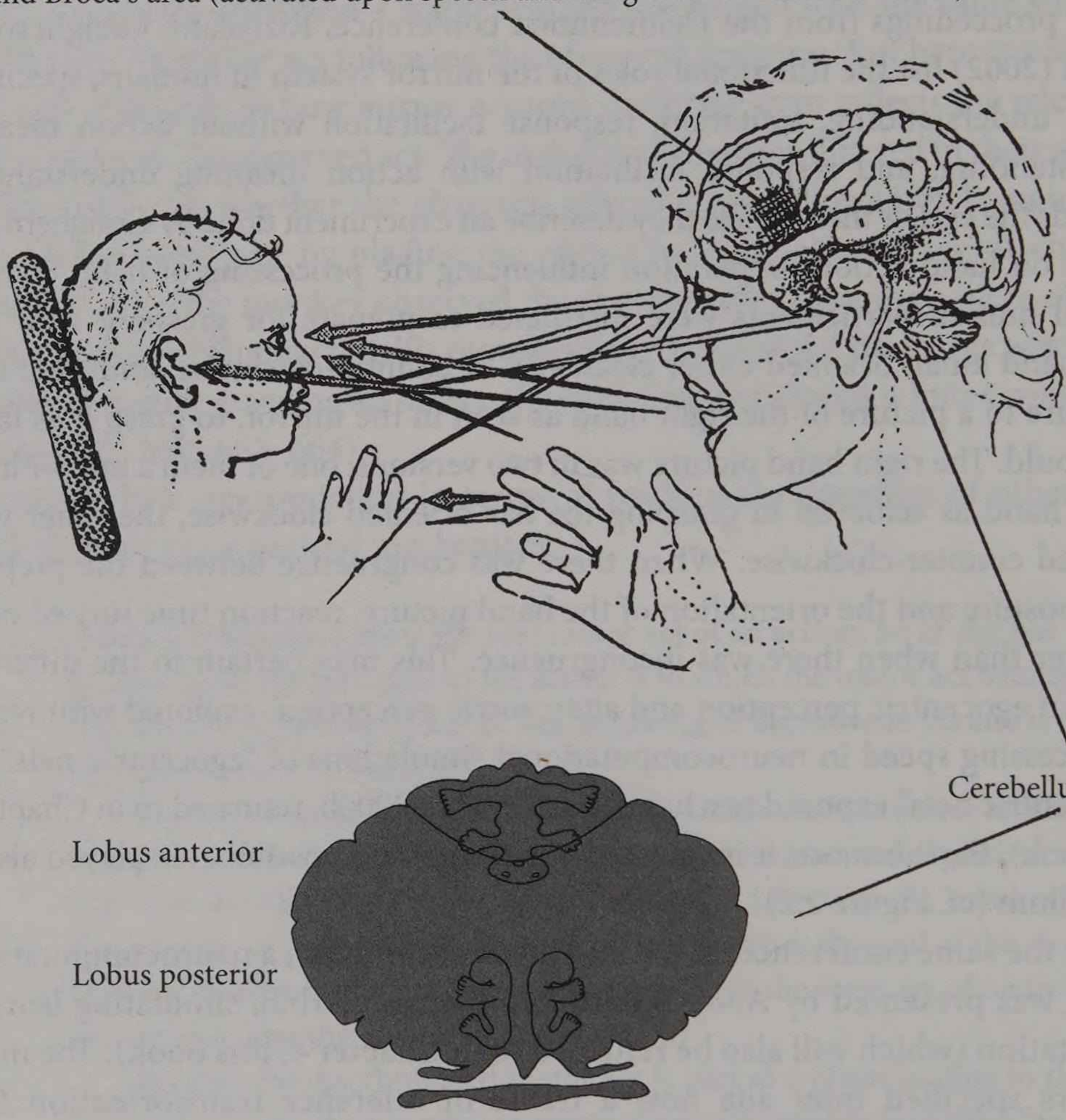



**Figure 2.2.** Some of the intricate interplay between various sensory and bodily impressions and gestures – facially and manually – during face-to-face engagement and protoconversation (adapted from Bråten & Trevarthen 1994/2000; Bråten 2007c:104), and with added by cross section the approximate areas in which the mirror system is activated in the mother's brain.

(*Top*) In the lateral portrayal of the mother's brain are indicated crossed regions, including Broca's area, related to regions in which the mirror neuron system is activated, e.g., upon the mother's seeing the child grasping something and when she herself reaches forward with her hand to grasp (in line with the specifications afforded by Rizzolatti & Arbib 1998).

(*Bottom*) Cerebellum in outline with its anterior and posterior reversed somatotopical maps of body limbs (adapted from Ghez (1991) and Brodal (1995)). Could it be that cerebellum is not only involved in scheduling movements, but also plays a role by virtue of its two reversed maps in the mirror reversal required in face-to-face situations entailed by shifting from other-centred participation to body-centred execution of the grasping gesture being imitated? (cf. chapters by Billard & Arbib and by Bråten in Stamenov & Gallese (Eds) 2002).

## Can we read our partners' minds without access to a constructed theory of mind?

As to whether or not you understand or read your partner's mind unless you have a theory of the other's mind from which to draw inferences about what the other is intending, replies to this question in terms of the mirror neurons discovery will be returned to in Chapter 10. But let me anticipate: A yes-reply is voiced in a joint paper by Vittorio Gallese, one of the mirror neurons discoverers, and Alvin Goldman, one of the advocates of the simulation alternative to the theory-theory of mind version. Before turning to that, let me refer again to Gopnik (1993) who advocates the theory-theory version, pointing out that as children have difficulties in assessing their own mental states, the simulation version would be untenable. But then, this is not consistent with the simulation version. Only if you assume a "like me" stance, as does Meltzoff and Moore in their account of neonatal imitation, and think in those terms also with respect to simulation, i.e., I simulate my own state in order to understand your state, then her argument would be valid. But as another simulation version advocate has pointed out, simulation does not entail introspection or inferences from me to you (Gordon 1995); your state is simply being simulated. This issue was already brought up by Rommetveit in the middle of the 70's when referring to my conversation model of how conversational participants simulate one another's encoding and decoding (Bråten 1973ab), recounted below and in more detail in Chapter 10. He asked whether this entailed simulation of self or simulation of other in terms of individual differences as "characteristics of "autistic" as opposed to "other-oriented" communication" (Rommetveit 1974:59). The former would pertain to my asking "What would the other do in my shoes?", while the way in which I posed this question illustrating my model was this "How would I in his shoes…?" and which implies other-oriented simulation. And this is also radically different from a position in which I were to construct a theory of the other's mind and deduce inferences from that theory about what is now going on or being said.

Here the revealed mirror neuron system is pertinent in two respects. First, it certainly does not operate via conceptual or theoretical structures, but entails an immediate evocation of the matching mirroring in the participant perceiver, sometimes even accompanied by resonant muscle movements. Second, this is embodied simulation of what is occurring in the other, sometimes unwittingly evoked, and which allows me to grasp her or his mental state and intentions without being mediated by any conscious reflection or theoretical maneuvers on my part or from my own state of mind. That is why one of the discoverers of mirror neurons and one of the advocates of the simulation version find the mirror neurons discovery to support the simulation version (cf. Gallese & Goldman 1998).

But when they point to simulative prediction or account of mental processes in the other based on own state of matching resonance with the other's doings, and which is not self-referential or self-reflective, but may occur unwittingly, this has been interpreted by Vogeley and Newen (2002:136) to mean self-referential usage "of own mental state to predict or explain mental processes of others," unlike the theory version of theory of mind which is "independent from own mental states." On these interpretational premises Vogeley and Newen set out to explore through a functional magnetic resonance (fMRI) study the two alternatives, the self-referential simulation version (SST) seen to entail a self-referential mental state and the theory version (TT) devoid of any self-reference. The subjects were exposed to fifteen stories – some excluding and some inviting TOM (theory of mind), and some excluding and some inviting self-perspectives through the use of personal pronouns. If SST were assumed to be exclusively valid, the researchers reasoned, then "all mental states requiring TOM, irrespective of whether they were attributed to someone else or to oneself, should activate the same brain region" (p. 147). They found that mind-reading in the theory version sense based on activation in the anterior cingulate cortex seemed "to be the key structure for assigning a mental state to someone else" (p. 145), while the capacity to take a self-perspective, which the researchers associated with SST, was predominantly located in the area of the right temporo-parietal cortex (p. 147), found also in other studies to be involved in computing an egocentric reference frame. Vogeley and Newen find that their data reject both the theory version (TT) and their self-referral simulation version (SST) in this self-reflective sense. Suggesting a mixture of both they concede, however, that it

> "might well be, that this [mirror neuron] system represents a primitive version of simulation algorithm that is essential for mind-reading"
>
> (Vogeley & Newen 2002:147).

Their point about "a primitive version" concerns the essential difference between the theory version (TT) and the non-reflective primitive simulation version (ST). While TT entails deliberate and conscious theory inferences about the other's mind, ST in the unreflective sense of matching resonance occurs unwittingly by virtue of participant perception – not self-centred but other-centred and certainly not self-referential. It is pertinent that they find the anterior cingulate cortex to be activated both in the case of self-assignment and theory-of-mind mentalization. In Chapter 6 will be referred to studies indicating such an activation upon observation of pain in others.

## An early model of simulation of mind in conversation partners

But what about activation of simulation during verbal conversation, would that not require conscious reflection, such as for instance evoked upon suspicion of the other's

misunderstanding? Drawing *inter alia* upon Rommetveit's (1972) notion of the complementary nature of speech acts and upon my own laboratory and computer simulation studies of dialogues in the early 1970s, I submitted then a circular model (succinctly expressed in Figure 2.3) of how partners in conversation monitor and adjust their own coding activity by simulating the reverse coding process in the other (Bråten 1973ab, 1974). While preparing an utterance, the speaker monitors own encoding by simulating the listener's decoding, and while processing the utterance, the listener checks and adjusts own decoding by simulating the speaker's encoding process. Thus, ego's speaking is monitored by predictive participation in alter's listening, and ego's listening by postdictive participation in alter's speaking. This means that while engaged in the act of producing an utterance, there is a virtual processing of that utterance in the speaker, and while engaged in the process of analyzing the utterance heard, there is a virtual production of that utterance in the listener facilitating the listener's understanding. To avoid misunderstanding, the speaker sometimes wittingly predicts by simulation the listener's processing of the utterance and may thus come to arrest and modify herself in the midst of the utterance before any feedback is afforded by the listener to correct for the misunderstanding which may otherwise have been evoked by the aborted tentative utterance.

Simulation circuits may be pictured as in Figure 2.3. Here the talker's anticipatory simulation circuit predicting the listener's comprehension is marked '$C_{cosim}$', while '$F_{sim}$' marks the circuit by which the listener recreates by simulation the speaker's production. This, then, is a diagrammatic specification of the cybernetic simulation of mind model of how "ego's capacity for alter-oriented regulation" of own act or understanding by assuming the role or the attitude of the other (Bråten 1974:328). In the process of producing the intended contents the speaker moderates own production of F from (*) anticipatory simulation ($C_{cosim}$) of the decoding process in the listener who, in turn, when processing the comprehended content postdictory simulates (**) in the ($F_{sim}$) circuit the speaker's encoding resulting in the formulation F. Or, in current *theory-of-mind* terms of the simulation version (cf. Gallese & Goldman 1998; Harris 1992): the encoding involved in talking is monitored by predictive participation by way of simulating the listener's mind; and the decoding involved in listening is monitored by postdictive participation by way of simulating the talker's mind.

While producing the utterance there is evoked in the speaker implicit processing of that which will be heard, and while listening there is evoked in the listener implicit production of that which is being heard. The former is consistent with Mead's (1934) notion of anticipatory response, and the latter with Liberman's (1957) motor theory of speech perception, to which also Rizzolatti and Arbib (1998) refer in their keynote paper on 'Language within our grasp'.

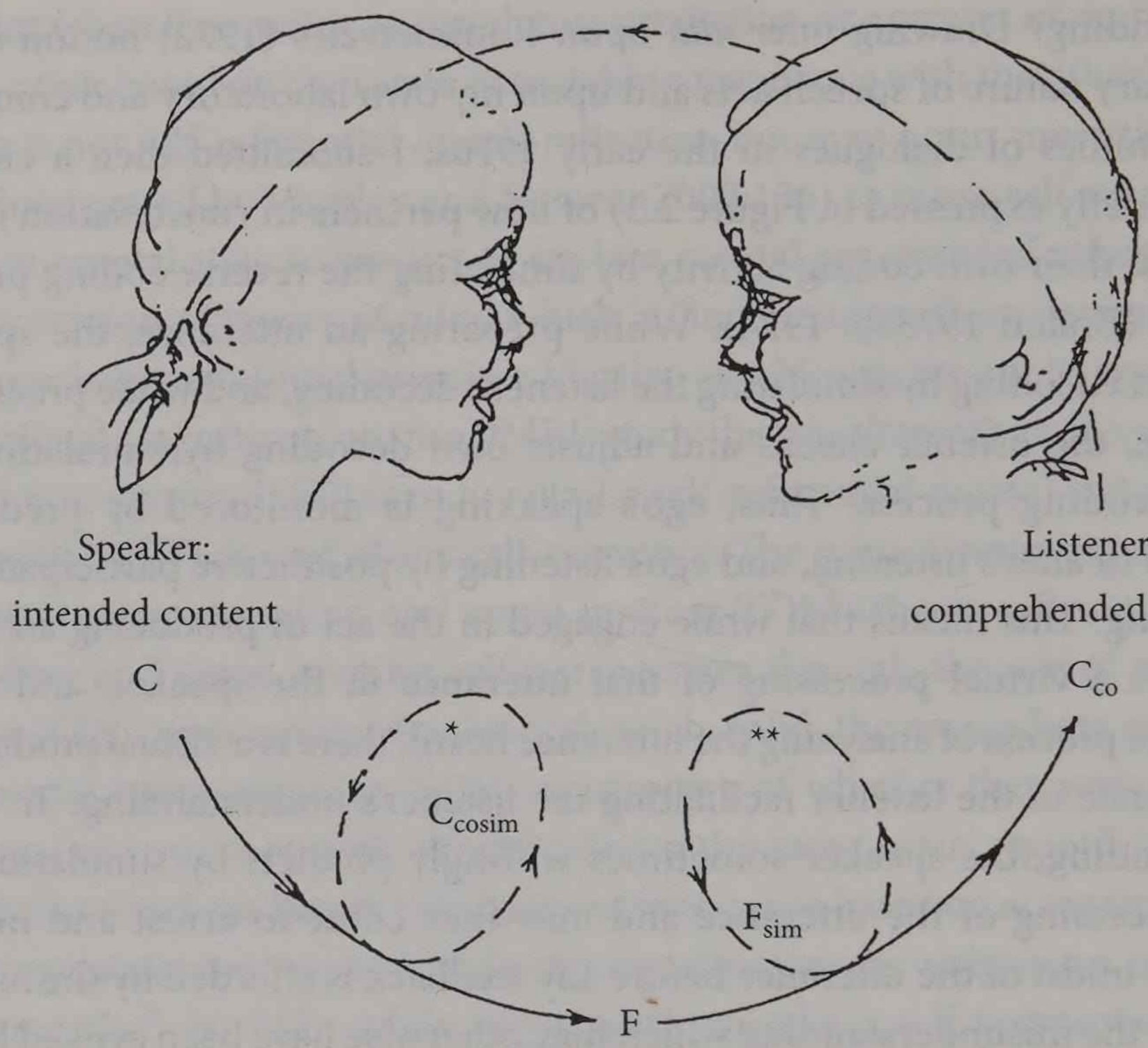



**Figure 2.3.** A simulation of mind model of speaker's and listener's virtual participation in one another's reverse activity (Bråten 1973ab, 1974), incorporating G.H. Mead's (1934) notion of anticipatory response and Rommetveit's (1972) consistent notion of the complementarity of speech acts, and being in line with a version of Liberman's (1957) motor theory of speech perception. While preparing an utterance, the speaker monitors own encoding by simulating the listener's decoding, and while processing the utterance, the listener checks and adjusts own decoding by simulating the speaker's encoding process as if being a virtual co-author. These circular simulation processes (broken elliptic arrows) need not be conscious and may be evoked independently of any external feedback about possible mismatch between intention (C) and comprehension ($C_{co}$).

(*Left*) The speaker regulates her utterance by simulating the listener's decoding of her utterance candidate F'. If the simulated listener-understanding ($C_{cosim}$) is consistent with the speaker's intention (C), her utterance is produced as F; if not, another utterance candidate may be attempted.

(*Right*) The listener regulates her own speech analysis yielding a tentative understanding (comprehend candidate $C_{co}$') by simulating the speaker's encoding, re-enacting the utterance production. If the simulated utterance ($F_{sim}$) matches the utterance (F) heard, then the comprehend candidate is admitted as comprehension ($C_{co}$).

Thus, as I would phrase it today, when you find yourself more or less unwittingly completing what your conversation partner is about to say, taking the other's stance in a shared symbolic code and culturally embedded situated context, your alter-centric participation in the producer's activity is probably subserved by a reso-

nant mirror system, entailing a virtual-alter mechanism preverbal in nature. Even though your partner is the initial author of the incomplete sentence being produced, it enables you to become a virtual co-author of your partner's production. This is sometimes behaviourally manifested, and may be heard by others, occurring frequently in daily-life conversations. Illustrations from a moral dilemma processing dialogue have been afforded by Bråten (2002:277–278) showing recorded instances of such completion of the other's utterance in laboratory situations even when a semantic perturbation has been imposed. Sentence-completion occurring during experts' conversation of safety measures for ships has been documented in light of the above model by Rosness (1999).

Even though higher-order semantic mechanisms were at play in these examples, this capacity to virtually participate in the other's reverse activity is also demonstrated by the preverbal mind, as will be documented in Part Three. And in Chapter 10 we shall see examples of sentence completion in the published conversations with Sartre by Simone de Beauvoir (1986) in *"Adieux"*, attesting to both of them sometimes being a virtual co-author of what the other is saying. Of course, such advanced feats of simulation of mind by competent speakers at the highest layer (III), presuppose the developmental nature-nurture helix from birth of interactional nurture and embodied capacities for cultural learning and language acquisition by participant perception. Playing one of the subserving operative parts already at the layer of (I) primary intersubjectivity, mirror neurons system can be expected to contribute and continue to play a prevailing and supportive part also at the higher-order layers II and III (cf. Fig. 3.1).

## Returning to the nature of mind-reading in the light of the mirror neurons discovery

In an interview with Gallese and myself (on mirror neurons systems implications) for the brain issue of *Impuls* (no. 4, 2004), the editors posed inter alia this question:

(Qi) Does the mirror neurons system offer a new heuristic tool for empirical examination of cognitive capacities, such as mind-reading, and how does it relate to the theory version vs. the simulation version?

With reference to the three layers of intersubjectivity specified by Bråten and Trevarthen (1994, 2007; cf. also the next chapter), I replied that mirror neurons systems support pertains more directly to subserve participant perception at the (I) primary and (II) secondary preverbal layers, than at the higher-order layer of (III) tertiary intersubjectivity. But I pointed out that the mirror neurons discovery invites examination of processes also at that layer which entails symbolic interaction and second-order mind-reading, and in particular with respect to the theory-of-mind

controversy on the theory version versus the simulation version. I referred to Gallese and Goldman (1998) who have shown that the mirror neurons discovery favours the simulation version. I had expected no less, having already in 1973 proposed the above cybernetic model of how conversational partners simulate one another's coding and understanding processes (Figure 2.3), and where I referred to Liberman's motor theory of speech perception congenial to implications of the mirror neurons discovery (cf. also Chapter 10, this book). Conversation partners manifest such simulation of one another's mind when they sometimes more or less unwittingly complete one another's unfinished utterances. That model anticipated the simulation version of Theory of Mind in an alter-oriented sense.

In his reply to the above question (Qi) about whether the mirror neurons discovery implied a new heuristic tool concerning questions about mind-reading, Vittorio Gallese replied that mirror neurons seem to suggest that we should not study social cognition exclusively within the frame of Folk Psychology.

> "Neuroscientific research has unveiled the neural mechanisms mediating between the multi level personal experiential knowledge we hold of our lived body, and the implicit certainties we simultaneously hold about others. Such personal body-related experiential knowledge enables our intentional attunement with others, which in turn constitutes a "shared manifold of intersubjectivity". This we-centric space allows us to understand the actions performed by others, and to decode the emotions and sensations they experience. A direct form of "experiential understanding" is achieved by modelling the behaviors of others as intentional experiences on the basis of the equivalence between what the others do and feel and what we do and feel. This modelling mechanism is embodied simulation. Mirror neurons are likely the neural correlate of this mechanism."
>
> (Gallese in Bråten & Gallese 2004:99).

By means of embodied simulation we do not just "see" an action, an emotion, or a sensation, Gallese pointed out. Side by side with the sensory description of the observed social stimuli, internal representations of the body states associated with these actions, emotions and sensations are evoked in the observer, 'as if' he/she would be doing a similar action or experiencing a similar emotion or sensation. Gallese went on to point out that it is an empirical question to be addressed by future experiments to which extent this embodied simulation mechanism is at work during more sophisticated forms of mind reading. In addition to embodied simulation there is another functional mechanism underpinning social cognition by virtue of explicit cognitive and reflective elaboration. While the bodily matching and simulation mechanism is probably the most ancient mechanism from an evolutionary point of view, the higher-order reflective mechanism affords a "detached" cognitive description of an external state of affairs. Gallese posited that

embodied simulation scaffolds such propositional, language-mediated mechanisms. When the former mechanism is prevented from being evoked or is malfunctioning, as perhaps is the case in autism, the latter can provide only a pale, detached account of the social experiences of others (cf. Gallese et al. 2004).

The latter point pertains to the autobiographical report of Temple Grandin (to be returned to in Chapter 11). She describes how she has to behave as a psychologist, trying to develop some theory about the workings of human minds. But she certainly lacks the ability to simulate others' minds. Instead, she has to run through in her head previous encounters with others as if re-playing a video in order to prepare for a future meeting. Baron-Cohen (1995:141) regards her description as giving us "a clue as to how successfully adapted individuals with autism may have managed to circumvent their mindblindedness". He is thinking in terms of the theory version of theory of mind, while others might rather consider their lack of lack of empathic identification and an impaired intersubjective mirror system to be more characteristic, and which may underlie the lacking capacity to simulate other peoples' minds.

## Questions about the relation between altercentric participation and we-centric space

When Vittorio Gallese replied in the interview to a question about imitation, he pointed out that its early and mature forms in humans share a basic feature, which is therefore independent of highly developed cognitive faculties:

> "What is common between a neonate replying to his mother sticking out the tongue with an equivalent behaviour on his side, and the skilled repetition by an adolescent of the piano chords as demonstrated by the piano teacher, is that both instances of imitative behaviour are only made possible by the capacity to circumvent the computational difficulties inherent in any type of interpersonal mapping, due to the different perspectival points characteristic of demonstrator and imitator. If I want to reproduce the behaviour of someone else, no matter how complex it is or whether I understand it or not, I always need to translate the personal perspective of the demonstrator displaying the behaviour I am supposed to imitate into my personal body perspective. The basic feature shared by early and mature forms of imitative behaviours is the presence of a shared, multimodal, we-centric, blended space."
>
> (Gallese in Bråten & Gallese 2004:103).

The above invites two questions: First, do I need to translate, as Gallese says, the personal perspective of the demonstrator I am imitating into my personal body-centred perspective? The answer is yes, in order for me to be able to execute the imitation which indeed requires my own body centred perspective for the executed re-enactment. What is translated then, is my other-centred perspective, supported by mirror neuron, which I entertain when watching the demonstrator. During

my perceiving the model, I am in her shoes, as it were, but when it comes to my bodily execution of the imitation, I have to put on my own shoes. I am replacing her shoes, into which I stepped in my participant perception, with my own, as it were, when imitating her, or more formally stated: through a frame-of-reference shift (cf. also Billard & Arbib 2002:346).

Second, would that which is termed by Gallese "we-centred space" differ from the immediate companion space in which You and I engage in mutual other-centred participation when having an intimate conversation? The answer is again yes. The distinguishing key words here are 'we-centred' versus 'other-centred'. When engaged in a shared, multimodal space, such as when attending a rock concert, dancing and singing with the others in the audience, or when joining in a community prayer within the closed walls of the assembly, the senses of You or I may be bracketed, while a strong we-centred feeling may indeed be the most prominent characteristic. This is what makes for the glue or cement of our group or tribe or national feeling, and which also easily invites an ethnocentric stance, excluding outsiders from our precious shared and blended space. Hylland Eriksen (2004:277–281) makes the point that in order to try to understand fear of aliens and alienation between people we have to realize that "the strong we-feeling" which begins and ends at certain places, where somebody is included and others are excluded, are based on deep learning and early identification. You do not find the other whom you can trust among those that behave strangely and differently. Those who behave in ways in which I cannot understand makes me uncomfortable, perhaps scared, and may invite alienation and discrimination. Cultural nurture and learning feed and give direction to our intuitive we-feelings, but then even learning by altercentric participation may come to invite discrimination of other, Eriksen points out:

> Learning by altercentric participation, as Bråten terms it, entails that one puts one self in the place of the other – at first literally, later virtually through inner dialogue. The voice of conscience belongs to no other than one's virtual other […] but what gives cause to worry about this perspective is that the fundamental other-orientation at the basis of self-consciousness and personal identity also tells us something about why groups often have such strict boundaries and [entertain] a sceptical attitude towards others.
>
> (Eriksen 2004:280–281, translated by S.B.)

Thus, Eriksen here suggests that the cultural nurture of altercentric feelings may pave the way for what Gallese describes as "the shared, multimodal, we-centric, blended space" which, however, by its very we-centric nature may come to invite sceptical attitudes towards outsiders even though this we-centric space is qualified to entail a "shared manifold of intersubjectivity". If this manifold is entertained in the sense of a manifold of perspectives there may be openings in the fence for letting in outsiders' perspectives. And, then, as Nakano (1995) has pointed out,

there is a concept of intersubjectivity in Japanese everyday life entailing the movement from one's *kokoro* (mind-and-heart) to the other's *jo* (emotion) within the space of "we" which these Japanese terms connotate. To this will be returned.

## When tongue muscles are activated upon listening to words

Can electrophysiological data on mirror neurons and motor representations afford clues to questions about the emergence of language if we assume a gestural origin? This question is posed by Fadiga and Craighero (2007). They report on experiments on how a system in human subjects motorically 'resonates' when the subjects are listening to verbal stimuli. Employing single pulse transcranial magnetic stimulation (TMS), they assess the excitability of motor cortex in correspondence of tongue movement representation, and by recording motor evoked potentials (MEP) from the anterior tongue muscles. They report on reactions in human subjects exposed to an acoustically presented randomized sequence of disyllabic word sounds and pseudo-word sounds which they were asked to attend. For control was used acoustic exposure to bitonal sounds without any word or pseudo-word form, but replicating their intonation pattern. The TMS stimuli were applied synchronously with double consonants – either /ff/ or /rr/ – of presented verbal stimuli (words and pseudo-words) and in the middle of the bitonal sounds. Results showed an increase of motor evoked potentials recorded from the listeners' tongue muscles when the heard word required strong tongue movements. Facilitation with respect to words listened to was found to be significantly larger than in the case of pseudo-words. The researchers point out that mirror neurons constitute the neural basis of a mechanism that creates a direct, nor-arbitrary link between the sender of message and its receiver, without any cognitive mediation. The results they report

> "indicate that the passive listening to words that would involve tongue mobilization (when pronounced) induces an automatic facilitation of the listener's motor cortex. Furthermore, the effect is stronger in the case of words than in the case of pseudo-words suggesting a possible unspecific facilitation of the motor speech centre due to recognition that the presented material belongs to an extant word."
> (Fadiga & Craighero 2007:106)

Fadiga and Craighero suggest that it is fruitful to seek to combine two complementary paths of research which have had different points of departure: the study of hand representations in monkeys and the study of representations of speech in humans. Speech as well as imagination of and preparation for hand movements activate the same area: the premotor region of the inferior frontal gyrus where Broca first localized the "frontal speech area". The presence of "audio-visual" mirror

neurons in the monkey and the presence of "speech-related acoustic motor resonance" in humans, indicate that independently of the sensory nature of the perceived stimulus, the mirror-resonant system retrieves the stimulus-related motor representations from action vocabulary (stored in the frontal cortex). A recent brain imaging study by Buccino et al. (2004) revealed that even observation of human silent speech activates the pars opercularis of the left inferior frontal gyrus, which is a sector of Broca's region (cf. also Ferrari & Gallese 2007:78). When an action done by an individual is transformed into a representation of the same action in the motor cortex of the observer, this creates, as emphasized by Fadiga and Craighero, a direct non-arbitrary link between two communicating individuals enabling understanding without any cognitive mediation. This is the basis for Rizzolatti and Arbib's (1998) proposal that the mirror-neuron system constitutes a critical neurophysiological mechanism in the evolution of language, enabling direct (action) understanding between participants in the first primitive dialogues.

This invites a return to the question about the possible relation between the percipient's understanding (C) of what the other is doing or saying and (M) the matching mirror resonance activation in the percipient; which comes first or is a prerequisite for the other:

> (M -> C) does the mirror neurons system activation facilitate comprehension of what the other is doing or saying, or
> (C -> M) is understanding of what the other is doing or saying rather a prerequisite for activation of a matching mirror resonance response?

These two alternatives need not be mutually exclusive, but may rather complement each other dependent upon further qualifying conditions Q (M -> C), (C -> M). Here is a proposed qualification: Yes, even though some sort of direct comprehension – in an immediate, but not reflective sense – of the other's move or of the object of that move is necessary for a matching mirror neurons response to be evoked, the actual mirror resonance will by virtue of participant perception give rise to an understanding in an operational sense of what the other is doing or saying. This is why the mirror neuron system is likely to afford neurosocial support even of imitative learning given model actions that are not too complex. One should point out, though, that while a mirror resonance match may be evoked in the learner during exposure to the model's act, the subsequent delayed and deliberate act of imitative re-enactment on the part of the learner does not entail that a matching mirror resonance is evoked during this delayed re-enactment. Whether or not participant perception of an exposed act is manifested by muscle activation, mirror resonance would occur concurrently or pre-actively with the exposed move – not retro-actively as in a willed subsequent re-enactment. But if imitative re-enactment is evoked it may draw upon the previously evoked mirror resonance.

## On mouth mirror neurons and imitation of gestures

In their report on mirror neurons and intersubjectivity, Ferrari and Gallese (2007) present monkey data profiles on mouth mirror neurons, i.e., lips-smacking neurons, on lips protrusion neurons, as well as on grasping and holding neurons. In one experimental series the experimenter grasps a piece of food with his teeth and holds it, and grasps with his hand and holds it. In another series revealing communicative mouth mirror neurons, the experimenter makes a lip-smacking action while looking at the monkey, and in another experiment protrudes his lips while looking at the monkey, who responds almost instantly by making a lip-smacking return action to the experimenter's gesture (cf. also Ferrari et al. 2003).

Some chimpanzee neonates have been found to imitate human facial gestures of tongue protrusion, mouth openings and a series of tongue clicks (Bard 1998; Bard & Russell 1999). While this tendency disappears after two month of age and face-to-face interaction is not actively encouraged by chimpanzee mothers, this is of evolutionary relevance. So what about macaque monkeys? Ferrari et al. (2006) have exposed macaque neonates at the age of 1, 3, 7 and 14 days to the experimenter's mouth opening, tongue protrusion, and hand opening, using the experimental methodology introduced by Meltzoff and Moore (1977). At the age of 1 week the macaque infants were found to imitate the gestures. In each exposure, for example of tongue protrusion, the human model repeated the gesture 7 or 8 times in a period of 20 seconds. When the monkey responded by protruding its tongue, no other movements with hand or mouth were recorded. While imitation was recorded at 1 week of age, this tendency disappeared soon thereafter (Ferrari & Gallese 2007:81). But again, as in the case of chimpanzee neonates, even though these imitative tendencies were elicited by human models and fail to be manifested later in ontogeny, they may suggest a latent capacity which came to be fully exploited by homo sapiens, and most likely by hominids (cf. Chapter 6). Pointing to the likely "crucial evolutionary force" of early imitation, Ferrari and Gallese suggest that neuroscience should explore more in depth the question of whether the mirror neurons matching system is confined to action understanding or whether the system affords neurosocial support of altercentric participation:

> "…what the data on early imitation seems to suggest is that in some species of primates the newborn is capable of tuning his/her behaviour with that observed by another individual. The sensory-motor system is already set to be coordinated with someone else's experience in a participatory sense. The 'alter-centred participation' is one the tenets of the "primary intersubjectivity" model (Bråten 1998). According to this model, in fact, infants have a whole set of capacities to attune their minds with those of others. The result of this attunement is that of

> sharing the first- and third-person experience. This (probably) innate capacity to enter and participate in others' experience could be served by a neural mechanism such as that of the mirror neurons."
>
> (Ferrari & Gallese 2007:81–82).

The mirror neurons system is the most likely candidate for the major neurosocial support of altercentric participation. However, as we shall return to, in face-to-face imitation of object-handling and in face-to-face learning by altercentric participation, mirror reversal is also involved. Shifts from the altercentric frame of reference evoked upon participant perception of the model, to body-centred frame of reference required for own execution of the imitated act, may involve inter alia the *cerebellum* (as I first voiced at a seminar 2000 which Gallese invited me to give at the Human Physiology Institute in Parma – the site of the mirror neurons discovery.)

At the Delmenhorst symposium the same year, Billard's and Arbib's computational model of learning by imitation provided another example: they had to implement a frame of reference shift from what they termed "eccentric" (when the learner perceives the arms raised by the model) to an egocentric frame (when the learner executes imitative re-enactment of such arm raising) (cf. the chapters by Bråten and by Billard & Arbib in Stamenov & Gallese (Eds) 2002:173–94; 343–52). This pertains to the following question.

Why is imitation in face-to-face situations more difficult than when sitting side by side?

Only in pathological cases, and cases of biological impairments, would there be confusion of own (self-centred) processes of production and understanding with processes of re-enacting or simulating the other's movements.

At the Theory Forum symposium in Oslo 1994, Whiten and Brown presented instances of imitation failures by subjects with autism when trying to comply with the model's request 'Do as I do!" in face-to-face situations. When imitating raising arms, for example, some of the subjects with autism do so with their palms inward (the opposite of what the model is doing), inviting an account in terms of failure of other-centred participation (cf. Bråten (Ed.) 1998:114–117; 260–280).

When the infant learner is participating as a virtual co-author of the observed model's motor act, this entails activation of an altercentric frame of reference on the part of the learner. When the learner subsequently is to imitate that act, which means a full scale execution by the infant, drawing upon e-motional memory of having been a co-author, the infant would have to shift to an egocentric proprioceptive frame of reference in order to allow for full scale execution of the imitative re-enactment. The subserving mirror system plays a part, both when the altercentric frame pertains to the perception of the model act and when the

mirror resonance is drawn upon by the egocentric frame of reference pertaining to the re-enactment of that act.

If the learner (Ego) is learning by imitating the model (Alter), then I would say that (i) in face-to-face situation this entails perceptual mirror reversal of Alter's enactment, (ii) evoking participant perception of Alter's movements as if Ego were a co-author and operating in terms of Alter's frame of reference; (iii) giving rise to a shared vitality (affect) contour, reflecting the manner in which Alter's enactment is felt to be virtually co-enacted, and (iv) which leaves the learner with an e-motional memory that (v) enables circular re-enactment of the model act.

Thus, in order for such a circular re-enactment to be executed in full scale by the learner, the learner has to shift back from an alter-centric frame to an ego-centric frame of reference for his proprioceptively guided execution of a semblant act. I have suggested that supplementing the mirror neuron system, cerebellum – with its bodily maps both in frontal and reverse direction (cf. Fig. 2.2 (bottom)) – may play a part in such mirror reversal in face-to-face situations.

The latter is what is demonstrated by the frame of reference shift from "eccentric" to "egocentric" in the Billard-Arbib model, previously referred to. Another pertinent feature of that model is its inclusion of a cerebellum module in addition to primary, premotor and temporal cortex, and such that the learning of new combinations of movements is modelled to be done in the premotor cortex and in the cerebellum modules, pertaining specifically to temporal move sequences. This relates to a question about cerebellum raised in my seminar talk in Parma concerning its potential role in a bodily frame of reference transformation. We know that spinocerebellum subserves adjustment of own body-centred ongoing movements. This may entail body mapping in two different areas, the anterior lobe and the posterior lobe, of the spinocerebellum cortex. Two different somatosensory maps of the body appear to be involved, inverted relative to one another: One in the anterior lobe with feet forward and face extended backwards, while the other with a forward and possibly divided mapping of the head and limbs. Thus we may ask: May the cerebellum also be involved in altercentric mirroring, in particular, in the mirror reversal entailed by transformations between ego-centric and alter-centric frames of references? If that be the case, then perhaps cerebellum impediments might be expected to be found in autism, and along with that, mirror neurons system perturbations? I ventured such a suggestion in a note to the Delmenhorst proceedings: "when electrophysiological equipment will be improved to allow for measurement in persons interacting face-to-face there will be little or no matching [resonant mirror neurons] response in subjects with autism." (Bråten in Stamenov & Gallese (Eds) 2002:290n). In Chapter 11 will be returned to the topic of autism entailing biological breakdown of participant perception and mirror neurons support.

CHAPTER 3

# Introduction to child's steps to speech in ontogeny and questions about cultural evolution

In the last decades some of the story of human infancy and child development has been re-written, as has been indicated, replacing earlier theoretical views of infants as a-social and ego-centric with a new understanding of infant capacity for inter-personal communion from the outset. Human newborns' readiness to mirror facial expressions and gestures, and young infants' impressive speech perception attest to highly efficient mechanisms at play during their exposure to and interplay with language-using companions, facilitating the path to spoken language acquisition and conversation in the culture into which the child is born. For example, as documented inter alia by the contributors to the source volume on *Intersubjective Communication and Emotion in Early Ontogeny* (Bråten (Ed.) 1998:15–88, 105–143, 297–335):

- *1-hour-olds* can imitate some distinctive facial gestures, and even attempt to imitate the vocal sound /a/ (Kugiumutzakis 1998);
- *by 6 weeks* they can fully engage in reciprocal protoconversation (Murray 1998, Trevarthen 1998);
- *by 6 months* infants have begun to turn a "deaf ear" to sound distinctions that do not make sense in the ambient, native language (Kuhl 1998; cf. also Conboy & Kuhl 2007);
- *11-month-olds* can show care and reciprocate caregiver's spoon-feeding, showing by their mouth movements that the reciprocating infants also take a virtual part in the other's intake of food by virtue of their altercentric participation (Bråten 1998a);
- *18-month-olds* appear able to "read the intention" of others failing to perform an intended act (Meltzoff & Moore 1998), and soon begin to combine words to predicate linguistically, e.g., "Doggy Wet"; "Ball Roll" (Akhtar & Tomasello 1998);
- *three year olds*, when listening to a fairytale, take the protagonist's stance, identifying by virtue of an altercentric mode (Harris 1998), and children at that age across cultures afford prosocial nurturance to younger ones (Edwards 1998).

## From primary intersubjectivity, as defined by Trevarthen, to speech and mind-reading

Today, based on recent empirical findings, such as listed above and in Table 3.1, we are able to distinguish different layers of intersubjective attunement in early human development, arising from the foundations of infant intersubjectivity which Trevarthen was the first to define in the 1970's. Protoconversation in mutual attunement soon after birth attests to *primary intersubjectivity* (Trevarthen 1979). Around 9 months of age joint object-oriented attention and manipulation signify the onset of *secondary intersubjectivity* (Trevarthen & Hubley 1978). When verbal conversation is beginning to unfold from 18 months or so we now speak of the onset of *tertiary intersubjectivity* which later – between 3 and 6 years of age – gives rise to a second-order layer entailing reading of conversation partner's mind (Bråten 1998b; Bråten & Trevarthen 1994/2000; 2007).

These intersubjective layers affording steps in ontogeny to speech and simulation of mind will be spelt out in detail in part III. As illustrated by Figure 3.1, they are not stages in the sense of Piaget, with earlier stages discarded as higher-order stages emerge. The primary and secondary layers of intersubjectivity remain operative throughout life, supporting the first and second order layers of tertiary intersubjectivity. This is in line with the "staircase logic" introduced and applied by Stern (1985/2000) to the various senses of self in ontogeny, to which we shall return and relate to primary and higher-order consciousness. But first, let us succinctly specify the various intersubjective layers or steps.

### (I) Newborns' imitation and protoconversation in the first weeks and months

Most parents and caretakers have experienced how their babies in the first months of life appear to complement them in a finely tuned interplay of mutual fulfilling and follow-up of gestures and expressions. Even in the first weeks after birth mother and child can achieve such coordination of expressions and movements in a sort of circular dance of mutually completing and inter-woven bodily motions. There is a primary intersubjective attunement in a reciprocal subject-subject format of protoconversation and interpersonal communion, in which participants attend and attune to the emotive expressions and gesture- and sound-producing movements of one another, inviting semblant re-enactment and affect attunement, beginning soon after birth and preparing for and supporting higher-order competencies later in life. For example, pertaining to vocal imitation and speech development, some 45-minutes-olds may attempt to imitate /a/, and 20 weeks-olds /a/, /u/ and /i/); at 6 weeks or earlier infants engage with adults in reciprocal protoconversation, and in speech perception infants are beginning to 'prune' sounds from their perceptual space that make no sense in the ambient language.

**Table 3.1.** Intersubjective layers in ontogeny and some pertinent findings allocated to the various layers, constituting steps from protoconversation to verbal conversation and mind-reading

| Intersubjective layers or steps | Examples of findings giving rise to a new paradigm |
|---|---|
| *Primary intersubjective attunement* in a reciprocal subject-subject format of protoconversation (Trevarthen 1979) and interpersonal communion, entailing a sense of self-resonating-with-another (Stern 2000), exhibited in the first weeks and months of life (cf. Chapter 7, this volume), announcing the kind of mutual mirroring and turn-taking which we find also in mature verbal conversation | ***1-hour-olds*** can sometimes imitate some distinctive facial gestures, and even attempt to imitate the vocal sound /a/ (Kugiumutzakis 1998); ***an 11-days-old*** at the nursing table can engage in a dance-like interplay with the attending mother (Bråten 1998b) and by *6 weeks* infants can fully engage in reciprocal protoconversation (Murray 1998; Trevarthen 1998); ***6-month-old*** infants have begun to close their perceptual space to sound distinctions that do not make sense in the ambient, native language (Kuhl 1998) |
| ***Secondary*** *intersubjective attunement* in a *triangular* subject-subject-object format (Trevarthen & Hubley 1978) involving shared attention and altercentric participation (Bråten 1998a) in the object-oriented movements of one another (cf. Chapter 8, this volume). Like social referencing, such object-oriented cultural learning opens for semantic learning, entailing a sense of verbal self (Stern 2000), and is precursory of mental simulation in verbal conversations to come | ***9-month-olds*** are capable of deferred imitation of object-manipulation after exposure to the experimenter's face-to-face demonstration the day before (Meltzoff 1988), and can appreciate one another as intentional and object-manipulating agents (Tomasello 1999) ***11-month-olds*** can show care and reciprocate caregiver's spoon-feeding (Bråten 1996; 1998ab). ***18-month-olds*** appear able to "read the intention" of others failing to perform an intended act, such as the experimenter's failing to pull a dumbbell apart (Meltzoff & Moore 1998, which they see to be precursory to the theory-version of Theory of Mind) |
| ***Tertiary*** *intersubjective understanding* (Bråten & Trevarthen 2007) in narrative speech and during conversation, entailing predication (from about 18–24 months), a narrative self (Stern 2000) (from about 3 years of age), self-conversation (with their virtual other or an evoked companion) (cf. Chapter 9, this volume). | ***24-month-olds*** have begun to combine words to predicate linguistically, e.g., "Doggy Wet"; "Ball Roll", and engage in linguistic conversations (Akhtar & Tomasello 1998); ***3-to-4-year olds*** engage in emotional absorption in fictional others, identifying with the stance of the main protagonist when listening to fairytales (Rall & Harris 2000). They soon become able to understand others' (mis)understanding by virtue of inferences from a theory of mind (Gopnik & Welman 1992; Leslie & German 1995) or by mentally simulating others' minds (Goldman 1992, 2005; Gordon 1986, 1995; Harris 1991). Such narrational and emotional absorption and simulation of mind are manifested by conversation partners who complete one another's statements as if being virtual co-authors (Bråten 1974; 2002, 2007) |
| *Second-order tertiary intersubjectivity* entails meta-understanding of others' minds and emotion (Astington et al. (Eds) 1988; Whiten (Ed.) 1991) and simulation of conversation partners' minds (Bråten 1974, 1998b, 2002) (cf. Chapter 10) | |

In the first weeks after birth infants have been documented by experimental studies to imitate a variety of gestures, such as tongue protrusion, brow motions, and head rotation, finger movements, gestural features used to express surprise, delight and boredom, and vocal (vowel) productions. Most dramatic is perhaps the 1982 video documentations by Kugiumutzakis (1998:74) of how neonates in the first hour after birth attempt to come up with a semblant response, matching his mouth and brow gestures. Inviting even vocal imitation, respectively, of the sounds /a/, /m/ and /ang/, newborns, ranging from 14 to 42 minutes of age, tried to produce a matching /a/, while failing with respect to other sounds. Trying hard to emit the sound, accompanied by stretching hand movements and closed eyes, the result was usually an intense explosion of a prolonged and unstructured /a/-sound. By the way, when I show Kugiumutzakis' video record on the screen to an audience, for example, of a 20 minutes old girl exposed to his wide mouth opening preparing to imitate him, some people in the audience reveal by their own wide mouth opening their virtual participation in what the newborn is trying to do, as if unwittingly coming to her virtual aid. This is not imitation but anticipatory pre-moves on the part of the audience manifesting other-centred participation. Such manifestations were mentioned in the previous chapter in connection with infant feeders opening their own mouth as they put the food in the patient's mouth. This is anticipating pre-enactment, while their act of reciprocating spoon-feeding is imitative re-enactment attesting to their having learnt to spoon-feed another.

Exposure to speech will come to invite attempts at imitation and covert re-enactment. But before that the young infant learner has already begun to exclude potential sounds that make no sense in the ambient language to which the infant has been exposed. In her studies of early speech perception, Patricia Kuhl has demonstrated by a number of comparative experiments how infants by 6 months have begun to narrow their perceptual space – first to vowel and second to consonant sound distinctions that make no sense in the native tongue exposed to. For example, infants from the US and Sweden were tested with two vowel prototypes, the /i/ in English (as in "peep") and the /y/ in Swedish (as in "fye"). American infants treated the Swedish /y/ as a non-prototype, while Swedish infants showed the opposite pattern. With respect to consonants, the phonetic units /r/ and /l/ in English are not distinguished in Japanese and, hence, invite a more narrow perceptual map. But what about prolonged bi-linguistic exposure, may that prevent narrowing? Kuhl has demonstrated that nine-month-olds open up and pay attention to a second language if being exposed to live interaction, but not if those foreign sounds are mediated by tape only (cf. also Conboy & Kuhl 2007).

Kuhl points out that as infants listen to speech they appear to include more than the auditory characteristics; "the infants store 'polymodal' aspects of speech – the

auditory and visual speech they experience, and the motor patterns they themselves produce." (Kuhl 1998:300). She suggests that infants acquire a life-long native-language accent *inter alia* by virtue of an innate link between perception and action, extending the influence of linguistic experience beyond perception to the motor patterns acquired in speech. If that is the case, then this may perhaps invite a specification in terms of learning by altercentric perception of ambient speakers and virtual participation in their speech production. Once established, Kuhl points out, the perceptual and perceptual-motor system underlying speech is difficult to alter. This would somehow entail that the learner, perhaps even the pre-verbal learner, be capable of altercentric perception of and participation in the sound-producing movements of the ambient speech performers. The capacity revealed by vocal imitation in infants may be precursory to such participant perception.

This kind of learning can hardly be accounted for in terms of perspective-taking in a social-cognitive sense, but rather in an e-motive and participatory sense of more primitive subjective experience evoking temporal *feeling flow patterns* that are shared by the speaker and the learner. The same applies to object-oriented learning by imitation pertaining to secondary intersubjectivity.

### (II) Object-oriented learning by altercentric participation and reading of intention

Secondary intersubjective attunement in a triangular subject-subject-object format involves shared attention and participation in the object-oriented movements of one another. Beginning to evolve between 6 and 9 months of age with co-operative use of objects of joint emotional referencing this invites circular re-enactment: learning by imitation to manipulate objects and to reciprocate caregivers' acts such as learning to spoon-feed another, such as demonstrated by 11-month-old infants featured in the previous chapter. Photo records presented in this volume (Figure 8.2) and elsewhere do not just illustrate their learning capacity. As we saw from Figure 2.1, each of the infant feeders opens their own mouth as the recipient of food opens her mouth, and one of them even tightens own lips as the recipient takes in the afforded food by closing her mouth (Bråten 1996, 1998/2004, 2007:116; Eibl-Eibesfeldt 1979, 1997). So, here we see demonstrated that while the infants are feeding their caregiver, they manifest by their mouth movements that they also take a virtual part in their caregiver's intake of food as if they were co-authors of her eating. This we term 'other-centred participation' or altercentricity (Bråten 1998a; Stern 2004) – the very opposite of the egocentricity that Piaget (1926/1959) attributed to the child as point of departure for cognitive development and acquisition of language.

Around the middle of the second year toddlers demonstrate object-oriented competence to virtually participate in and even simulate the completion of the other's

act. For example, an 18-month-old in Meltzoff's (1995) behavioural re-enactment design successfully realizes and (re)enacts a novel target act from watching a model failure (Meltzoff & Moore 1998; cf. also Meltzoff & Brooks 2007, and Figures 8.3 and 8.4, this volume). Here is demonstrated the child's capacity to "read the model's intention" (Meltzoff & Moore 1998:50–52). But more is involved, and which may be specified in terms of altercentric participation: From having virtually participated in the model's effort, evoking simulated completion of the attempted act, there is circular re-enactment by the child, successfully realizing the target act. These toddlers – perhaps feeling to be of help – show that they can realize the unrealized target from merely watching someone aiming for the target, from e-motional memory of mental simulation circuits evoked by altercentric participation.

Irrespective of how we differ in our interpretation of the outcomes of Meltzoff's behavioural re-enactment experiment, to be returned to in Chapter 8, we may agree on this: here is demonstrated precursory processes on the path to mental simulation or theory of mind which we find in children from between 3 and 6 years of age. While Meltzoff conceives of this as cognition reading of intentions paving the way to construction of theory of others' minds, which allow for cognitive inferences about the thoughts and feelings of others, an alternative way is to see this as inner simulation preparing the way for simulation of the intentions and understanding of others also in verbal conversation by virtue of identifying with others in an altercentric manner.

### (III) Listener's altercentric perception and interlocutors' simulation of one another's act

The age of about 24 months entails the beginning of conversational and narrative speech, and the emergence of a sense of verbal or narrative self and other in first-order modes of symbolic communication entailing mental understanding of activities of self and other in virtue of mental co-enactment of activity intended or pretended. We see the beginnings of symbolic conversation, and self-recognition in mirrors, the use of personal pronouns "I", "my", "mine". There occurs spoken predication of object characteristics ("[car] – broken"); joint pretence ("me – Daddy") ([banana] – "mobile"). From about 3 to 6 years of age, then, is manifested meta-understanding of other's understanding entailing *second-order* mental understanding of thoughts and emotions in self and other in virtue of recursive mental simulation of mental processes in others – beginning with discovery of deceit and attribution of false beliefs, and with co-narrative fictional constructions with peers, and enabling the child listening to a story to take the point-of-view of the main character. For example, in an Oxford study, Jamie Rall and Paul Harris (2000) find that when 3- and 4–year-olds are asked to retell fairytales, say about Cinderella, they manage best

when the verbs in the stories listened to are consistent with the stance of the protagonist with whom they identify, inviting their altercentric participation in 'Cinderella's slippers', as it were. The children have trouble when the verbs in the stories told are used from the reverse perspective, at odds with their perspective-taking. On the basis of experimental story recall studies, including their own studies at Oxford of 3- and 4-year-old children's recall of 'Cinderella' and 'Little Red Riding Hood', Rall and Harris make this suggestion: Finding that recall is more accurate for verbs, such as 'come' and 'bring', 'go' and 'take', if used *spatially consistent* with the point-of-view of the main protagonist, they state

> "[it] would be plausible to conclude that listeners engage in what we might call 'altercentric participation' (Braten, 1998). This would allow us to make sense of the fact that listeners not only encode movements and location in relation to the protagonist, they also anticipate the emotional implications of impending events" (Rall & Harris 2000:207).

This pertains to the qualitative leap to children's simulation or theory of mind, correlating with their verbal and conversational ability and entailing understanding of others' thoughts and emotions by virtue of second-order (meta)representations, from about 3 to 6 years of age (Astington, Harris & Olson (Eds) 1988; Bråten 1974; Goldman 1989; Gordan 1986; Harris 1991; Whiten (Ed.) 1991). This kind of second-order mental understanding of others' minds, entailing simulation or theory of mind, may begin with the discovery of deceit and attribution of false beliefs to others. Pertinent to this level is also G.H. Mead's account, referred to in Chapter 1, of how a gesture is symbolically significant when the individual, making the gesture, anticipates the other's response by calling up that response in herself or himself. Interaction with significant others gives rise to role-taking in play, and to the formation of the "generalized other" that enables perspective-taking in symbolic and representational mediacy. Furthermore, his account of how role-taking enables the actor to modify his act by calling up in himself the other's response, may be seen to pertain to a precursory of the ability to imagine mental processes in others and simulate other minds (Harris 1991; Rall & Harris 2000). When conversation partners sometimes spontaneously complete one another's sentences this reveals their participant perception and simulation of one another's intention (Bråten 1973ab, 2002), and when they attune to the immediate attunement of one another (Rommetveit 1998, 1974) this also reveals that a primary intersubjective mode is concurrently at play.

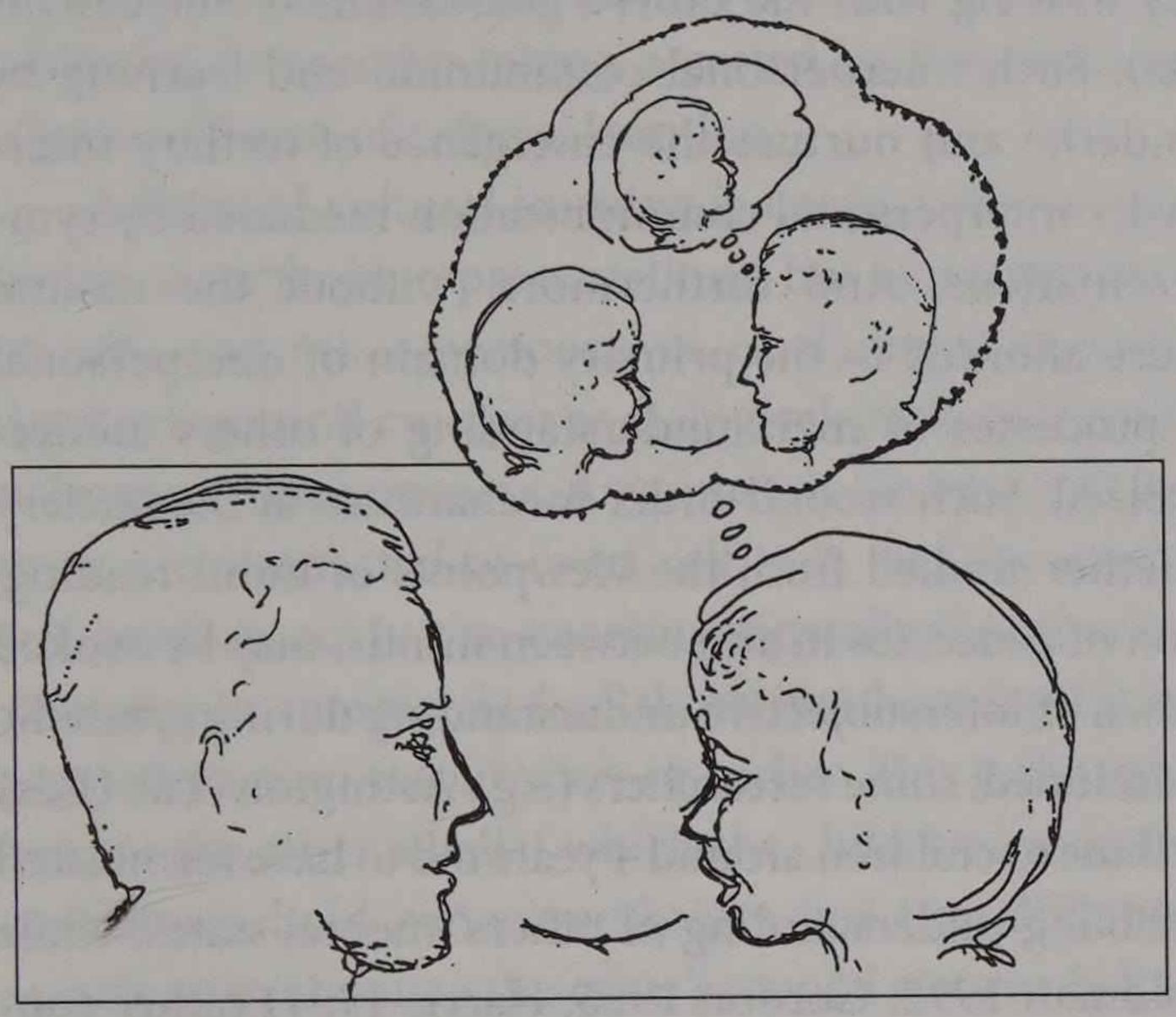
As pointed out in the previous chapter, it seems reasonable to assume that a mirror system for matching or simulating others' acts may afford a precursory and nurturing path to simulation of other minds (cf. Bråten 1998ab; Bråten & Gallese 2004; Gallese & Goldman 1998), and that such preverbal capacity for virtual participation in what others are doing is likely to support the kind of inner feedback

loops defined by Bråten's (1974) conversational simulation of mind model, illustrating how dialogue partners simulate one another's verbal production and understanding (cf. Fig. 2.2). Featured in the previous chapter, this is the first model to articulate the simulation version of theory-of-mind approaches in psychology and philosophy. This seminal model was *inter alia* based upon Mead's (1934) notion of anticipatory response and computer simulations of dialogues recorded in the laboratory (Bråten 1971).

With respect to the theory-of-mind controversy on the theory version versus the simulation version, Gallese and Goldman (1998) have shown that the mirror neurons discovery favours the simulation version, as pointed out in the previous chapter. This is consistent with this model of how conversational partners simulating one another's speech production sometimes more or less unwittingly complete one another's unfinished utterances. When looking for examples of such sentence completion, it is not difficult to find records of such occurrences, including examples in the published conversations with Sartre by Simone de Beauvoir (1986) in "*Adieux*" (to be turned to in Chapter 10) attesting to their participant perception and their being a virtual co-author of what the other is saying. While mirror neurons systems support, however, pertains more directly to subserve participant perception at the (I) primary and (II) secondary preverbal layers of intersubjectivity, it affords a heuristic tool for examining processes also at the tertiary layers (III.1 and III.2).

Returning to primary intersubjectivity, as illustrated in Figure 3.1, the capacity to enter into an engagement of feeling with others in a direct, non-reflective sense as manifested in early infancy has bearing for cultural learning. Normal human infants engage actively and effortlessly in mutually attuned affective contact with adults (Stern 1985; Trevarthen 1990a). Even in peer contact, when opportunity arises, 3-month-olds have been found to engage in reciprocal gazing, smiling, vocalization, and sometimes reaching for each other (Field 1990). Such capacities, indicative of sociality from the outset, may be allocated to the first of several steps in early communicative development, and which continues to underlie and support higher-order abilities later in life. We have already referred to a form of cultural learning operative in the preverbal infant soon after birth and, hence, differing from advanced learning by the verbal mind with access also to symbolic descriptions, conceptual representations and declarative memory. This is the documented results of early speech perception which Kuhl (1998) has reported: how infants during the first 6 months of life learn to tune their speech sound perception to the music and sounds that make sense in the native language of the culture into which they are born, discarding sounds that make no sense in that language (cf. also Conboy & Kuhl 2007).

Another example of early cultural learning at the secondary layer of intersubjectivity is afforded by the recordings of how 11-month-olds can reciprocate

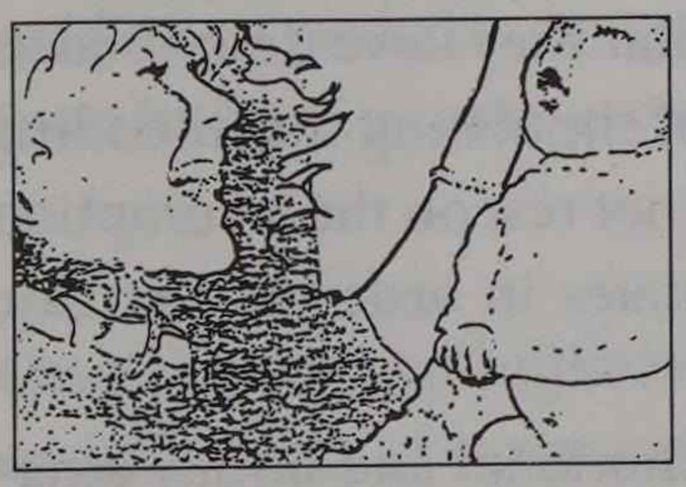


III.2: Second order tertiary intersubjectivity entailing meta-understanding of others' (mis)understanding and simulation of others' mind, including other-centred participation in what the other is about to say as manifested, for example, when the child completes the other's unfinished statement as if the child were a virtual co-author.

III.1: Tertiary intersubjectivity (first order) entailing verbal predications and narratives and opening for engagement in symbolic interaction and understanding of the conversation partner's meaning and intentions by virtue of a shared symbolic world and participant perception of the accompanying gestures or tonality patterns inviting shared vitality contours that make sense and invite attuned response



II: Secondary intersubjectivity entailing object-oriented joint attention and imitative learning, such as demonstrated in Meltzoff's deferred imitation experiment (right) in which the infant and the instructor face one another requiring mirror reversal for the infant's re-enactment to occur, unlike the physical hand-guidance in the Bali case (left) permitting re-enactment without any mirror reversal



I: Primary intersubjectivity entailing mutual attunement in the interpersonal communion of non-verbal protoconversation announcing the kind of mutual mirroring and turn-taking that we later in life find in verbal conversation, mutual dance-like interplay between newborn and care-person may occur in the first weeks (illustration of an 11-days old girl at the nursing table is based on photo records in Bråten 1998/2004:39); newborns' imitation of facial gestures have been demonstrated even in the first hour after birth

**Figure 3.1.** Intersubjective layers or steps operative throughout life, with the lower order layers supporting higher-order layers (after Bråten 2007c:147; Bråten & Trevarthen 1994/2000, 2007).

(*Bottom*) Primary intersubjectivity (I) operates almost from birth and throughout life (cf. photo records in Figure 1.2, this book).

(*Middle*) Secondary intersubjectivity (II) begins about 9 months of age (The left drawing is based on Gregory Bateson's photo from Bali (in M. Mead's appendix to Darwin 1955). To the right, Meltzoff invites deferred imitation of a nine-month-old sitting on mother's lap.

(*Top*) Tertiary intersubjectivity of first order (III.1) with verbal conversation beginning around 18–24 months of age, while the second order step (III.2) from around 3–6 years of age entails *inter alia* understanding of misunderstanding and reading conversation partners' minds.

their caregivers' spoon-feeding, having learnt to do so by virtue of their altercentric capacity to learn by virtually moving with the other's goal-oriented movements (Bråten 1996a, 1997a, 1998a). Such interpersonal communion and learning by altercentric participation underlie and nurture the emergence of tertiary intersubjectivity entailing first-order interpersonal communication mediated by symbols and conceptual representations. And furthermore, without the natural capacities and cultural nurture afforded in the primary domain of interpersonal communion, second order processes of meta-understanding of others' understanding could hardly be realized. Such second-order mechanisms at the tertiary layer of intersubjectivity, whether studied from the viewpoints of mind-reading, theory-of-mind, or simulation of processes in and between minds, may be evoked in this domain upon breakdown of intersubjective understanding during symbolic conversation. As has been mentioned, some researchers (e.g., Astington et al. (Eds) 1988; Whiten (Ed.) 1991) attribute to children around 4 years old to have formulated a theory of others' minds enabling understanding of others' mental states, while others (like Bråten 1974; Goldman 1992; Gordon 1986; Harris 1991) rather consider children or adults to use their imagination to mentally simulate others' thoughts and emotions.

While finding "theory-of-mind" findings useful, Tomasello et al. (1993:502) prefer the simulation-of-mind account. So does one of the discoverers of mirror neurons, Vittorio Gallese, who has written an article to that effect with one of the proponents of the simulation version, Alvin Goldman (Gallese & Goldman 1998). As previously referred to, they point out that what they have described as perspective-taking could easily be described in terms of simulating the intending and thinking of another person, provided that this does not rest on the assumption that children have to understand their own mental states in order to simulate those of others.

However, as has been indicated, there are socio-emotional and bodily altercentred processes that are not just precursory, but continue to underlie and play a role also in such higher order circular self-other processes. Altercentric participation in the other's movements has been described in terms of a virtual other mechanism which complements the infant's bodily self-feeling. This operational notion affords an explanatory account of the bridge between intra- and inter-personal processes in the various intersubjective domains listed in Table 3.1 and portrayed in Figure 3.1: (I) The virtual other mechanism allowing the bodily self to be complemented in felt immediacy by the actual other in primary intersubjectivity, (II) enabling becoming a virtual co-author of the actual other's object-handling in secondary intersubjectivity, and – given culturally shared codes and symbol-processing abilities – (III.1) allowing for altercentric perception and completion of the interlocutor's intention in first-order domain of tertiary intersubjectivity and – with the advent

of mental simulation capabilities – (III.2) support mental simulation of the other's mental processes in the second-order domain. This, then, provides a clue to advanced modes of perspective-taking, asserted by Tomasello et al. (1993) to be required in advanced forms of cultural learning.

Advanced cultural learning is not just characterized by perspective-taking in virtue of symbolic representations, but by recursive mental symbolic simulations of self- and other-perspectives in dialogue (Bråten 1973a, 1982b; 1988). The developing mind emerges as dialogical, perhaps the unique operating characteristic of human consciousness. Asymmetric (instructed) learning in which the instructions are re-enacted in overt self-talk, and the evocation of internal dialogue as self-guiding, not just re-enacting mentally the other's instruction, but co-creatively engaging in symmetric (collaborative) learning (Tomasello et al. 1993), occur in peer interaction at four years or earlier. This is the age at which the child may attribute to the other a belief which the child knows to be false. That presupposes the capacity to hold concurrently not just two different perspectives in mind, but somehow to simulate the other's mental state or belief.

Even co-operation, which already 18-month-olds may exhibit, for example retrieving and returning a toy which the other has dropped, or joining with the other to search for it, requires the capacity to entertain in parallel two different perspectives. And, then, when a two- or three-year-old engages with an imaginary or evoked companion entailing an internal dialogue between one's own perspective and the perspective of another not being present, such dialoguing in representational mediacy is probably unique to humans, while necessarily nurtured by experiences from interacting with actual others in prior presentational immediacy.

## On primary and higher order consciousness and Stern's specification of senses of self

What is essential here, as distinct from the stages in Piagetian theories, is the 'staircase logic' of the above layers (indicated by Figure 3.1): each lower-order layer continues to support higher-order layers throughout life. Thus, for example, mutual attunement and participation in the partner during verbal conversation (the tertiary layer) is supported by capacity for protoconversation (at the primary layer) and the capacity for joint object-oriented attention and other-centred participation (revealed at the secondary layer). This conforms to the staircase logic which Stern (1985/2000) introduces for various senses of self: Each lower layer, such as the sense of a core-self-with-another from birth, remains operative throughout life, supporting higher-order layers, such as the verbal self from about 18 months of age.

## The various senses of self according to Daniel Stern

Recognition of self in the mirror typically occurs when children achieve a verbal sense of self in a self-reflective manner. In the domain of tertiary intersubjectivity, supported by the lower order domains, children have developed a sense of narrative self (or narrative selves and others) as specified by Daniel Stern (2000/2003:xxv) in a new introduction to the paperback edition of his seminal 1985-book on '*The interpersonal world of the infant*' in which he revised his multi-layered model of senses of selves (and others), beginning with a sense of an emergent self, and with each layer supportive of higher-order layers and continuing throughout life:

*From birth*: Sense of an *emergent self*, underlying the sense of a *core self*, entailing coherence, continuity, and agency, and the sense of *core self-with-another*, entailing self-resonating with another in the self-in-presence-of-another domain of primary intersubjectivity (cf. Chapter 7, this book)

*From 9 months*: Sense of an *intersubjective self* in the domain of secondary intersubjectivity, entailing affect attunement and joint attention when objects are brought into play (cf. Chapter 8, this book)

*From 18 months*: *Verbal self-formation* announcing the reflective self-other relations opened for by symbols and language with the onset of tertiary intersubjectivity of first order (cf. Chapter 9, this book)

*From about 3 years*: *Narrative self/selves*, entailing self-biographical stories co-constructed with others, as part of the official family history and a part of family lore, as unfolding in the domains of tertiary intersubjectivity (to be turned to in Chapters 9 and 10).

Besides making these seminal distinctions, one should not forget two important aspects. First, sense of other is entailed by each sense of self, for example, the core self-with-another. Second, Stern (1985/2000) graphically specifies the various higher-order senses of self, such as the verbal self, to be supported by the lower-order senses of self, including the sense of core-self-with-another in operation from birth. This 'staircase logic' also characterizes, as we have seen, the relations between the various intersubjective layers, such as portrayed in Figure 3.1.

The sense of a verbal self and the sense of one or several narrative selves, depending upon the actual context of narratives, are unfolding in the child's conversation with actual companions and in self-conversation with the child's virtual or evoked companion, as will be illustrated in Chapter 9.

In Stern's (2000/2003) introduction to the paperback edition of *The Interpersonal World of the Infant*, in which he revises the early beginnings of the newborn's sense of a core self, he also raises the issue of consciousness. Somehow, even the underlying emergent sense of self entails a sort of consciousness as "a sort of coming-into-being at the present moment" which distinguishes it from unattended activities. What

kind of consciousness is this? With reference inter alia to Damasio (1999), Stern specifies this as *primary consciousness* which is neither self-reflective nor verbal, and lasting only during a present moment that corresponds to "now". Moments of primary consciousness, he points out, appear to occur most markedly during the states of alert inactivity and alert activity.

Stern (2000:xx) refers to findings about adaptive oscillators (by Port et al. 1995 and by others), enabling synchronicity to be evoked between systems within us and between us. Synchronized intrapersonal oscillators have been found to index or give rise to phenomenological consciousness (cf. Engel et al. 1999). In that case we face the curious entailment that while intrapersonal synchrony may involve phenomenological consciousness, interpersonal synchrony often occurs unwittingly – and may come to be arrested if a spectator makes the participants self-conscious of what they are doing.

Emphasizing the heterogeneity of consciousness, Edelman (1989:196) distinguishes these three systems of consciousness: First, primary consciousness entailing perceptual and sensational processes; second, primary consciousness reflecting conceptual distinctions and, third, higher-order consciousness involving linguistic abilities. The first system may be allocated to the primary intersubjective layer, the second reflecting object-oriented conceptual distinctions to the layer of secondary intersubjectivity, while the system of higher-order consciousness pertains to the tertiary layer. According to Edelman all or any of these systems may be active at a given time period. Like the various layers of intersubjectivity, this holds for the mature individual, but of course not for the newborn beginning to unfold primary consciousness in the sensational sense.

## Primary consciousness and the senses of an emergent self and of a core self

As Stern puts it, object-oriented primary consciousness is a yoking together, in the present moment, of the intentional object being stretched towards – an internal pain, the sensation of the nipple in the mouth, a red ball – and the vital bodily background input which specifies that now you are having the experience. The internal input from the body includes the momentary states of arousal, activation, tonicity, degrees of motivational activation and well-being. This is what Damasio terms 'background feelings' similar to what Stern specifies as 'vitality affects'. And then, there is all the other input from what the body does or must do to permit and sustain mental activity, movements and displacement in space, including proprioceptive feedback from muscle groups. As pointed out by Edelman (1989:102), in the absence of external stimuli and proprioceptive inputs, primary consciousness could not appear. In his words, one could say that previous memories and current activities of the brain interact to yield primary consciousness as a

form of "remembered present". This is partly consistent with Stern's point that primary consciousness lasts only during a present moment, a 'now', dependent on inputs such as internal sensations from the body accompanying perception, feeling, cognition and remembering:

> "All these body signals come from the self – and as-yet-unspecified self. Such signals need not be attended to. They need not enter into awareness. Yet they are there in the background. They are the continuous music of being alive. That is why I refer to changes or modulations in this music as vitality affects. It is this music that will permit the emergent self – the "proto-self" in Damasio's (1999) terms – to appear. But first it must be yoked with a mental activity. [....]
>
> Each time there is moment of primary consciousness, the self as experiencer is felt and is situated in the world. At that moment, the sense of an emergent self appears. This must happen many times an hour, or minute. Although these moments of primary consciousness are short and periodic, they offer rehearings of the continual music of living."
>
> (Stern 2000:xviii).

In Damasio's term, the sense of an emergent self is a sort of "pulse" which continually re-specifies the living self in the process of experiencing which – by virtue of the dynamic quality of vitality affects – has a contoured time line.

Like the sense of an emergent self, the sense of core-self-resonating-with-another relates to primary intersubjectivity allowing inter alia for interpersonal synchronization of movements, for which an explanatory key-term is adaptive oscillators (McCauley 1994; Torras 1985).

As for subcategories of the infant's sense of self-with-other pertaining to infants, Stern distinguishes the self-in-the-presence-of-the-other while being in the presence of a care-giver, from being psychologically alone by perceiving, thinking or acting by itself. And yet, even then an internal dialogue may unfold with an evoked companion. And, then, there is the infant presenting itself to others inviting their appreciation and appraisal of the infant's displayed 'trick' behaviours. Six-month-olds can 'show-off', making odd postures and grimaces, 'silly' faces, repeating this to amuse themselves and familiar companions, as pointed out by Trevarthen (1998:39), who suggests that this indicates a kind of early self-consciousness that is part of awareness of others.

And then, there is the question of how the sense of self-with-other varies when the infant is part of an interacting dyad, and when the infant engages as a part of a family triad. In terms of illustrations, there is dyadic interaction when Thomas is being spoon-fed by his sister (Figure 9.2), while there is triadic context for Oda's sitting on her father's lap while being spoon-fed by her mother (Figure 7.3). Do these dyadic and triadic constellations make a difference? Sometimes they do; a triad may become imbalanced, such as with the father as the third person in

relation to the mother-infant dyad, or even with the baby as the third person in relation to the parent pair. With reference to Fivas and Corboz (1998), Stern raises this question: How does a sense of self in dyads differ from a sense of self in triads and in larger groups? This question pertains also the layer of secondary intersubjectivity and to what Stern specifies as the sense of intersubjective self.

## Secondary intersubjectivity, core consciousness, and the sense of the intersubjective self

When objects are brought into play as references of joint attention and allowing for manipulation, triadic relations in the sense of subject-subject-object emerge. This may invite imitation in the nine-month-old or in the older infant, such as in the above cases of Thomas and Oda. In his book on *The Feeling of What Happens*, Damasio (1999:310–311) suggests that exposure to attended objects entails changes in proto-self giving rise to second-order map of organism-object relationship. This opens for what he terms 'core consciousness' which sits above, but still is close to other foundational capacities, such as action, emotion, and sensory representations, shared with several nonhuman species. When Thomas and Oda reciprocate the feeders' spoon-feeding, they are clearly conscious at least in this sense, while showing enhanced attention and drawing upon a working memory. When Thomas, however, opens his own mouth when offering the spoonful into his sister's mouth, his mouth-opening is clearly done unwittingly. And here he demonstrates, then, his capacity for altercentric participation, and drawing also upon his primary intersubjective capacities, he illustrates what Stern (2000/2003:xxiii) terms self-resonating-with-another,

> Should any of these reciprocating infants turn to offer the spoon and then withdraws it with a smile before the caregiver could get to the food, then something radically different had happened, with the infant finding such a offer-withdrawal game funny. Chevalier-Skolnikof (1982) has described toddlers' teasing in this format: offering toy and smiling, withdrawing toys and laughing. Reddy (1991) has reported episodes of offer-and-withdrawal teasing by younger infants. In one episode, following a few pleasant exchanges of an object, the infant first offers and then withdraws the object with a broadening smile as the adult reaches for the object. When the adult then withdraws the hand, the infant repeats the offer with a slight smile which broadens as the adult's hand approaches and the infant repeats the withdrawal (Reddy 1991:146). This entails that two complementary perspectives are activated in the infant teaser, and that the infant's smile would not have broadened unless the infant were able to mentally imagine or simulate the adult's successful grasping and contrasting that with the aborted grasp. As anticipatory simulation of the actual other's move, completed in fancy, while aborted in actuality, this comes close to what 18-month-old toddlers do in

the dumbbell experiment reported by Meltzoff and Moore (1998) when they pull apart the dumbbell which the experimenter had failed to do – completed by the toddler in fancy and realized in actuality. The teasing infant's smile would probably not have broadened at this point of withdrawal unless some core self- and other-consciousness were at play. And furthermore, some rudimentary simulation capacity may have been entailed here as precursory to the later capacity for simulation of others' mind emerging later in three- or four-year-olds at the second order layer of tertiary intersubjectivity.

## Tertiary intersubjectivity, verbal self, narrative self, and simulation and theory of mind

With the advent of spoken language the child's sense of a verbal self (and verbal other) comes into operation opening windows to higher-order consciousness that is linguistically mediated. For some children, their facial recognition of themselves in the mirror in an extended self-conscious manner, differing from earlier probing reactions, coincides with their being able to address themselves and others as 'I', 'me', and 'you'.

Around 38–42 months of age, what Stern terms 'the narrative self' or narrative selves are being developed as part of stories about the child and the child's other. In Damasio's (2000:310) terms this entails an extended consciousness involving an autobiographical self. It may be elicited by questions such as "What happened at school today?" or "Did you guys find anything on the beach?", and most such autobiographical narratives become co-constructed with others (Stern 2000:xxiv). That pertains to the root sense of conscious (*con-scientia*) as together-knowing or knowing-with, reflected by many languages (cf. Pask 1978; von Foerster 1984) implying the conjunction of more than one perspective.

The ability to entertain concurrently more than one perspective is required whenever the child appreciates and understands another's misunderstanding or false belief. As we shall return to in Chapter 10, there are two competing or complementary frames of reference for approaching such phenomena. On the one hand, the theory of theory approach attributes to children a representative theory of others' mind from which children may draw inferences in a cognitive manner about the beliefs of others. On the other hand, there is the simulation approach attributing to children the capability to imagine or simulate the other's moves, feelings or state of mind. Probably, from around the age of 3 to 4 years both kinds of mechanisms may be available and with a year or two earlier as precursory of the simulation capability. Each could reinforce the other as development proceeds, as pointed out by Stern (2007:42) who adds: "But I cannot imagine any fundamental base for intersubjectivity without resonance, by whatever mechanism. In the last analysis, it is about feeling, not cognition." I agree.

When children, usually about 3 to 4 years old, are able to attribute a false belief held by another, this is taken as evidence that they have a theory of the other's mind in the cognitive sense of entertaining a theory that enables them to draw inferences about the other's false belief from their own theory of the other's mind. A standard test involves placing an object in a box, as witnessed by a naive subject in front of the child and, then, while that box is out of sight for the naive subject, emptying the box and placing the object at another location. When the box is made available to the naive subject, then if the child is expecting that the naive subject will reach for the (absent) object in the box, due to the naive subject's false belief and ignorance about the object having been removed, this is taken as evidence of the child's entertaining a theory of mind. Most 3- and 4-year-olds pass this test, consistent with their abilities available at the secondary layer of tertiary intersubjectivity.

Until quite recently, such attribution of a false belief was thought to be beyond the capacity of toddlers even though they may be shown to be able to mentally simulate the completion of others' attempted moves (cf. the interpretation by Bråten 1998a:115, and connected to Figure 8.4 in the present book). And just recently, Southgate et al. (2007) have conducted an experiment in which 25-month-old children indicated by their look of anticipation an attribution of false belief to the video-recorded naive subject, a woman wearing a visor so they could not see her eyes, and being behind a screen so that she cannot see what is being done with the two boxes in front of the screen. She could reach through two flaps towards each of the two boxes. In the familiarizing trials in this experiment, a puppet places a ball in a box and the windows light up, and the naive woman reaches through a window to the box containing the ball. In the false-belief trials the ball is removed from the box while the naive woman is not watching. She now turns back and the windows are illuminated. Most of the two-year-olds first looked at the flap next to the box when she had last seen the object, and they looked at it longer. Their longer look is taken to indicate their expecting her to reach through that flap and, hence, their attribution of a false belief to the naïve woman subject (cf. Doherty 2008:32, referring to Southgate et al. 2007).

This invites comparison with Savage-Rumbaugh's (1999) record of the reactions of the bonobo Panbanesha (15 years) to a false-belief situation, recounted in Chapter 5 in the present book.

### An intermediate comment on the different usages of the term "intersubjectivity"

The above distinction of several intersubjective layers invites a comment on the various usages of the term "intersubjectivity" (cf. the introduction to Bråten (Ed.) 1998:1–2, and also Bråten 2003a).

First, there is the immediate sense of interpersonal communion (Martin Buber 1958; Gabriel Marcel 1949/1960; Daniel Stern 1985), which pertains to a primary level of (I) sensorimotor attunement in the first weeks of life, entailing an emergent sense of self and other which enables and is nurtured in infant-adult protoconversation, characterized by Trevarthen (1979, 1986) in terms of 'primary intersubjectivity' and specified in terms of the inborn 'virtual other' inviting completion by actual others in the mutual mode of felt immediacy (Bråten 1988, 1992; Bråten & Trevarthen 1994/2000; Trevarthen 1992, 1998). Transitional phenomena, identified by Winnicott (1953) as re-enactments of engagements with the (m)other, may be partly seen to be related to this domain. When Merleau-Ponty (1962:139) emphasizes that a movement is learned when the "body understands it" and that movements to be performed can be anticipated independently of re-presentations; he defines corporal and intercorporal relations consistent with this primary mode of presentational immediacy, differing from higher-order modes of re-presentational mediacy. Merleau-Ponty's phenomenological contributions will be returned to in Chapter 8.

Second, there is the more conventional sense of intersubjectivity entailing joint attention to objects or states of shared social referencing, pertaining to the level of (II) 'secondary intersubjectivity' from around 9 months of age when objects are brought into play for recognition and re-enactment of end-oriented moves and simulation of manual handling (Akhtar & Tomasello 1998; Bråten 1998a, Hobson 1998; Meltzoff & Moore 1998; Trevarthen & Hubley 1978). The temporal contours of such shared bodily background feelings have been specified by Stern (1985, 1999) in terms of 'vitality contours'. Elsewhere has been indicated how the infant's virtual participation in the caregiver's or abuser's activity leaves the learner with a bodily participatory memory that invites circular re-enactments later in life (Bråten 1998a, 2007). Here is a link to traumatic aspects, albeit in another sense than Levinas, and partly related to Freud's concern with identification. And, again, there is a link to Winnicott's (1986:36–37) observation that the infant's engagements with a transitional object, such as a doll, may be recognized also in the creative adult's performance with other kinds of objects later in life, such as a piece of wood or a musical instrument. Such an object is imbued, I have suggested, with participant life by the performer's virtual other in the creative self-dialogue (Bråten 1992:88–90).

Third, there is the first- and second-person reflective and recursive intersubjectivity in the sense of communicative understanding mediated by (meta) representations, including symbolic references to actual or fictional worlds of imagination or joint pretence and entailing the capability to draw inferences about intentions, beliefs and feelings in others (Gopnik & Meltzoff 1993) and to imagine or simulate mental states or processes in the other (Bråten 1974; Humphrey 1984; Goldman 1992). This usage pertains, as we have seen, to the layer of second-order tertiary intersubjectivity.

## Ontogenetic and sociogenetic dimensions of intersubjectivity: Conflicting views

While the distinction between 'primary intersubjectivity' and 'secondary intersubjectivity', introduced by Trevarthen and Hubley (1978), now appears to be established in use, some authors, following Tomasello (1999a:302–304), prefer to reserve the term 'intersubjectivity' for the second domain (II) in which infants, around 9 months, recognize others as subjects of experience and intentional agents. Thus, Fonagy, Gergely, Jurist and Target (2002:210) take exception to the nativism implied by what they call 'the "strong intersubjectivist" position' represented by Bråten (1988, 1992), Stern (1995), and Trevarthen (1979, 1993). The affinity of our positions is attested to by Stern in the introduction to the paperback edition of his seminal book on the interpersonal world of the infant. Here Stern (2000:xx–xxii) attributes early forms of intersubjectivity almost to the beginning of life "in light of the new evidence on other-centered participation" shown by imitating infants, as well as recent social neuroscience findings on mirror neurons and adaptive oscillators. All three of us insist on the critical intertwined interplay between nature and cultural and interactional nurture throughout ontogeny and from the outset. The melody of the ambient language may begin to make itself felt even before birth. And when Kuhl (1998), for example, demonstrates how speech perception in early infancy alters speech perception, accounting for the acquisition of a life-long dialect, she also asserts that there is an innate link between perception and action.

As succinctly indicated in Figure 3.1, the above domains have been distinguished to characterize some critical steps, and in which the lower-order layers or steps, entailing engagements with others in the mode of felt immediacy, continue to be operative throughout life and support the higher-order domains of communicating with and understanding others in the modes of symbolic and re-presentational mediacy.

Each layer will be characterized in more detail in Part III, and some conflicting views of the nature, nurture and impairment of intersubjectivity will be examined. Given two rival views, it is sometimes worth while to investigate whether they concern competing views ruling out each other or whether they concern complementary features that allow for contingent validity to be attributed to both sides of a conflicting pair of views. Take, for example, the question of whether (A) affect-oriented or (C) cognitive-oriented terms are best fitted to characterize such phenomena as neonatal imitation (Chapter 7), empathy (Chapter 6) or mind-reading (Chapter 10). Such questions may be posed in the following ways.

First, if assumed to involve a path afforded by evolution towards intersubjective attunement, does *empathy* entail the (C) cool or cognitive-oriented interpretational variant usually meant when we are using the English term "empathy", or an (A)

affective participant perceptional mode suggested by the German terms "*Einfühlung*" and "*Mitbewegung*", and by the Greek root ('*pathos*' for passion) making up part of the root of 'em-pathy'? In their examination of ultimate and proximate bases of empathy, Preston and de Waal (2001) are open to both paths when they see an underlying action-perception link as primary in evolution, and as having been augmented to support more cognitive forms of empathy subserved by the recent evolutionary expansion of prefrontal functioning. Frans de Waal's primate recordings and contributions will be taken up in Chapter 6.

Second, when seen as an entrance to primary intersubjectivity, does *neonatal imitation* as described in Chapter 7 entail an (C) active cognitive process involving deliberate conscious matching, or a (A) shared feeling flow pattern of participant perception in a self-organizing dyad? Kugiumutzakis (1998:81) suggests that both kinds of processes may be concurrently operative in newborns exhibiting imitation: (C) one of deliberate conscious volition, and (A) another of spontaneous emotive connectivity, operating outside of the conscious level of cognition, while Meltzoff and collaborators are cognitivist oriented and attribute a partly self-oriented mode to the newborn when suggesting the 'Like me'-hypothesis.

Third, does *mind-reading,* as examined in Chapter 10, entail a (C) cognitive and conscious mode of inferring from a constructed theory of others' minds, or an (A) empathic mode of simulating others' thoughts and feelings? Investigating issues of self-construct in a functional magnetic resonance study based upon exposure to stories, some of which involve personal pronouns, Vogeley and Newen (2002:147), for example, find themselves partly open to both possibilities, as referred to earlier, even though they associate simulation with inferences from own mental state. Another example: when comparing his model of a specialized mind-reading system with the apparent incompatible 'social module' suggested by Brothers and Ring (1992) to enable inter alia identifying response to emotional states in others, Baron-Cohen (1995:95–96) suggests that, as various cases of neuropathology are studied in more detail, we are likely to see that different patterns of neurocognitive (dys)functions are possible, and that this specialized system may be a part of such a more encompassing social module. In any case, a future challenge is to arrive at specifications of the qualifying conditions for complementary Q(A,C) relations.

The above questions imply invitations to begin to specify in further research the contingent validating and boundary conditions in the relative and relational format of Q(A,C). More generally, given competing perspectives, R versus S, both backed up by some evidence, on various modes and impairments of intersubjectivity, the time will soon be ripe to convene and compare conflicting research results in order to draw some demarcation lines and operationally specify the respective boundary conditions and activating contexts for operating characteristics that may be in concurrent and, even, contrary operation and competing for being dominant. The challenge, then, in

the intersubjective spirit of a science of intersubjectivity, is to be open to the possibility that a contingent degree of validity may be attributed to both sides and to qualify the Q(R,S) relations that may hold for the real world phenomenon in question. To be open to such possibilities is to be open to a third position acknowledging both sides of such dualities and transcending them (Bråten 1981, 1984). For example, even if unwittingly manifested and inter alia subserved by a mirror neurons system, the phenomenon of participant perception, described in the previous chapter and followed up in Part III, may in relation to the observed performance at time t, invite specification in terms of these two perspectives: (R) action re-presentation, interpretation, and imitation versus (P) pre-presentation and predictive simulation. For example, there has been a tendency to confuse mirror neuron activation in an involuntary manner upon watching a performer with the deliberate post-performance activation required for imitative re-enactment – even though such imitation may depend on matching mirror resonance evoked during perception of the model act that invites imitation. Implying different time aspects, both of them invite to be transcended by the recognition of an extended intersubjective present qualified in the format of Q(P,R). To capture the temporal aspects of vitality contours, as invited by Stern (1999), and to re-open the questions of time, raised by such source authors as Charles Sanders Peirce, G.H. Mead, and Husserl, may be the most challenging and immediate need in research on the nature, nurture and impairment of intersubjectivity (See the notes to this chapter and the concluding chapter, this book).

## Questions about phylogeny: Speculation about the selective pressure on early hominids

In connection with the infant illustrations in Figure 2.1 the previous chapter afforded an introduction to the infant capacity of learning by altercentric participation, assumed to be subserved by the mirror neurons system in adapted form. This invites the question: In which epoch and evolutionary conditions would the most critical selective advantage have been afforded by such an adapted resonant mirror system, enabling altercentric participation? In the following will be succinctly ventured a speculative reply, based inter alia upon my comparative observations of infant-adult interaction in humans and in captive chimpanzees.

As Chapters 5 and 6 will partly reflect, I have had the opportunity to observe chimpanzee interactions in Kristiansand Zoo and Wildlife Park in the Southern part of Norway, where I for more than a decade have been focusing on adult-offspring relations. I have records not only of infants clinging to the mothers, but of offspring carrying a younger sibling on their back, when allowed by the watching mother. It is striking how the infant, clinging to the mother's back, not only moves

with her movements, but usually also adjusts the head to the mother's head direction, and thus appears to gaze in the same direction as the mother's gaze (cf. photo glimpses in Figure 5.2 in Chapter 5).

The speculative reply I venture to the above question is this: In the pliocene epoch hominid parents and offspring were deprived of a particular advantage enjoyed by modern chimpanzees and – may we assume, by the ancestral miocene ape: The offspring capacity to cling by own force to the back of the mother (or other adults), enabling not just protective carrying, but learning to orient oneself from the back of the carrying mother, afforded social learning by copying movements (what Byrne (1998) terms "program-level imitation") from moving with her movements from her stance.

While apes' infant offspring learns to orient itself from the carrying mother's stance, bodily moving with her movements, without having to transcend own (egocentric) body-centred perspective, learning by copying of movements without transcending situation specifics (cf. illustrations in Fig. 5.2), hominid infants and parents, deprived of the advantage of protective and nurturing carrying on the parent's back, those who had the compensating capacity to warn and listen to warning signal and to teach and learn to cope by altercentric perception and virtual participation in the other, would come to have a critical selective advantage.

Infant and early childhood adaptations for efficient learning by altercentric perception and virtual participation in facing adults' activities and the parent's enhanced pedagogical capacity for altercentric participation in the child learners – with these child and parent capacities subserved by an adapted resonant mirror system – may constitute the phylogenetic roots of the kind of reciprocal mirroring we may observe in early human ontogeny, and indeed throughout normal human life, for example in intimate dialogue between interlocutors.

Deprived of this protective and nurturing advantage, with children having to be left hold of (in a tree or on the ground) when bipedal parents needed to use both arms, and given increased infant helplessness and prolonged childhood, those parents and children would have had a critical selective advantage, I submit, whose resonant mirror system, had been adapted to enable altercentric perception and virtual participation in the other's action execution in reciprocal settings, i.e., to subserve face-to-face pedagogy in which one's body-centred (ego-centric) stance is transcended.

The increased infant physical helplessness and prolonged childhood have to be compensated for by maternal vocalizations, to which the infant is sensitive and sensitized, by virtual hand-guidance of the child, and by face-to-face pedagogy in which there is parental capacity for altercentric participation in the child learner's activity (perspective-taking). I further venture to suggest that such a selective advantage would have been especially critical before the invention, perhaps by late Homo erectus, of baby-carrying devices (baby-slings constructed from animal

**Table 3.2.** Tentative comparison of parent-offspring relations in apes and hominids, inviting speculation about the selective pressure on pliocene hominids (when offspring could no longer ride safely on the back of their mothers) compensating for this lost advantage enjoyed by miocene apes (attributed here modern chimpanzee characteristics), implying that hominid parents and children with an enhanced mirror system capacity would have a critical selective advantage

| Epoch Species | Miocene<br>**African ape parent-offspring relations** ~ ancestral to the hominid family and to modern chimpanzee (assumed here as frame of characteristics reference) | Pliocene<br>**Hominidae/Homo parent-offspring relations** ~ from Ardipithecus ramidus (4.4 mill. years ago?) to early Homo erectus, especially **before invention of 'baby carrier'** (1.8–1.6 million years ago?) |
|---|---|---|
| **Infant/adult loco-motion** | The infant offspring clings by own force to the back of the mother (or other adults) climbing in trees or moving on the ground | The infant or small child is carried on the mother's arm and has to be left hold of (in the tree or on the ground) when parents need to use both arms |
| **Mobility/ migration potential** | Capacity for inter-group mobility by mothers and for group mobility | Severely restricted ~ until 'baby carrier' were invented (made of animal skin or plant material) perhaps coinciding with migration |
| **Infant mode of orientation and learning** | The infant orients itself from the back of the carrying mother, viewing the world from her stance and afforded social learning by copying movements (program level learning) from actually moving with her actual movements without having to transcend own body-centred stance shared by the mother's stance | Deprivation of the advantage of protective and nurturing carrying on the parent's back, increased infant physical helplessness and prolonged childhood have to be compensated for by maternal vocalizations to which the infant is sensitive and sensitized, and by face-to-face pedagogy and imitative learning by virtue of parent's and child's capacity for taking one another's stance (reciprocal perspective-taking) |
| **Assumed functional meaning and adaptation of mirror system** | Matching observation/ execution system enables the infant on the mother's back to learn from actually moving with the mother's actual movements, enabling recognition and discrimination of observed activities, such as grasping, holding, manipulation and mouth-intake of food objects and, later, subserving even program-level copying ("imitation") of food foraging and preparation skills | Matching observation/execution system may have been adapted to enable parents and children to virtually participate in one another's activity in face-to-face pedagogy and reciprocal interplay. Hence, those would come to have a critical selective advantage who had a mirror system tuned to subserve ego's attending, instructing and learning by virtual participation in alter's acts from alter's stance, used in reciprocal and complementary give-and-take exchanges (e.g., virtual grasping while actual giving, and virtual giving while actual grasping) |

skin or plant material), restoring some of the lost advantage enjoyed by the apes, and which only recently is being made use of by working Western mothers. In Africa, for example in the Gusii culture, such baby carrying is handled by siblings (cf. LeVine & LeVine 1988). Richard Leakey (1995:93) attributes baby carriers (made of animal skin) to Homo erectus: If and when they migrated out of Africa, they could certainly not have done so without such an invention. In the preceding epoch, compensating for the lost advantage of bodily clinging by offspring of miocene apes, a critical selective advantage would have been afforded to Pliocene parents and children by a mirror system adapted to subserve altercentric perception and virtual participation in the other's action execution in reciprocal settings.

If adults and offspring were constantly threatened by toxic plants, predators and other forms of hazards, child care and 'baby sitting' would not suffice without children's capacity to learn to cope by watching the adults. Unlike the great apes, with offspring riding on the back of their parent and learning to move and operate in the world from that (egocentric) position, these children may have had to depend for their survival on a kind of alert and attentive face-to-face engagements with the adults, learning from them even when not being hand-guided.

In such critical conditions there must have been selective pressure on both hominid parents and offspring to compensate for the loss of the back-carrying advantage enjoyed by the ancestral ape. We may assume that they shared a resonant mirror system, but while there may have been no particular selective pressure on chimpanzees to adapt that system, I venture this conjecture: Those hominid parents and offspring that were capable of efficient face-to-face pedagogy and learning by imitation, entailing an adaptation of the mirror system to enable teaching and learning by altercentric perception and virtual participation in the other's moves, i.e., by bodily and action-oriented perspective-taking, would have had a critical selective advantage. For the evolving chimpanzees, there may have been no selective pressure to adapt the resonant mirror system in such a direction, and no cultural environment inviting it of offspring. Modern times entails another story with chimpanzees and bonobos in captivity exposed to human environment and being semi-encultured, and with their infant offspring being particularly impressionable (cf. for example, chimpanzee offspring with human foster parents appearing capable of neonatal imitation face-to-face, as Kim Bard (1998) has shown, and the lexigram skill learning by bonobos demonstrated by Sue Savage-Rumbaugh and described in Chapter 5, this book).

## Questions about domains of cultural evolution

In his '*Origins of the Modern Mind*', Donald (1991) distinguishes in phylogeny and sociocultural evolution the cultural stages of episodic immediacy, resembling patterns found in the great apes, and the mimetic homo erectus culture from the

succeeding symbolic stages of *Mythos* and *Logos*. With partly a focus on different kinds of memory involved in the evolving cognitive and cultural patterns, Donald describes transition stages in terms of these distinctions (cf. the adapted expressions in Table 3.3, left column):

**Table 3.3.** Domains of cultural evolution in phylogeny and cultural learning in ontogeny

| **Phylogeny** (adapted from Donald 1991) | **Ontogeny** (Bråten & Trevarthen 2007) |
|---|---|
| **(i) Episodic (Primate) Culture:** Pair bonding within the group that provides a collective shield for defence and aggression, social co-operation in providing food and child care, social event perception and self-reproduction of communality from *episodic* memory of concrete event re-presentation in a biographic record of phenomenal experiences within a spatio-temporal framework (from about 4 million years ago?) | **I. Communion in subject-subject format** involving (primary) interpersonal communion and protoconversation between participants who attend and attune to one another's emotive expressions and movements in felt immediacy, inviting affect attunement and circular re-enactment from sensory-motor perception of and virtual participation in others' gesture- and sound-producing movements (from first weeks and throughout life) |
| **(ii) Mimetic (Homo Erectus) Culture** reproducing itself by re-enactment in individual and collective mimesis of standardized gestures, invention of tools; *procedural* memory extended by re-enactments (mimesis) of production in toolmaking industries and usage of fire; community (*Gemeinschaft*) reproduces itself by communion in group rituals, re-creating by dancing and singing systematic tactics in group hunting (from about 1.5 million years ago?) | **II. Object-oriented interpersonal communion** involving joint attention in a *triangular* subject-subject-object format involving shared attention and participation in the object-oriented movements of one another – beginning with co-operative use of objects of joint emotional referencing and imitative learning from e-motional memory of alter-centric participation in object-handling movements (from about 6–9 months of age and throughout life) |
| **(iii) Oral Mythic (Archaic Human) Culture** evolving mythic narratives in cultural patterns reproducing themselves by symbolic oral communication involving *semantic* memory transcending time and space; making sense in terms of cosmic myths; symbolic and magical power (from about 150 000 years ago?) | **III1. Mediate symbolic communication** involving *first-order* mental understanding of self's and other's activities in virtue of mental co-enactment of activity intended or pretended; perspective-taking and beginnings of narratives from generalized and verbalized conceptions of self and others (from about 18–24 months of age and throughout life) |
| **(iv) Theoretic Linguistic Carving Culture** evolving *external symbolic storage systems* from picture carving and non-alphabetic systems to the invention of phonological alphabet (from only 3.000 years ago?); meta-linguistic skills, science and information technology play a part in the transformation and transcendence of *Gemeinschaft* and *Gesellschaft* societies (Tönnies 1887) to net-societies for communication transcending space and time (Bråten 1981c) | **III2. Meta-communication and simulation of mind** involving *second-order* mental understanding of thoughts and emotions in others; narrative self and others in stories that find representations in drawings and writing, narratives are made sense of in co-constructed factual, fictional and meta-physical worlds as (theoretical) universes of discourse (from about 3–6 years of age and throughout life) |

(i) **Episodic (Primate) Culture:** Pair bonding within the group that provides a collective shield for defence and aggression, social co-operation in providing food and child care, social event perception and self-reproduction of communality from *episodic* memory of concrete event re-presentation in a biographic record of phenomenal experiences within a spatio-temporal framework (from about 4 million years ago?)

(ii) **Mimetic (Homo Erectus) Culture:** reproducing itself by re-enactment in individual and collective mimesis of standardized gestures, invention of tools; *procedural* memory extended by re-enactments (mimesis) of production in toolmaking industries and usage of fire; community (*Gemeinschaft*) reproduces itself by communion in group rituals, re-creating by dancing and singing systematic tactics in group hunting (from about 1.5 million years ago?)

(iii) **Oral Mythic (Archaic Human) Culture:** mythic narratives in cultural patterns reproducing themselves by symbolic oral communication involving *semantic* memory transcending time and space; making sense in terms of cosmic myths; symbolic and magical power (possibly from more than 150 000 years ago after the assumed occurrence of the FOXP2 gene mutation facilitating articulation (Vargha-Khadem & Liégeois 2007:137–146; cf. also Chapter 4, this book)

(iv) **Theoretic Linguistic Carving Culture:** *external symbolic storage systems* from picture carving and non-alphabetic systems to the invention of phonological alphabet (from only 3.000 years ago?); meta-linguistic skills, with science and information technology coming to play a part and nowadays giving rise even to internet cultures.

Representation and memory are key terms in his theory of evolutionary stages (listed in the left column of Table 3.3). The first stage involves a transition from the episodic memory of social event perception in the primate-like culture to the invention of representations in mimetic skills for reproducing conscious, self-initiated, representational acts that are intentional but not linguistic. The second qualitative transition in Donald's account is from mimetic to mythic and oral culture involving semantic memory, and the third to a theoretic culture involving external symbolic storage and meta-linguistic skills.

In spite of pitfalls of drawing parallels between ontogeny and phylogeny, Table 3.3 invites a halting comparison between the above cultural domains in line with Donald's specified transitions and the intersubjective domains or steps in ontogeny laid out in Table 3.1. Donald's specified transitions, as adapted here, invite a comparison with the ontogenetic domains of children's communicative development distinguished previously. However, even though auto-organizational inventiveness plays a part in phylogeny, sociogenesis, and ontogeny, they differ in two critical respects: First, the role of the primary and secondary intersubjective layers in supporting higher-order layers in ontogeny does not quite fit the relations of transitions between earlier and later phylogenetic cultures. Second, while societal evolution from phylogeny has involved the generation of new cultural lifeworlds in new domains

never before entertained, the child is born into the peculiar rhythms and musical sounds of a language culture that *already exists*, nurturing the self-creative transitions from consensual communion to symbolic, narrative communication. While the child is learning to 'swim', as it were, in the existing cultural 'ocean' into which the child is born and drawing upon the advantages of just recent cultural innovations, the phylogenetic transitions described by Donald entail the creation of cultural 'oceans' that never before have existed. Furthermore, the meta-communicative simulation capacity (III.2), entailing virtual participation in conversational partners, however, may have evolved already with the advent of the mythic culture (iii).

In spite of the above distinctions preventing an analogue to be drawn between phylogeny and ontogeny, and in spite of the critical difference between the way in which verbal conversation partners share a common speech culture and the preverbal infant's begins to learn to operate in that culture, these questions are invited:

Q1. Given the lack of concrete empirical evidence pertaining to oral aspects of the mythic culture distinguished by Donald, is there some other means of making precise and pursuing implications of theories of evolution of speech, for example, in line with or at odds with Darwinian mechanisms of selection? Chapter 4 and 5 will demonstrate some indirect modes of circumventing this problem. Concerned with the questions of how spoken language and infants' (m)other-centred learning may have emerged in phylogeny, Chapter 4 concerns the questions of candidate mechanisms explored in computer simulations, while Chapter 5 draws upon comparative chimpanzee studies.

Q2. When compared with the episodic memory of the primate culture, what period of hominin or human evolution would have been most critical in the sense that survival of offspring would have come to be dependent on some capacity for face-to-face communication at a distance? A tentative reply is already implicit in the formulation of this question, which could have been re-formulated in this way: In what period of hominid evolution would infant face-to-face learning at a distance to cope and take care have played the most critical role, and how may this have contributed to the phylogenesis and sociogenesis of hand-sign gestures and proto-speech? A tentative reply will be afforded in Chapter 5.

Q3. And, finally, how can the phylogenetic roots and basis of altruism in early ontogeny be attempted accounted for without resort to exchange theoretic attribution of 'reciprocal altruism' entailing personal gain return in the long run? This is succinctly pursued in Chapter 6.

## Notes: On philosophy of the present and a paradox of time entailed by participant perception

Returning to the philosophies of Buber and Mead, what kind of philosophy of time is implied by their positions? What about temporal aspects of matching mirror resonance and

participant perception? When someone is concurrently entertaining two different frames of reference, what does that entail with respect to time in terms of being simultaneous or not with oneself?

According to relativity theory two observers are precluded from sharing a "now" due to their different frames of reference. But what about the different frames entailed by complementary perspectives evoked in the participant who at the same time feeds the patient (in a body-centred executive frame) and participates in the patient's intake of food (in other-centred participatory frame), such as exhibited by the infants illustrated in Fig. 2.1? By virtue of sharing the patient's frame of food-intake the infant might be said to be simultaneous with the patient. But if the paradox of relativity were to apply the feeding infant boy could not be said to be simultaneous with himself due to concurrently entertaining two different frames of reference – one of affording food and the other of virtual participation in the other's food-intake. To this will be returned after some notes on philosophy of the present.

## Philosophy of the present, feelings and temporal dualities

In his pragmatics Charles Sanders Peirce was concerned with a tripartite ground for logic and comprehension, involving signs and relations between representations as necessary constituents. The sensory feeling quality of being present is primary to mediation and, hence, cannot be mediated. The feeling has passed before there is time to reflect upon it. We can never recapitulate that feeling in itself:

> "..on the one hand, we never can think, "This is present to me", since, before we have time to make the reflection, the sensation is past, and, on the other hand, when once past, we can never bring back the quality of the feeling as it was *in and for itself*, or know what it was like *in itself*, or even discover the existence of this quality except by a corollary from our general theory of ourselves, and then not in its idiosyncrasy, but only as something present. But, as something present, feelings are all alike and require no explanation, since they contain only what is universal. So that nothing which we can truly predict of feelings is left inexplicable, but only something which we cannot reflectively know. So we do not fall into the contradiction of making the Mediate immediable."
>
> (Peirce 1868/1960:5.289)

Peirce came to influence George Herbert Mead, who like Peirce considered thinking a dialogical process. A few months before his death Mead reads his Carus lectures at the meeting of the American Philosophical Association at Berkeley. Here he applies his principle of perspectives to the meta-physical domain of time and existence, which later came to be published in the posthumous *The Philosophy of the Present* (1932). He deals with the social nature of the present as the locus of reality. To Mead, however, the present is mediate, not immediate. The present mediates the generation of the future and the reconstruction of the past. Everything that exists, exists according to him in the present. The present comprises the past as well as emergent future.The future emerging in the present calls upon the reconstruction of the past as part of this very same present. This occurs in the mental field. But the locus of the mind is not in the individual. The mental field is not bounded by the skin of the organism, but comprises the social through perspective-taking.

Mead's philosophy of the present invites comparison with the views on time voiced by St. Augustine and by Buber. For Augustine, strictly speaking, only the present exists, while the past and the future arise by the soul's remembrance and expectations:

> "The future, which it [the soul] expects, passes through the present, to which it attends, into the past which it remembers."
>
> (Augustine, Book XI § 28).

For how, he asks, can the future be absorbed if it does not yet exist, and how can the past be prolonged in time when it no longer exists? This is his reply: It can only be in the mind which lives in the present which exists and which performs these functions: expectations about the future, remembrance of the past, and paying attention to the present.

Compare the above to Buber's dialogical concern. He insists, as we saw in Chapter 1, upon a primary distinction between the mode of being in an I-You union, devoid of past and future, of means and ends, and the alternative mode of being in an I-It relations, where other persons and things are made into objects and means-end relations. The I-You union emerges from an encounter in the immediate present, while the arrow of time running from past to future belongs to the object-oriented sphere of I-It relations. Usually we operate in the I-It mode, which is a rational mode of mediate relations which easily involve subordination and domination through means-end relations. In contrast, the I-You mode is immediate in the sense that the You is not construed or mediated by the I. The I-You unity emerges in the primordial dialogical encounter in the in-between of immediate reciprocity. Neither past nor future, neither means nor ends, intervene between You and I in such a modality. That is why therapy, even in the Rogerian tradition of dialoguing, will not admit, according to Buber, an I-You union to emerge. According to him the *Thou* meets an I in a relation that is direct, where "no system of ideas, no foreknowledge, and no fancy (*keine Begrifflichkeit*) intervene" between I and Thou.

Buber's I-Thou/I-It distinction relates to the distinction advanced in this book between the mode of engaging with others in felt immediacy (where no fancy intervenes, for example in the neonate engaging in protodialogue), and the mode of representational mediacy (for example, mediated by reflective thoughts about what the other is thinking). But are these modes mutually exclusive, as Buber claims the I-Thou and I-It relations to be? I have preferred to think so; it makes modelling and conceptions in terms of ideal types easier. However, in line with the staircase logics of the various layers of intersubjectivity, as depicted in Figure 3.1, even though verbal conversation occurs in representational mediacy, it is supported inter alia by the primary intersubjective mode of felt immediacy or by what Whitehead (1929) terms "presentational immediacy" and which may seen to be reflected in the accompanying expressive gestures. And, then, when infants reciprocate spoon-feeding, which is an object-oriented act occurring at the secondary layer of intersubjectivity, their accompanying mouth-movements in anticipation of the patient's intake of the afforded food is an unwitting simulation in felt immediacy evoked by virtue of an other-centred frame of reference that differs from the own body-centred frame of reference employed in the infant's execution of feeding. Given this activation of two different frames of reference, what does that imply with respect to time and simultaneity?

## On relativity and the mode of presentational immediacy

While relativity theory denies that there can be simultaneity in any sense but the relative one, Whitehead (1929) comes forward with a version that admits presentational immediacy for

actual occasions in the unison of becoming, to use his terms defined in *Process and Reality*. He is influenced by Leibniz' idea of self-creative monads, but not without windows. Each actual occasion – be it an elementary particle, a biological cell, or a person – is a mode of the process of feeling the world, "of housing the world in one unit of complex feeling". There can be perception even in the mode of presentational immediacy, which differs from re-presentational mediacy and is complementary to what Whitehead terms the mode of causal efficacy. He regards an actual occasion as included in its own immediate present, which can be shared with another in a unison of becoming. Thus, an actual occasion prehends other actual occasions in presentational immediacy. Being included in its own immediate present, an actual occasion, A, defines one duration in which it is included, while it may lie in many durations where each duration, including A, also includes some portion of A's present duration. In relation to A as a percipient actual occasion, there are actual occasions in A's causal past, as well as actual occasions that are A's contemporaries, perceived by A in the mode of presentational immediacy. Thus, B and C may both be contemporaries of A, immediately perceived by A, while B and C are not contemporaries of each other. This means that sharing what Whitehead terms a unison of becoming, A and B lie in the same duration, and A and C lie in the same duration, while B and C are not in a unison of becoming. This makes A and B contemporaries, and A and C contemporaries, while B and C are not contemporaries of each other.

In the above terms Whitehead offers his special interpretation of relativity, while opening also for a "directly perceived immediate present". This Einstein could not accept. In a conversation with Northrop (1951) Einstein conceded that many problems would be solved if it were true, but that it would make non-sense of any two observers speaking about the same event. Einstein denies any shared immediate present for two observers, A and B. He proposed that the concept of absolute simultaneity be dropped, and replaced by relative simultaneity, that is, relative to the frames of reference of each observer. This means that what may lie in A's past, may very well, dependent upon the frame, lie in B's future. In the domain of relativity, by virtue of their entertaining different frames of references, two observers, A and B, cannot share an absolute "now" and be truly simultaneous.

But, then, we would have to ask with respect to the single observer or actor who concurrently is engaged in a way that evokes two complementary frames of reference: Does the above imply that he is not simultaneous with himself? Such a denial might apply to the infants feeding their big sisters, as illustrated in Figure 2.1 (or as described in Chapters 6 and 8) whose body-centred frame of reference for executing the feeding is evoked concurrently with the evocation of the other-centred frame of reference that applies to the feeder's participant perception of the big sister's food intake. In that case the feeder is both a participant actor and a matching resonating observer. Thus, it would appear that what we may have gained in explanatory power with respect to phenomena accounted for in terms of the intersubjective matrix would have to be balanced against the cost of creating paradoxes with respect to time in terms of relativity. Or perhaps we have stumbled upon a paradox in relativity theory, revealed when attempted applied to finer and intrapersonal levels of resolutions than those applied with respect to gravitation phenomena? For, surely, the individual observer would have to be considered to be simultaneous with herself/himself, or, would s/he? Consider again the event of reciprocating feeding, for example as pictured in Figure 2.1, or the photo illustrations in Figure 8.2. When the Oslo-boy, Thomas, reciprocates his sister's feeding by spoon-feeding her, he executes his feeding moves in terms of his own body-centred frame of reference which differs from the other-centred frame of reference, manifested by his mouth movements, evoked in him when virtually participating in his

caregiver's intake of the food that he is giving her. Well, actually it makes sense to state that the two evoked frames of reference differ with respect to time: When executing the feeding, Thomas, carries out an act planned in the past. When opening his mouth as his sister is about to open hers to take in the food, he is unwittingly anticipating and virtually participating in the act to be completed in the future by his sister. Hence, in a curious sense, he is not simultaneous with himself.

PART II

# On the origin of (pre)speech and efficient infant learners

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CHAPTER 4

# On language evolution and imitative learning

## What can computer simulations tell us?

Some of the most challenging and open-ended questions in the research frontiers of biological, neurophysiological, psychological, sociocultural and anthropological studies of evolution concern questions about the emergence of speech language. It is even difficult to make such questions about phylogenesis sufficiently precise, in view of our disagreements about the main features of current days' language usage and architecture, about what are entailed by sense and significance, and the many blind spots in our maps of the interplay between the pertinent areas of the human brain and constitution of the ambient language society yielding linguistic production and understanding. And then, unlike traces to be found of early tools, decorations, and even carved language signs, no premordial windows into early speech-using societies and groups can be afforded. Nor are we left with any echo of sounds made by earlier hominid groups who like pre-modern homo sapiens groups may have used what may be termed 'proto-speech' entailing some of the features that may have been precursory of the conversational speech engagements of modern homo sapiens.

But even though this makes attempts to afford replies to questions about the evolution of speech highly speculative, such questions should not be avoided since they concern the very essence of human beings and human societies which we share with no-one, not even our closest primate relatives – even though some of them in captivity have allowed themselves to be trained to understand and make themselves understood through the use of sign language or computer key boards with symbols emitting sounds (cf. Savage-Rumbaugh et al. 1998).

### 'Homo symbolicus'

It is not inconceivable, Deacon (1998:340, 409) points out, that the first steps of crossing the threshold towards symbolic usage were taken by our apelike ancestors with about the same mental capacity and physiological constraints for voice articulation which are exhibited by modern chimpanzees. In 1974 the fossils remains of

'Lucy' (*Australophithecus afarensis*) were uncovered, and later fossil footprints of three such apelike bipedals who had walked on volcanic ashes perhaps more than 3.5 million years ago (Hrdy 1999:268–69). But this affords no enlightening clues about the emergence of protospeech language. It is hard to imagine any concrete fossil material that could tell us about that, except for skeleton prerequisites.

In the middle of the 1980's Richard Leakey (1995:93–98) uncovered the skeleton of a Homo erectus boy at the lake Tanganyika in East Africa to whom he ventured the attribution of elementary proto-speech capabilities. Even if highly speculative, such fossil cranial and skeleton parts that may be dated to about 1.5 million years ago may be interpreted to point in the direction that Homo erectus (or Homo ergaster of the same period) may have been endowed with some of the prerequisites for voice articulation and mimetic representations (cf. Donalds 1991:168–69; Deacon 1998:409). While impossible to confirm or falsify, a speculative hypothesis has been advanced in the previous chapter about the critical selective advantage of hominid mother-infant face-to-face communication by gestures and voice signals, subserved by a mirror system that may have been adapted prior to baby slings being invented (Bråten 2002, 2004a; Falk 2004b), perhaps in the Homo erectus/ergaster period. To this we shall turn later in this chapter and, in more depth, in the next chapter.

But first a series of computer model simulations of possible ways and modes of evolutionary emergence of language will be succinctly described after the rationale of computer simulations has been indicated. In a collective source volume edited by Knight et al. (2000) computer simulation models are resorted to in order to spell out the consequences of various assumptions, implemented as operative model mechanisms and reflecting various ways in which language may have emerged. Key words for such model mechanisms for exploring through computer simulations assumptions about language evolution are these:

- cooperation and competition in the evolution of pre-linguistic communication (Noble 2000);
- gestural imitation involving mirror neurons systems activation (Billard & Arbib 2002);
- symbol-based cooperation in hominid politics (Dessalles 2000);
- emergence of sound systems through self-organization (de Boer 2000);
- emergence of compositionality from vocalizations in population of learners without natural selection (Kirby 2000);
- how linguistic generalization is favoured by social transmission in a speech community entailing innate mechanisms (Hurford 2000);
- physiological prerequisites evolving in the speech-physiology co-evolution (Livingstone & Fyfe 2000), and
- acquisition of recursive grammars by means of exemplars (Batali 1998, 2002).

## Why computer simulations? Reply in terms of a tripartite scheme

When questions are raised about how speech languages may have emerged from the sociocultural processes in the human evolution of modern human beings, *Homo sapiens sapiens*, speculative replies are all we can expect. A number of tentative replies have been offered, and a variety of hypotheses has been afforded. But we are at a loss to provide any conclusive platform for their falsification, let alone confirmation. But two of the paths of inquiries open are these: Since we probably shared with chimpanzees common primate ancestors more than 5 or 6 million years ago we may resort to comparative studies of modern chimpanzees in view of their never realizing speech (turned to in the next chapter). Provided that we are able to put our conjectures in a sufficiently precise form we may run computer simulations in the form of computational experiments with participants in constructed populations, equipped for example with artificial 'neural networks', with members and learners who through their interaction are in the seminal process of giving rise to some sort of emerging prespeech or protospeech. But what is the point – why resort to computer simulations when we do not know what actually happened?

When given computer operational form as operating characteristics of participants in an implemented population we can at least spell out implications of our conjectures through such computer runs. Too complex to allow for an elegant equation in mathematical form that can be solved, assumptions about the possible emergence of language invite being formulated as operating characteristics of computer models which – through computer-operational experimentation in varied conditions – allow for the implications to be spelt out by means of computer simulations. Thus, as indicated in Figure 4.1, (S) computer simulation models may serve to mediate between a layer of (T) theoretical assumptions and a layer of (E) pertinent empirical findings, even though pertinent findings are difficult to come by in the elusive domains of language evolution.

Here is where the (S) model layer of experimentation with computer models, i.e., computer simulations, may come in as a mediating bridge between (T) the theory layer and (E) the empirical layer, such as portrayed in Figure 4.1. The above modelling frame of reference has inter alia been used in computer simulation studies of interpersonal dyads and communication networks in which persons shift between states of balance and imbalance (affective-cognitive inconsistency) in relation to choice between two competing alternatives (Bråten 1968; 1976; 1980). One example: (E) network panel data on vote intention and vote outcome in the EU referendum controversy in Norway 1972, during which voters were exposed to interpersonal influence and promotions by agents and mass media; (T) cognitive dissonance theory and sociosemantic processing, implemented as (S) model

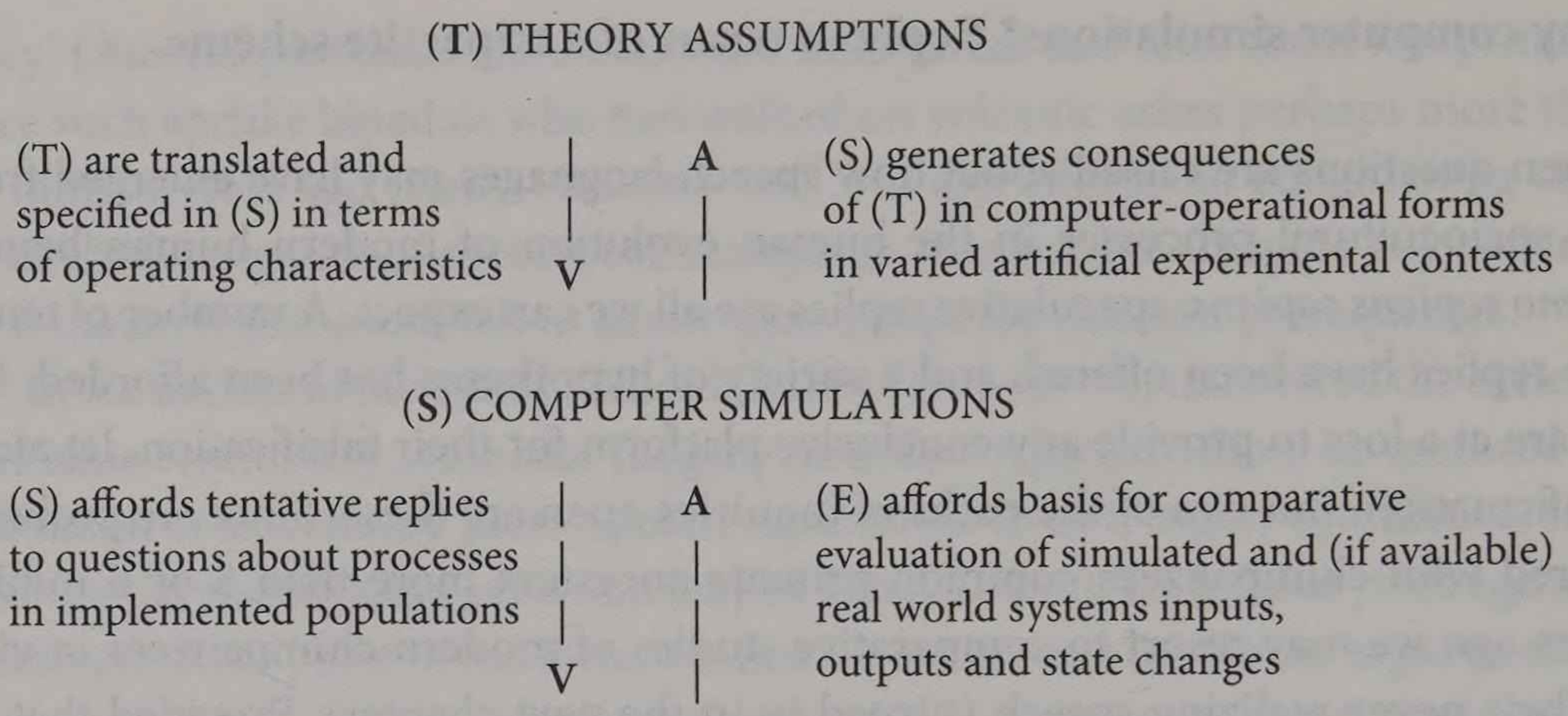



**Figure 4.1.** On the role of computer simulations exploring the dynamic implications of theory through computational experiments with populations of interacting persons equipped with computer-operational expressions of mechanisms according to theory. This methodological frame of reference comprises the epistemological layers of (T) theory, (E) empirical findings and evaluations, and mediating (S) computer simulation models allowing for experimentation with computer implemented expressions of T in conjunction with implemented boundary conditions and initial state values in line with assumptions about E. If E does not afford any basis for comparisons between outputs at E and S and, thus, cannot contribute to inform about the validity of T, S may be still be used to spell out the implications of competing (T) theory assumptions implemented in (S) populations allowing for comparative evaluations (After S. Bråten 1981c:5 (Fig. 0/2) in a Norwegian textbook on 'Models of Man and Society').

mechanisms in simulated populations of voters, yielding states and transitions at intra- and interpersonal level, as well as at network level and aggregate population level (Bråten, Jahren & Jansen 1978).

## When empirical clues about human evolution are lacking – tools for exploring assumptions

Description of computer simulation models, including the models on evolution and imitation to be turned to, requires distinctions to be made at the (S) model layer between input, output and state variables, and between boundary conditions and model mechanisms or algorithms. So here we have three epistemological layers: the (T) theoretical assumption layer open for all kinds of conjectures, and the (E) empirical observation layer which is mostly lacking with regard to concrete and pertinent data, while the intermediate layer (S) of computer simulation model contributes to make up for the complexity of the (T) layer by spelling out implications, and allowing for artificial experimentations with implemented populations under varied conditions. Thus, even if defying comparison with real world data

which are lacking in the (E) empirical domain, the (S) layer may at least offer replies to these kinds of questions: How may a population of language inventors, learners and users behave and what patterns may emerge if equipped with mechanisms that are computer-operational characteristics in line with the assumptions at the (T) layer?

Computational models pertaining to speculations about language evolution often employ artificial 'neural network' mechanisms, with a number of 'neuron nodes' being activated or passivated in language using or language learning members of the simulated population. In the simulation runs such models are released from initial boundary conditions as well as initial values on input variables and state variables. During the simulation run, state variables values are updated by the model as consequence of the simulated events entailing outcomes of operating characteristics or mechanisms. Such model mechanisms or algorithms, then, for example, a sentence processing mechanism, are implemented as operating characteristics of each actor, who in a simulated event of exposure to a co-actor, given input variable values and state variable values, produces change of values of a state variable or output variable, or even gives rise to a response, such as making a choice, or produce and send message, as part of an interaction sequence. For example, we shall have a succinct look at one model which simulates social transmission entailing acquisition of syntax (compositionality) through mechanisms for observational learning (Kirby 2000:303), and at another computer simulation model with mechanisms for "imitation games" through interaction between initiators and imitators in a simulated population of individuals with self-organizational operating characteristics (de Boer 2000:184).

So, even though there is a lack of concrete evidence at the E-layer, computer simulation model may be useful for spelling out implications of competing theoretical assumptions. One example of a topic of some controversy concerns the question whether or not mechanisms according to Darwinian natural selections could have been operative in language evolution. This invites comparison at the S-layer of how models with implemented natural selection mechanisms fare in simulations runs as compared to models without such mechanisms.

While there is a lack of adequate empirical sources for generating pertinent data on (pre)linguistic evolution at the E-layer, there is an abundant richness of speculations and propositions at the T-layer about cultural and pre-linguistic evolution. That is why computer simulation models may come in as mediating heuristic devices. Here (S) computer simulation models may contribute to clarify and spell out the consequences of competing proposals concerning, for instance, possible implication of mechanisms in line with Darwin's natural selection, contrasted with cultural learning mechanisms. In three collective source volumes on language evolution, respectively edited by Briscoe (2002), by Hurford et al. (1998), and by

Knight et al. (2000), some of the contributing authors make use of (S) computer simulations in order to illustrate and spell out consequences of their various and competing (T) theoretical assumptions about evolution of speech.

Some of these simulation studies, such as the simulations by Livingstone and Fyfe (2000) on language-physiology co-evolution, or Batali's (1998) study of the emergence of grammar, relate to the neuropsychological level or entail implementation of neurocomputational networks. So does an imitational learning model presented by Billard and Arbib (2002) in the context of 'mirror neurons and the evolution of brain and language' (Ed. Stamenov & Gallese 2002:344–352). The Billard-Arbib model, repeatedly returned to herein, is anchored in the (E) empirical domain of neuroscience, including brain imaging data and studies of (mirror) activity in the brain during observation and execution of the same movements, including functional resonance magnetic imaging (fMRI) records.

## On alternative mechanisms of cultural learning and communication

Many of the models to be turned to, including Kirby's social transmission model, explicitly exclude any natural selection mechanism with reference to Darwin, while some take into account the so-called Baldwin effect, such as in the model by Livingston and Fyfe. Before turning to these models, let us succinctly review some contributions by Darwin and by Baldwin which do not quite fit a neo-Darwinistic frame of reference. Their respective contributions before the end of the 19th century raised some pertinent questions returned to at the end of the last century.

In his *The Expression of Emotion in Man and Animals*, Charles Darwin (1872) approaches emotional expression as a form of communication. Finding similarities across human cultures, he raises the question about some common innate basis for emotional communication in children. Reporting how his six-month-old son once immediately reproduced his nurse's sad expression, Darwin speculated about the possibility of an innate basis for the imitation of facial gestures. More than 100 years later, laboratory results on neonatal imitation (Meltzoff & Moore 1977, 1998; Kugiumutzakis 1998) came to confirm his speculations (cf. Chapter 7), and comparative and cross-cultural studies came to revive his concern with emotional responsiveness and communication (cf. Bråten (Ed.) 1998)

James Mark Baldwin (1895) re-formulates and reduces Darwin's principles of emotional expressions in terms of motor attitudes. Searching for a common denominator for ontogeny and phylogeny that would allow the principle of natural selection to be supplemented by cultural learning mechanisms of communication and adjustment, Baldwin arrives at the concept of the self-repeating circular reaction. Motions that are felt to be pleasant are reinforced through fine-tuning

and repetition. Baldwin proposes that the infant's consciousness is infused with emotion, and that infants are able to feel what others are feeling by imitating their movements. While discarding the possibility of early imitation, such as suggested by Darwin (1872) and reported by Preyer (1887), he afforded a critical supplement to the Darwinian principle of natural selection. Drawing some parallels in terms of cultural learning between ontogeny and phylogeny, and emphasizing the role played by imitational learning through circular re-enactment, Baldwin (1895) proposed in his volume on *Mental Development in the Child and the Race* that those members of a population that were most efficient in such learning processes through enhanced selectivity would contribute to a re-distribution of the population which in turn would have an effect on the reproduction of selective advantages. Thus, we may add, such behavioural change through efficient cultural learning by selectively favouring afforded traits that were adaptive in terms of new learned behaviour, could be pertinent to gestural learning and, later, to even learning to process and produce sound systems. This would favour those individuals whose nervous and motoric system developed in ways that enabled and improved such processing. In similar terms Bickerton (2000) offers an account of the transition from a structure-less proto-language to a language entailing basic phrasal-clausul structure and, then, in the evolution of syntax crossing the coherence threshold and unleashing

> "a cascade of consequences including the development of grammatical morphology and parsing algorithms that were incorporated into the human genome by Baldwinian evolution."
>
> (Bickerton 2000:282).

The Baldwin effect about the impact of learning is also taken into account in a simulation model developed by Livingstone and Fyfe (2000:199–215), to be turned to later.

## Computer simulation models with and without natural selection mechanisms

Given that speech language is a unique characteristic of the human species claims have been made that this cannot be explained in terms of Darwin's theory of natural selection. Chomsky (1986, 2002) who posits an inborn generative grammar finds it difficult to conceive how that could have come about through natural selection in the sense of Darwin; linguistic evolution must have occurred in another way. As we shall see, some computer simulation models simulating language evolution in constructed populations appear to manage without any natural selection

mechanisms. For example, without any assumption about natural selection, Kirby (2000) has demonstrated with his computer simulation model how linguistic syntax composition may emerge in a population as a dynamic consequence of learned systems of communication. His model shows how individual members of the simulated population are able to acquire and make use of syntactic strings with subject, object and predicate elements, and to operate with a semantic meaning space with hundreds of potential meanings by virtue of the dynamics of systems of communication in which the participants learn by observation of others.

Unlike Kirby's model in which the emergence of syntax occurs without any natural selection mechanism, another computer simulation model, designed by Livingstone and Fyfe (2000), demonstrates how selective mechanisms may have been operative in the phylogenesis of other-oriented language users. In their 'neural network' simulation model, self-organizing formation of grammar occurs in a population with simple language learning and language-using agents with hereditary capacities for simple language usage.

Pinker and Bloom (1992) assume that human language has evolved through natural selection. Darwin's concept of 'natural selection' implies that species have been altered over time in processes of change and development in which characteristics are multiplied by copying which exhibits variation, and such that the incomplete and changed copies are inherited. Thereby new species characteristics emerge in a manner that promote their own reproduction, and such that the carriers of these adapted characteristics reproduce themselves more efficiently than the competitors lacking these characteristics (cf. Pinker 1995:356–357). When assuming that human language has evolved through natural selection, Pinker and Bloom advance two arguments. First, language entails such a complex system of mediation of proposition structures that it may be compared to highly specialized biological systems. Second, a Darwinian account of such processes in terms of natural selection appears to them to be the only way to account for the emergence of such complex systems. And recently, Livingstone and Fyfe (2000) have demonstrated by computer simulation how such selective mechanisms may be operative in other-oriented users even in a sort of self-organizing formation of grammar. One of their computer models simulates how a simple language with simple words for unambiguous meanings may have been a precursor of a sort of protolanguage. In a simulated population in which there is interaction between simple language-capable and language-learning agents with inherited language processing capacities, such a protolanguage appears to afford selective advantages for family groups engaging in information exchange.

Given that speech language is a unique characteristic of Homo sapiens sapiens, Gould and Lewontin (1979) have questioned whether Darwin's theory of natural selection may at all be applied to human evolution. Such an advanced evolution

may have occurred by way of other mechanisms and, here again, computer simulation models can be used to illustrate alternatives or complements. For example, Kirby (2000) has demonstrated with his computer simulation model how individual members of a simulated population may acquire and use syntactic strings expressive of a variety of meanings, and where learning occurs through communication with and observation of others. This does not quite rule out a modified Darwinian account in terms of the Baldwin effect. It is conceivable that such learning processes may have operated upon results of something like Darwinian selection processes which in turn may have re-enforced and influenced the population distribution. That would have been consistent with Baldwin's emphasis on imitative learning through circular re-enactment: Those in a given population who were most efficient in their learning processes would come to influence the population distribution, which in turn would be reflected in the reproduction of selective advantages.

## Altruism or symmetric cooperation involved in language evolution?

One of the questions recurring in the discussion and comments of those who have attempted to model or simulate posited processes in the evolution of speech language is this: What is the role of what Trivers (1971) has designated as '*reciprocal altruism*'? Such a designation is somewhat misleading, because by 'altruism' we usually mean unselfish aid to others at own expense, while 'reciprocal altruism' re-introduces egoistic self-interest: I help you today, expecting you to help me tomorrow. The designation is pertinent, however, in the sense that it does reflect the prevailing tendency to limit your aid to those belonging to your group or your tribe, which by virtue of continuous interaction between group or tribe members sooner or later may result in your becoming the recipient of apparent unselfish aid by another member of your group or tribe. Hence, there is reciprocity and cooperation over time. But as will be touched upon in Chapter 6, authentic altruism can be shown even by infants, as a pertinent phenomenon attesting to an essential inborn other-orientation. Many of the language evolution models referred to in this chapter reject the possibility of any role played by reciprocal altruism in service of what Dawkins (1976) terms "the selfish gene", operative in kinship selection. In one computer model, written by Dessales (2000:71), a symmetric cooperation scenario is implemented which fails to generate evolutionary stability in the runs with simulated populations operating with such cooperation mechanisms. In a model built by Livingstone and Fyfe (2000), the simulated language-capable agents may sometimes help language-learning agents in their neighbourhood, "with no benefit" to themselves, as the model builders point out. That fits with 'reciprocal altruism', since the language-capable agents will come to benefit from helping to generate communicating partners.

## A model of language-physiology co-evolution (Livingstone & Fyfe)

Livingstone and Fyfe (L&F) point out with reference to Deacon (1992) and Lieberman (1992) that in human evolution, vocalization and speech must have provided selective advantage that may have entailed emergence and adaptation of certain human physiology traits in support of improved language production and processing capacity. Their simulations are related to assumptions about co-evolutionary processes. The L&F model involves simulation of a population consisting of simple language agents capable of sharing information by means of sending and receiving messages. Each agent learns to map such received messages to internal 'meaning' states and uses messages to coordinate their internal state variable values. The message processing mechanisms implemented in the L&F model are specified to be dependent upon hereditary genes: they determine the number of language nodes processed by agents and which determines the range of signals that can be produced. An Artificial Neural Network (ANN) architecture is employed by the computer model for message production from each arbitrary meaning and for the reverse mapping from received message to internal meanings. Thus, in this model, language agents are represented as two-layer ANNs with a meaning layer and a language layer. A recognition weight mechanism maps language layer patterns to meanings, while a production mechanism entailing generative weights maps meanings to patterns at the language layer. Critical is the way in which the learning mechanism is implemented, dependent upon the occurrence of error in the classification of words, such that learning only occurs when a word is misclassified.

Such model mechanisms were computer-implemented in spatially arranged simulated populations of language users and learners with varying degrees of spatial selection and complexity. Four different simulation experiments were performed with the L&F model:

*Experiment 1*: Language negotiation in populations for homogeneous language capability and learning by means of the above learning mechanism

*Experiment 2*: Language-physiology co-evolution involving agents of differing language capability to communicate

*Experiment 3*: Costly language-physiology co-evolution with a fitness penalty added for language capable agents, and with less able agents being allowed a free ride

*Experiment 4*: Negotiations and language evolution when the strength of spatial selection is reduced, showing that with small neighbourhoods language forms in tight clusters in which negotiated languages are shared, while two agents selected from distant points in the population may be unable to communicate with each other. With larger neighbourhood clusters, however, global – rather than just local – coordination of language can occur.

Thus, in these runs, language ability has been shown to emerge gradually in communities of agents, and agents of differing language production abilities have been able to co-exist within those communities with kin selection favouring individuals who are more capable of language production (Livingstone & Fyfe 2000:214). In the above runs the ability to comprehend language is invariant across the populations. In order that simulated language agents of different ability are allowed to communicate they all need to have full capability to receive and learn signals – even those signals that are beyond the capability of the less able producers. This is consistent with the Baldwin effect and is pertinent to language acquisition also in ontogeny.

## A model of self-organizational emergence of sound systems in a population (de Boer)

De Bóer (2000) makes the point that if one wants to account for the sound systems that are found in human language one has to model populations of agents that imitate and learn from one another's sounds under acoustic, articulatory and cognitive constraints (p. 178). In his computer simulation model agents are equipped with an articulatory synthesizer for sound production, perception mechanisms for human hearing, and a prototype list for storage of vowels. Each vowel is characterized by the first four formant frequencies of the generated vowel. These formant frequencies correspond to the peaks in the power spectrum of the vowel, and when the simulated agents communicate with one another they exchange only the formant value characteristics of the vowels. A given vowel consists of some elements which yield the articulatory prototype, and some other elements which yield the corresponding acoustic prototype. An agent's vowels are stored in a vowel set, and when a new vowel is being heard and being defined as new, both its acoustic and articulatory descriptions are added.

The simulated populations consist of 20 agents with vowel systems building up after a series of imitation games (up to 2000 games). Some perturbation as noise is added and various mechanisms entail variation and innovation, imperfect imitation and random insertion of vowels. Vowels are only retained if shared with other agents, with some mechanisms affording (implicit) selection of 'good-quality' vowels shared with other agents. From the population pairs of agents are selected at random, consisting of an initiator and an imitator. Each imitation game begins with the initiator's producing a sound which the imitator listens to and tries to analyze in terms of the sound prototypes available to the imitator. The imitator then produces the acoustic signal for the prototype found, and the initiator listens to this feedback signal and analyzes it in terms of its prototypes. If the prototype selected is the same as the one used to produce the original sound,

then the imitation is a success, otherwise it is a failure, and this information is fed back to the imitator.

The computer simulations with the above population of agents equipped with such mechanisms for handling and generating vowel systems indicate that local interactions in a population of agents with operative functional constraints under which the vowels are produced, perceived and learned, may contribute to generate coherent sound systems. De Boer regards his simulations to demonstrate that the emerging systems show characteristic tendencies similar to those found in human sound systems, such as more frequent use of certain vowels and symmetry of the system:

> "This means that we do not need to look for evolution-based explanations for the universal tendencies of vowel systems. Apparently they characteristics emerge as the result of self-organization under constraints of perception, production and learning."
>
> (de Boer 2000:193–195).

## A model of grammar acquisition by means of exemplars (Batali)

Let us now turn to a computational model concerned with simulating the acquisition of recursive grammars, developed by Batali (2002). The theory implemented in this model deviates from assumptions about rules and principles, induced from the learner's previous observations and used to derive analyses of structural mappings between signals and meanings. The theoretical alternative explored in Batali's computer simulation is that learners simply store all their analyzed observations as *exemplars,* which are used directly to convey meanings and interpret signals. No rules or principles are induced from them. Instead, exemplars as intact are used directly to express meaning or to interpret the signal recorded in the exemplar. The adoption and processing of such exemplars rest on the assumption that prior to and independent of language, agents have cognitive capacities for internal representations of persons and situations. Thus, in this theory implemented in the model, language learning entails a process of competition among exemplars:

> "those that are repeatedly found to be consistent with learning observations become more likely to be used to create new signal/meaning mappings; exemplar that are found to be inconsistent with learning observations, or with other exemplar, are used less often."
>
> (Batali 2002:117).

Here, Batali draws upon the (E) empirical domain of crosslinguistic studies of sentence processing, more specifically, the competition model developed by MacWinney and Bates (1989). In the simulated episodes at the (S) layer, mechanisms for such competitive selection from a set of alternative exemplars are implemented in the agents as operating characteristics and algorithms, which in conjunction with their initial data structures reflect the cognitive abilities required

to participate in a negotiation. Initially the agents have no shared communication system. They begin their negotiations with the capacity to manipulate internal representations of situations, termed 'formula sets', which serve as the meanings they convey to one another. They can also create and manipulate sequences of characters, called 'strings', which are used as signals. The mapping between a formula set and a string of characters is represented with a data structure called a 'phrase'. Phrases are used by the simulated agents as they learn to communicate.

Batali's computer simulation of the negotiation process is released from a created data structure representing a population of agents and their (initially) empty set of exemplars. The simulations then proceed as sequences of rounds, each of which involves two agents chosen at random from the population. At the start of a negotiation, the agents have no exemplars to guide their communicative attempts, but they do have capacity to create and manipulate internal representations of situations and their participants. Although the agents cannot handle embedded meanings, as sets of exemplars are gradually acquired, their communicative accuracy steadily increases, and a shared system emerges. Batali's model demonstrates that communication system can emerge as a result of learning mechanisms that entail no induction or rules, without any need to set parameter values. The simulated agents illustrate a simple learning dynamic: They learn to communicate by recording their observations of other communicating agents, and they use those records to guide their own communicative attempts.

### Syntax without Darwinian selection in a population of observational learners (Kirby)

Learning is also a key mechanism in Simon Kirby's (2000) computational model of how compositional syntax is the outcome of observationally learned communication systems. Kirby shows that in a simulated population of individuals, given their capacity to learn from observation, as well as the inventive capacity of some initial individuals to produce some invented strings of symbols, language as defined in the model may develop

> "from a simple idiosyncratic vocabulary, with little expressive power, to a compositional system with high expressivity, nouns and verbs, and word order expressing meaning distinctions."
>
> (Kirby 2000:303).

Here are the desiderata for Kirby's simulation model:

1. Individual has to be able to learn by observation of other individuals.
2. There has to be a gradual turnover of population members over time in order that historical and cultural transmission may be featured.

3. Death of population members should not reflect any failure in communicative success; hence, no natural selection is at play.
4. Initially, the simulated population should be "nonlinguistic" in order to ensure that that which emerges from the simulated interactions is the product only of the population model and the learning processes. Kirby even goes as far as requiring that "those individuals that make up the initial population should have no communication system at all." (Kirby 2000:305).

However, the last desideratum is not satisfied by his model. In order to allow for something rudimentary linguistic to be learned, he has to allow for the inventive capacity of some initial individuals to produce some invented strings of symbols, which then afford the opportunity for observational learning in the other members of the simulated population. But from this, syntax is shown to emerge.

## On the critical role of the learning child

In an introduction, concerning the emergence of phonetic structures, Studdert-Kennedy (2000) points out that the above modelling and simulation approaches of de Boer and of Livingstone and Fyfe rest on the implicit or explicit recognition of the critical role of the learning child:

> "The child's perceptual, articulatory and cognitive capacities are the filter through which words must pass from one generation to the next. That is one reason why the ontogeny of words offers our best, perhaps only, natural model of their phylogeny. Indeed, initial steps in the emergence of language have proved recalcitrant to evolutionary theory precisely because we lacked, until recent decades, a reliable description of how the infant progresses from gurgling to babbling to spoken words."
>
> (Studdert-Kennedy 2000:124–125)

Here is an appeal to a pertinent (E) empirical domain concerning ontogeny. In recent decades such an account of intersubjective steps to speech in ontogeny have been afforded, inter alia by contributions in Bråten (Ed. 1998; Ed. 2007), and in Stamenov and Gallese (Eds 2002). In the former contexts, early speech perception, predication in early language learning and use, the use of personal pronouns in early language acquisition, and the acquisition and linguistic mediation of meaning are accounted for in light of the intersubjective matrix (Akhtar & Tomasello 1998; Conboy & Kuhl 2007; Frönes 2007; Hobson 1998; Rommetveit 1998). In the latter context, Studdert-Kennedy (2002:207–228) describes vocal imitation and points to the potential role of mirror neurons in the evolution of particular speech, Billard

and Arbib (2002:343–352) present their computer simulation model of imitative learning of gestures, and Bråten (2002:273–294) emphasizes the role played by altercentric participation in the child's path from embodied simulation to simulation of mind in (proto) conversation partners.

## Innate basis for acquisition and articulation of speech?

Every typical child learns to use and understand conversational speech language in an impressive efficient manner, and in a way and with a speed impossible for adults to match. Exposure to the ambient streams of speech and through participation in protoconversation and interaction without any explicit instruction is sufficient, except for the parents and care-person being more explicit and distinct in their pronunciation when addressing infants.

Given this fact, it is not at all strange that they are attributed with an inborn linguistic acquisition capacity. Noam Chomsky has postulated that children are equipped with an innate device, a so-called Language Acquisition Device, enabling them to acquire fluency in a native language and entailing a generative scheme for generating a sort of Universal Grammar which he attributes to all languages – beneath and across their respective special grammars. It remains yet to be demonstrated whether or not there is an inborn basis for acquisition and mastering of language grammar, and whether there is a sort of universal grammar matrix into which the high variety of language grammars would fit. Languages differ in many respects, including grammatical structure. For example, unlike English sentences usually involving subject and predicate, in Chinese sentences the subject is usually absent. This is pointed out by Li and Hombert (2002:188), who suggest that it took approximately 1.5–2 million years for hominid communication to evolve into casual, spontaneously spoken language, facilitated by the increase of mirror neurons in the neocortex. If that is the case, then we might add: facilitated by the adaptation of the mirror system enabling efficient learning (cf. Chapters 2 and 5, as well as Part III, this book).

Even though no genetic basis for an innate grammatical capacity has been found, a discovery has recently been made that suggests a partial genetic basis of relevance for language acquisition and articulation. A gene, termed the FOXP2 gene, involved in the neurodevelopmental process that culminates in articulation of speech has been identified (Lai et al. 2001; Vargha-Khadem & Liegeois 2007), based on a three-generational study of the so-called KE-family of thirty members. Half of them suffered from a severe verbal and orofacial dyspraxia, entailing problems in execution of co-ordinated speech movements and facial expressive movements. Their impairments were found to be caused by a mutation of the FOXP2 gene, associated with bilateral brain abnormalities in cortical and subcortical

regions (including inter alia the inferior frontal gyrus (part of Broca's area) and the cerebellum). Functional Magnetic Resonance Imaging (fMRI) studies have been used to determine the pattern of brain activation associated with the FOXP2 mutation when performing language tasks including both covert and overt language processing. Unlike the unaffected family members for whom overt verb generation entails left hemisphere activation of areas that include the Broca's area, activation in the affected members involved both hemispheres and was diffuse, with just detectable activation in the anterior part of the left inferior frontal gyrus (Broca's area). The FOXP2 mutation was found to result in abnormal functioning of a circuit critical for speech and language functioning. It remains a mystery how such a circuit came to be adapted in humans to subserve articulate speech, Vargha-Khadem and Liegeois point out:

> "considering that in primates mirror neurons have been found in area F5 (i.e., the homologue of Broca's area in the monkey), it can be speculated that the frontostriatal circuit has been critical for the emergence of early communicative behaviour (Rizzolatti & Arbib 1998). How this circuit becomes adapted in humans to subserve the exquisitely fast and precise function of articulate speech remains a mystery."
>
> (Vargha-Khadem & Liegeois 2007:145)

They regard their findings to be consistent with the notion that the FOXP2 gene plays an important role in the development of brain circuits that are crucial for speech acquisition. And in the next chapter, and returned to in Chapter 5 (this book), a hypothesis will be put forward pertaining to the adaptation in human phylogeny and sociocultural evolution of a system subserving distant and face-to-face communication with efficient infant learners.

Even though the above FOXP2 mutation findings concern the genetic basis for language articulation and not syntax (with grammatically correct structure), they may lend some support to Chomsky's proposal about a genetic basis for language acquisition. His proposal has inspired others, including Steven Pinker (1995), to assume that the emergence of language has occurred through natural selection entailing mechanisms that fit a neo-darwinistic account of evolution, while Chomsky himself remains doubtful about this. While Chomsky may have gone too far with respect to grammar in attributing to children an inborn genetic device for language acquisition and later generation of grammatically correct sentences, infants have been found to be highly sensitive to their native or ambient speech language in their first year and incredibly efficient in their acquisition opening for utterances of the first words soon after that (cf. Kuhl 1998; Akhtar & Tomasello 1998). This impressive learning process may be indicative of an innate capacity at operation. This invites the assumption that the inborn capacity of human

infants for cultural learning is essential and that this is likely to be subserved by a mirror neurons system which has been adapted in evolution to support learning by mother-centred mirroring.

## Speculation on the selective advantage of learning by (m)other-centred mirroring

Even though there is disagreement as to whether or not so-called 'reciprocal altruism' may have played a part in the emergence of speech language, this has been proposed to play an important part: altercentricity, i.e., learning by other-centred participation, and which appears to be subserved by mirror neurons (Bråten 1998a; 2002, 2004, 2007, cf. also Bråten & Gallese 2004; Falk 2004; Ferrari & Gallese 2007). Its ontogenetic role will be elaborated in Part III, while the phylogenetic implications will be discussed in the next chapter.

As has been indicated in the introduction, human newborns demonstrate a readiness to mirror facial expressions and gestures, and young infants' impressive speech perception attests to highly efficient mechanisms at play during nonverbal and verbal interaction. In contrast to the Piagetian attribution of an *egocentric* point of departure for children's development of language, requiring decentration as the child matures, we believe we have now found evidence of infant capacity for *altercentric* mirroring and self-with-other resonance soon after birth (Bråten 1998a; Bråten & Trevarthen 2007; Stern 2000, 2004, 2007; Trevarthen 1998). It is probably supported by a mirror neurons system adapted in hominin phylogeny to subserve mother-centred participation (Bråten 2002), facilitating the ontogenetic path to speech in the culture into which the infant is born. As we saw in the previous chapter, this path comprises inter alia these steps: Mutually attuned protoconversation in the first months of life, and speech perception entailing that already by six months the infant has begun to "turn a deaf ear" to sound distinctions that make no sense in the ambient language (Kuhl 1998). This is soon followed up by the babbling onset of well-formed syllables and production of vowels approaching those of the native language, coinciding with joint attention and acknowledgment of self-other agency at about nine months. Early reading of intention and (pre)verbal learning are likely to be supported by mirror neurons revealed in macaque experiments (Fogassi et al. 2005), decentred in phylogeny to compensate for the hominin infant loss of the instructive and protective advantage enjoyed by other back-riding primate infants (cf. Bråten 2002; Falk 2004).

As the very reverse of egocentric observation, altercentric participation entails feeling and experiencing what another is feeling and experiencing as if one's own orientation is centred in the other. This means that when the other is doing something one virtually participates in the other's doing by virtue of feeling

to be in the other's bodily centre. In other words, by virtue of such altercentric participation one becomes a virtual co-author of what the other is doing (cf. Bråten 1998; Stern 2004:241–242). Now, with respect to infant learning, this entails that the infant learns from virtual participation in the model's doing as if the infant were a virtual co-author, and which leaves the infant with an implicit 'e-motional' memory (or what Fogel (2004) terms a participatory memory), which invites circular re-enactment.

Falk (2004a) has advanced 'the baby let down hypothesis' requiring hominid mothers to be particularly vigilant and to resort to pre-speech and proto-speech in addressing their infants. Independently this *hominid infant decentration hypothesis* has been advanced by Bråten (2002, 2004): In particular before the invention of baby carriers, those hominid infants, deprived as they were of the back carrying advantage of the offspring of other primates, who were able to learn by (m)other-centred participation from the adults to listen and to cope and take care would have had a selective advantage, and such that this would have contributed to the emergence of gestures and significant sounds as critical in the sociocultural phylogenesis of proto-speech. For the efficient acquisition of such proto-speech and for infant learning by altercentric participation to cope and take care, an adapted mirror system may have been a likely neurosocial support.

Subserving verbal learning by (m)other-centred participation, this altercentric capacity is supportive of verbal conversation to come with its reciprocal and participant characteristics. Not only may the speaker co-process his own production from the listener's stance. The listener may co-articulate the speaker's production as if she or he were a co-author. Such virtual co-articulation from the other's stance is manifested when a listener completes the speaker's aborted sentence or answers a half-spoken question, supported by the capacity for other-centred mirroring and resonance that we see at play in protoconversation and response to motherese (Bråten 1988; 2002, 2003; Trevarthen 1998; Stern 2000, 2004).

We shall later turn to recounts of some neural net simulations in order to illustrate issues implied by the Hominin infant decentration hypothesis, specified with reference inter alia to Falk (2004ab) and my identification of altercentric mirroring by human infants. My proposal about the mirror neurons system having to be adapted to subserve face-to-face learning to cope compensating for the lost protective and instructive advantage enjoyed by back-riding offspring of other primates (Bråten 2002, 2004) invites the conceptions of hominid mother-child dyads qua members of evolving small populations, embedded in a hazardous environment and entailing a rudimentary mimetic culture. My conjecture is that dyads supported by altercentric 'neural networks' would have had a selective advantage as compared with dyads merely operating with networks that have not been decentred, i.e., egocentric ones. Even if pertinent data on human phylogeny are lacking,

we are now in the position to investigate and explore neurosocial processes, such as entailed by the recently discovered mirror neurons, supporting pre-verbal imitation and learning in ontogeny (cf. Rizzolatti & Arbib 1998; Stamenov & Gallese (Eds) 2002; Ferrari & Gallese 2007; Bråten (Ed.) 2007).

When asked to do what the facing instructor is doing

As documented in this book and elsewhere (Chapter 5 in Bråten (Ed.) 1998:105–124), infant learners appear able to feel to be moving with the other's movements, entailing a virtual mirror reversal of the facing other's movements as perceived. This I have termed 'altercentric participation', the very reverse of egocentric perception. For example, when an adult model raises her hands with palms outwards and asks a child facing her to do what she does, the ordinary child will imitate that gesture correctly with palms outwards (Figure 4.2 (left)). A child confined

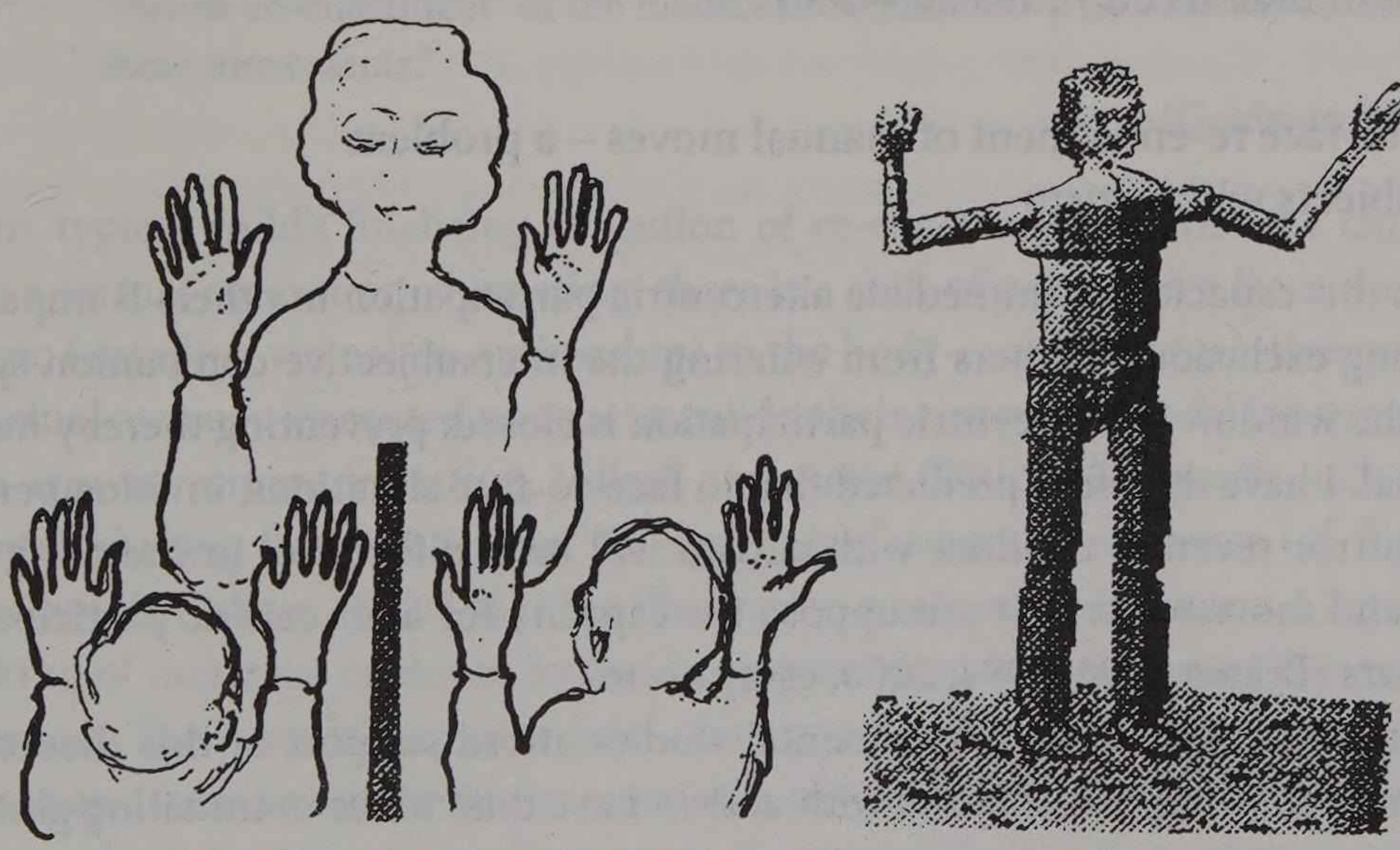


**Figure 4.2.** On imitation of arm-raising in face-to-face situations.

(*left*) When asked to do what the adult model does, the ordinary child (to the left), from feeling to be a virtual co-author of the model's movement, will automatically raise hands with palms facing outwards as the model does, entailing perceptual reversal from altercentric perception to egocentric execution, while a complying subject with autism (the child to the right) will merely mimic what the child is seeing, identifying the model's palms with own palms and raising arms correspondingly with palms inward. (Used in a 1997-lecture, this illustration has been reproduced in Bråten (Ed.) 1998:117).

(*right*) Adaptations of the illustration by Billard and Arbib (2002:346) portraying the kind of gesture imitation explored by their computer simulation model of learning, containing inter alia a module for frame of reference transformation (from eccentric to egocentric), a motor control system, and a learning system, employing inter alia a cerebellum module with somatotopic body map and 240-nodes-networks.

only to egocentric perception, however, will fail to execute such a mirror reversal. Identifying the inside of his own hands with the inside of the model's hands shown to him, such a child is expected to raise arms with palms inwards (Figure 4.2 (right)). This has been predicted to apply to autism from the assumption that the ordinary capacity for such mirror reversal has been impaired or blocked in children with autism, creating problems in face-to-face situations (Bråten 1994).

The bottom left illustration in the left portrait in Figure 4.2 pictures what typical children do when invited to do what the adult is doing, entailing mirror reversal, while someone with egocentric perspective, such as in autism, is expected to have problems: Seeing the resemblance between the inside of the model's hands with the insides of his own, and being incapable of a virtual reversal of the model's movements as felt, the child with autism who understands the request to do as the adult does, has been predicted to do what is being seen from own position, and will raise hands with inside inwards. This has been confirmed (cf. *inter alia* Whiten & Brown in Bråten (Ed.) 1998:260–280).

## Face-to-face re-enactment of manual moves – a problem for subjects with autism

When this capacity for immediate altercentric participation in others is impaired, entailing exclusion of others from entering the intersubjective companion space, then the window to altercentric participation is closed, preventing thereby mirror reversal. I have therefore predicted that in face-to-face situations, inviting perceptual mirror reversal, children with autism will have difficulties in imitating gestures and movements that presuppose the capacity for alter-centric participation in others (Bråten 1993, 1994; 2000: essay no.16).

Empirical data from experimental studies afford support of this theoretical inference showing that subjects with autism have difficulties in imitating gestures and movements, such as arm raising or grasping one's thumb, when exposed to them in face-to-face situations. The prerequisite reversal of movements does not occur. Referring to the above prediction, Whiten and Brown (in Bråten (Ed.) 1998) have demonstrated such failures, offering this explanation:

> "One conjecture is that a link [with lack of mind-reading] might exist because imitation involves effectively translating from a action done by another individual from their perspective, into what it is to do it from one's own perspective: put this way it appears an inherently intersubjective phenomenon [.....] The reversal errors found here are consistent with this 'mental perspective change' conjecture, as are the similar errors recorded in the study by Ohta (1987)."
>
> (Whiten & Brown 1998:278).

In contrast to ordinary children who re-enact the model's gestures from the model's position, which entails a shift from perceptual reversal of what the other is doing

to body-centred execution of the re-enactment, subjects with autism who understand the verbal invitation "Do as I do!" only see what the other is doing from the outside, for example in the case of arm raising, identify the model's revealed palms which they perceive from the outside, link this to their own palms and then raise their arms with the palms inwards (cf. Ohta 1987, and Fig. 5.4 in Bråten (Ed.) 1998:117).

Alvin Goldman, proponent of the simulation version of theory of mind, supports the above account:

> "A distinctly simulationist interpretation of Ohta's findings was later proposed by Braten (1998). In face-to-face situations, remarks Braten, the reenactment of gestures by infants depends on perceptual reversal of the model's movements. To imitate properly in the outward-facing palms task, the child must leave his egocentric perspective and adopt that of the model, who sees the back of her hand rather than her palm. Braten says that the imitator must engage in "virtual co-enactment" of the model's movements *as if* he were the co-author of those movements."
>
> (Goldman 2005:87).

In the typical child's finalizing execution of re-enactment of what the child has been a virtual co-author of enacting, there is a shift of perspective from the altercentric (entailing virtual co-authorship) to the body-centred perspective required for actual own ego-executed re-enactment. In their computer model for simulating such arm movement imitation, Billard and Arbid (2002:346) specify such a shift to entail shifting from "eccentric" to "egocentric" frame of reference (cf. Fig. 1 in Stamenov & Gallese 2002:346). The illustration to the right in Figure 4.2 portrays the kind of imitation explored by their computer simulation model of learning by imitation. Their model contains *inter alia* a module for frame of reference transformation (from eccentric to egocentric), a motor control system, and a learning system which contains inter alia a cerebellum module with networks of 240+240 nodes and somatotopic body map involvement. Their model will be turned to at the end of this chapter after a succinct review of the background for some pertinent crude 'neural network' simulations of egocentric and altercentric perception carried out in 1996–97 in order to compare the relative speed of altercentric nets and egocentric nets exposed to the same input patterns (Bråten 2000b).

## On the background for speculations about possible neurosocial architecture

My neurosociological prediction that an altercentric (mirror) system would be found in humans, and my expectation that perhaps even neurons sensitized to

altercentric perception might be found, was nurtured upon reflecting on what I had learnt at a King's College workshop on perception of subjects and objects in Cambridge. Here John O'Keefe (1992) raised the issue of the relation between self-consciousness and allocentric maps. For an animal an allocentric map of the landscape would be independent of the animal's gaze direction in relation to the landscape and, hence, transcending a view from an egocentric perspective. Earlier O'Keefe and Nadel (1978) had suggested that the hippocampus implements a cognitive map and performs spatial computation. Rats are able to find their way in an environment even when novel trajectories are necessary; they do so by virtue of hippocampal maps that hold information about allocentric space, as contrasted to egocentric space. In a study of a monkey moved to different places in a spatial environment, O'Keefe (1985) found evidence of *place* cells, dependent upon the place where the monkey was, and different from *view* cells, defined primarily by the view of the environment, and not by the place where the monkey was. And, then, Feigenbaum and Rolls (1991) had investigated whether the spatial views encoded by primate hippocampal neurons use *egocentric* or some form of *allocentric* coordinates (see Rolls 1995).

This inspired me – before I learnt in the autumn of 1997 of the mirror neurons discovery – to venture the prediction that neurons sensitized to altercentric (mirror) reversal would be found in infant learners who re-enact a facing model's novel movements or gestures: When realized at the neurophysiological level, it would entail that there be neural cells responding to the gestural movements of others not just egocentrically (that is view-dependent), not just allocentrically (that is independent of the infant's position and perspective), but altercentrically, i.e., centred in the other's position or perspective. If such neural cells should not be found, I declared, then more comprehensive neurosocial systems and pathways would be found to realize perceptual reversal in face-to-face situations.

## May such an altercentric (mirror) system be operative already in human newborns?

One may speculate about whether or not such a mirror system is dependent upon being sensitized or "trained" in order to be operative. I had expected that it was. While predicting it to be innate, I was reluctant to attribute such a mirror system already in operation in neonatal imitation in the first hour of life. But this is a matter for further investigation. Heimann (1997, personal communication) suspects it to be at play already from the outset. There is, indeed, the possibility that it is already present at birth, while not to be expected in infants who later are diagnosed as autistic (cf. Heimann's analyses in Bråten (Ed.) 1998:89–104). And now, Ferrari and Gallese (2008:81), exploring implications concerning mirror neurons

and intersubjectivity, declare that the "sensory-motor system is already set to be coordinated with someone else's experience in a participatory sense."

Still, a certain minimum of face-to-face sensitizing nurture may be required for such participant perception to be evoked. In 1973 Malsburg had presents a nerve net model for the visual cortex of higher vertebrates, and finding orientation sensitizing to be at play as a function of early training. His point of departure was the findings of Hubel and Wiesel (1962) about neurons selectively sensitive to the presentation of light bars and edges of a certain orientation to be organized in functional columns according to orientation. When subjected to "training" to only a restricted set of stimuli during the training period, his model implies that the cortical neurons will specialize to these stimuli and become insensitive to other stimuli. This is consistent with what Wiesel (1987) reports about how newborn monkeys and kittens exhibit marked changes in the ocular dominance column when influenced by visual training.

With this in mind, I nurtured the expectation that some critical sensitizing nurture during the first days or weeks of life would be needed to evoke altercentric participation and perceptual reversal. When, however, some neonates reported by Meltzoff and Moore (1989) imitate clockwise head-rotations in a clockwise direction after a pause (introduced to control for 'perceptual tethering'), i.e., in reverse direction of what is being seen face-to-face, this might indicate neonatal capacity for mirror reversal without any sensitizing in advance. And yet, while I attribute such a capacity to be available already at birth, I still expected it to be dependent upon some minimum of interactional nurture in order to be sustained and strengthened. We have to distinguish here between the covert participant perception that may be occurring while the neonate is gazing at the face of the experimenter doing the model gestures, inviting participant perception, and the actual gestural imitation that the neonate may exhibit after a delay, entailing shift to a body-centred mode of execution. While capable of including actual others in their companion space in felt immediacy, young infants would depend, I expected, on a minimum of prior face-to-face nurture in felt immediacy in order that a mirror reversal system be sensitized and "trained" to allow for response to companions in an altercentric manner. The first months – before infants engage with their companions in joint attention towards objects in the surround, inviting allocentric perception – may be critical in that respect.

## On two computer models involving artificial 'neural network' simulations

The above kind of questions and expectations were in the background for the crude connectionist explorations which were carried out at the Centre for Advanced

Study (CAS) in Oslo 1996–97 (cf. Bråten 2000b). My limited objective was just to demonstrate the operational feasibility of 'training' different versions of implemented 'neural net' simulators to reproduce input patterns, corresponding to the Gestalt of a manual gesture, in a copying (egocentric) manner and in a reversed (altercentric) manner. And now, as earlier mentioned, in the more elaborate computer simulation model of imitation of arm rising, Billard and Arbib (2002) had to implement a mechanism for shifting from the eccentric frame of reference involved in the perception of the model's arm raising to the egocentric frame of reference required for the execution of the re-enactment or, as I would put it: from the altercentric frame of reference for perceiving what the model is doing from his centre to own body-centred frame of reference entailed by the re-enactment of arm raising.

## Connectionist simulations comparing 'egocentric' and 'altercentric' networks (Bråten)

In neurocomputational simulations were studied in terms of speed two networks 'trained', respectively, to reproduce a copy of a given hand-sign input pattern and to generate the reverse of that pattern, as illustrated in Figure 4.3 (i). At the top to the left is shown the hand sign as seen by a perceiver facing the enactor of the sign. Below to the left is shown the reversed image corresponding to how the perceiver upon re-enactment of the gesture will see the sign from his own (egocentric) stance. For the facing perceiver, then, in order to re-enact the gesture as seen made by the other, the image has to be reversed. This inversion pattern has turned out to be possible to explore even by a simple three-layer recurrent network (of the family shown in Figure 4.3 (ii), but without contextual nodes), compared with recognition of from an egocentric stance.

Simple recurrent network learning and back propagation through time, of the kind implemented in *tlearn*, and used as above, has been developed by Plunkett, Elman and others to explore processes in children's language acquisition, for example, learning the English past tense (cf. Plunkett & Elman 1997). Thus, the three layer architecture of such simple recurrent networks, illustrated in Figure 4.3 (ii), has been designed for connectionist simulation of perceptual detection of patterns displaced in time. Such an implemented network consists of one input layer (symbolized at the bottom in the illustration), one output layer (symbolized at the top), and an intermediate layer with 'hidden nodes' (symbolized by dotted lines). For example, in some of our computational simulation attempts, using a low-resolution image of the hand sign, we used two identical three-layer networks, an 'Ego-net' and an 'Alter-net', each with an input layer of 838 nodes and an output layer of 838 nodes, and with 50 nodes in the

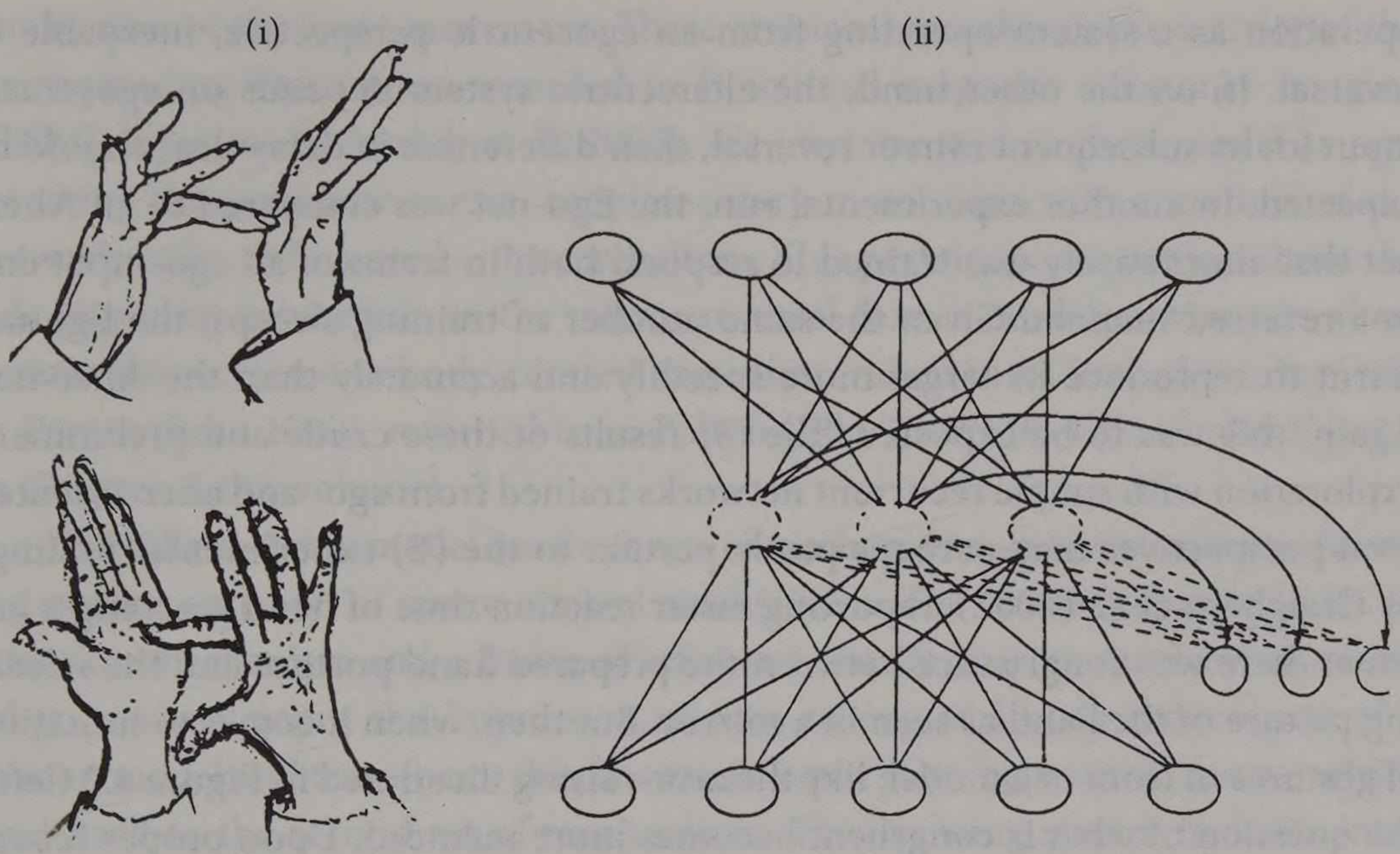



**Figure 4.3.** Hand sign pattern inviting reversal, and the connectionist network model architecture used in simulations comparing egocentric and altercentric networks.
(i) The hand sign for 'Jesus' (top) as presented to the perceiver, inviting mirror reversal upon own body-centred re-enactment, as portrayed below.
(ii) The architecture of a simple recurrent network (adapted from Plunkett & Elman 1997:152) with input layer of nodes (bottom) and output layer (top), and an intermediate (hidden) layer (connected also to contextual nodes (circles) serving to store a copy of the hidden node activation pattern at t for feeding to hidden nodes at t+1 in conjunction with new input at t+1 – not used in our simulations) (after Bråten 2000b:294).

intermediate (hidden) layer. While the Ego-net was trained to reproduce an image of the input pattern without any reversal, the Alter-net was trained to reproduce the reverse image (corresponding to the pattern at the bottom of Figure 4.3(i)). During network training, error is assigned to the hidden units by back propagating the error from the output, where the error reflects the deviance of the output pattern from the training target pattern. The error on the output and hidden units is used to change the weights on the intermediate and input layer. Although it should have been expected, given the design of *tlearn* programme, I was surprised to see that given the same number of training sweeps (400 presentations of the input pattern), the Ego-net and the Alter-net did not differ much in terms of error or time. It made me realize that if there be distinct systems, subserving respectively egocentric and altercentric perception in humans, then upon being sensitized or trained, they may not differ much in terms of expediency and delay time. This led me to suspect that an evolved system sensitized to altercentric (mirror) perception of a gesture or action may be as speedy in

operation as a system operating from an egocentric perspective, incapable of reversal. If, on the other hand, the altercentric system depends on egocentric input for its subsequent mirror reversal, then differences in delay time should be expected. In another experimental run, the Ego-net was compared to an Alter-net that alternatively was trained to respond both in terms of an ego-input and in a reversed manner. Given the same number of training sweeps, the Ego-net learnt to reproduce its target more speedily and accurately than the Alter-net. Again, this was to be expected. The (S) results of these crude and preliminary exploration with simple recurrent networks trained from ego- and alter-oriented rival perspectives may perhaps partly pertain to the (E) experimental findings by Craighero et al. (2002), reporting faster reaction time of hand grasping a bar when there was congruence between the prepared hand posture and the releasing picture of the hand as seen in a mirror. But then, when it comes to imitation of gestures in front of a model, like the arm-raising illustrated in Figure 4.2 (left), the question of what is congruent becomes more nuanced. Upon proper recognition of the act to be imitated, when asked "Do as I do!", this is speedily done by the typical child, even if it entails what Billard and Arbib term frame of reference transformation. Such re-enactment, entailing reversal from altercentric perception to body-centred execution, will occur more speedily than if the child were to comply with this request: "Do what you see me do (from your perspective)", such as exhibited by the child in the middle (with autism) who has to relate to the model's enactment from the outside, as it were.

## Computer simulation of imitation of arm-raising in a face-to-face situation (Billard & Arbib)

Michael Arbib is a key figure on implications of the mirror neurons discovery. Aude Billard and he use a computational neuroscience approach with computer simulation to explore processes involved in learning by imitation, such as imitation of arm-raising. As they point out, while much is known about visual recognition of movements and on motor learning, much less is known about the brain's ability to match visual and motor representations. They refer to documentations (by Gallese et al. 1996; Rizzolatti et al. 1996; Di Pellegrino et al. 1992) that mirror neurons provide the neural system enabling match of the neural command for action with the neural code for recognition of the same action executed by another primate. The Billard-Arbib model takes into account that the human mirror neuron system is distributed in neural network areas beyond Broca's area (area 45) including "the left dorsal premotor area 6, left inferior frontal cortex (opercular region) and the rostral-most region of the right superior parietal lobule (Iacoboni et al. 1999)", enabling similar mirroring activity during both observation, rehearsal, tuning and

production of the same movement. These areas, comparable to the activity of the corresponding brain areas recorded in functional magnetic resonance imaging (fMRI) experiments (Arbib et al. 2000), are implemented in their model as representing the premotor cortex, supplementary motor area with a module of the network and – to be noted – the cerebellum. This pertains to a question about the role played by cerebellum in the mirror reversal from a model movements alter-centrically perceived to body-centred execution (raised in an invited seminar talk in Parma (June 2000), returned to in Bråten (Ed.) 2007:120–121; cf. also Fig. 2.2 in Chapter 2, this volume).

The Billard-Arbib model has three sets of mechanisms – a visual system, a learning system, and a set of motor control mechanisms. The visual system includes an attention mechanism and a frame of reference transformation mechanism which takes as visual input the impression of arm raising and body movements of a human model and transforms this 'eccentric' input to an 'egocentric' format which lend itself to the second set of mechanisms. This learning system includes inter alia a cerebellum module entailing learning of temporal sequences of movements, operating in conjunction with a decision module for control of movements and which inhibits own movements during observation without imitation. The simulated cerebellum networks (240 + 240 nodes), take the input from the attention mechanism concerning leg, elbow and shoulder upon the operation of the frame of reference transformation, make use of somatotopic body maps before motor control mechanisms come into operation with sets of nodes coding for activation with links to spinal cord and motor neurons commanding muscles used in the imitating re-enactment of arm extractment as output (cf. Fig. 1 in Billard & Arbib 2002:346–347).

## On mirror reversal face-to-face and the open question about the role of the cerebellum

The way in which the Billard-Arbib model implements a necessary transition from 'eccentric' perception of the model to 'egocentric' execution of the imitative re-enactment, which then actually entails a mirror reversal, comes close to be consistent with the hominin infant decentration hypothesis (Bråten 2004a) to be returned to in the following chapter. This concerns the mirror reversal entailed in the shift from the perception of what the other is gesticulating as if being a co-author of that act or gesture to the re-enacted body-centred execution of the act or gesture to be imitated.

The way in which the attention mechanism and frame of reference transformation afford input to the learning system mechanisms with the cerebellum module suggests that B-A model does not – at least not explicitly – allocate a role

in that transformation played by the two opposed body maps in the cerebellum – one with face backward and one with face forwards entertained, respectively, in lobus anterior and lobus posterior (cf. Brodal 1995:399; Ghez 1991:634; cf. Fig. 2.2 in Chapter 2, this book). Such findings (originally by Adrian 1943 and Snider & Stowell 1944, referred to by Adrian) may be pertinent to the mirror reversal which has been identified in relation to such apparently simple imitations in face-to-face situations as re-enactment of arm raising, which subjects with autism who understand the model's request: 'Do what I do!' find difficult – many of them raising their arms with palms inwards (because they could identify the model's outward palms and compare with own palms) (cf. Fig. 5.2 and Whiten & Brown in Bråten (Ed.) 1998:117; 272–273; Ohta 1987). This was behind my pointed question at the Parma seminar in 2000 about the possible role played by cerebellum for the prerequisite mirror reversal required in imitation of gestures and movements in face-to-face situations, and returned to at the Delmenhorst symposium the same year when Billard presented the above Billard-Arbib model.

In so far as we might consider the instructor to be extracting or raising arms as a significant gesture, even though no meaning processing mechanisms are included in the above model, the Billard-Arbib model may be regarded to be relevant to this question to be posed in the next chapter: In what period of hominid evolution would a decentred mirror neurons system for learning by (m)other-centred participation have played the most critical role, and how may it have contributed to the phylogenesis and sociogenesis of hand-sign gestures and proto-speech?

Pertinent are also the simulations done by Kirby on social transmission without natural selection, emphasizing observationally learned communication systems, the model of initiator and imitator interaction developed by de Boer, and the model highlighting the Baldwin effect of cultural learning with model mechanisms operating even at the neural network level simulated by Livingstone and Fyfe.

And then, the Billard-Arbib model of imitational learning may be seen to be based on the implicit assumption that an adaptation allowing for frame-of-reference transformation has occurred in human phylogeny. The way in which this model the attention mechanism and frame of reference transformation afford input to the learning system mechanisms involving the cerebellum module does not, however, attribute any role that may be afforded by the two opposed somatotopic body maps in the cerebellum (such as suggested in Figure 2.2). That issue awaits further clarification, findings and modelling in the future.

CHAPTER 5

# On cultural evolution of mother-centred learning

## Comparing humans and chimpanzees

In 1866 a ban was imposed by the linguistic society in Paris on further attempts to account for the evolution of language. There had been an abundance of speculative attempts and a lack of substantial and pertinent criteria for evaluating the various proposals. With respect to empirically afforded criteria on phylogeny we are perhaps not much better off today. However, we do have access to new findings in some pertinent domains of ontogeny suggesting some innate capacities afforded by phylogeny in the sociogenetic contexts of cultural evolution. Infant research, studies of early language acquisition, brain research and primatology, including comparative studies of learning in chimpanzees, open new windows and at least permit us to pose our speculative questions in different ways. And, then, some critical evolutionary findings are being reported, such as the Turkana boy, described by Richard Leakey (1995) in *The Origin of Humankind.* As will be returned to, Leakey attributes a scenario to a Homo erectus group at that time, about 1 1/2 million years ago, in which chattering in a pre-linguistic sense occurs as social small talk and discussions about plant foods to be gathered.

### Do we have a firmer ground for speculating about pre-linguistic evolution?

Now, assuming that this attribution of *chattering* in a pre-linguistic sense is warranted, do we have somewhat firmer grounds for speculations about its origin than in 1866, when the ban was imposed by the linguistic society in Paris? I think yes, partly for these four reasons:

> First, as chartered inter alia by Bruner (1983), by Nelson (Ed. 1989), by Stern (1985), by Trevarthen (1974), and by contributors to two collective volumes on intersubjectivity and communicative development (Bråten (Ed.) 1998, (Ed.) 2007), we know a lot more about the path to language in the culture into which the infant is born: from the first vocal imitation of /a/, revealed in Crete by Kugiumutzakis in the first hour of life, through protoconversation in the first

months of life, speech perception entailing that already by 6 months the infant has begun to "turn a deaf ear" to sound distinctions that make no sense in the ambient language, through joint attention and affect attunement entailing shared vitality contours – all precursory and supportive of verbal conversation to come.

Second, we know a bit more about the nature of verbal conversation and of how the talking child also demonstrates the so-called "Theory-of-Mind" (T-o-M) ability to understand or simulate other minds. We see the precursory path to this when toddlers complete what adults pretend to fail to achieve, and we see it demonstrated when verbal conversation partners reply to one another's half-spoken questions, and which may be accounted for in terms of a cybernetic model of how they mentally simulate one another's coding processes (Bråten 1974, 2002).

Third, advances in neurophysiological and brain research, including novel computational and brain imaging techniques, have opened new avenues for studying neurosocial support systems, and their subtle interplay with culturally afforded support systems at the interpersonal level. For example, mirror neurons have been found to discharge in the macaque brain both when another is observed grasping a morsel and when the monkey is grasping the morsel. Rizzolatti and Arbib (1998) refer to evidence which suggests that in humans a similar mirror system may be allocated to a region containing Broca's area, and point to its possible support of the first primitive dialogue. This is consistent with implications of the virtual other postulate. In his discussion on infant intersubjectivity and the brain, Trevarthen (1998:46) points out that as the brain mechanisms representing the individual's body in its activities and states are of ancient lineage and very extensive, the mirror system enabling the expressions and moves of other individuals to play a part in "learning intersubjectively, the 'virtual other' mechanism (Bråten 1988, 1994, 1998) must be similarly extensive." And I have indicated how cultural learning by altercentric perception may be partly supported by an adapted mirror system (cf. our contributions in Stamenov & Gallese (Eds.) 2002, and an interview with Gallese and myself on implications of the mirror neurons discovery in the brain issue of *Impuls* 2004:96–107).

Fourth, while Savage-Rumbaugh (1999) has demonstrated that one of our closest relatives, the bonobos, appears able to pass a simple Theory of Mind (T-of-M) test, upon having learnt to engage in proto-symbolic signalling by means of computerized sign boards, chimpanzees appear incapable to come up with something resembling protoconversation and proto-narratives. Pertinent in this respect is also the virtual absence of prolonged eye-contact (as stressed by Bruner 1996:163 with reference to Savage-Rumbaugh et al. 1993). Having compared infant-adult interactions in humans and in chimpanzees for a decade, I can confirm this, at least as pertaining to the chimpanzees I have studied in a Southern-Norway zoo and wildlife park.

## Comparative studies of infant-adult interaction in humans and chimpanzees

When clinging to the mother's back, offspring of great apes learns to orient themselves in the world in which they operate from the carrying mother's stance. Moving with her movements, they may even be afforded the opportunity to learn by copying her movements (perhaps in the way that Byrne (1998) terms "program-level imitation") without having to transcend own (egocentric) body-centred perspective. In my periodic studies of captive chimpanzee-offspring relations, I observe how the infants, when old enough to cling to the mother's back, not only bodily move with the mother's movements but often adjust their head to her movement direction, appearing to be gazing in the same direction as she does. When a mother holds the infant in front of her for grooming (which adults more often do from behind one another), a sort of face-to-face situation is established, but not for the kind of reciprocal interplay entailing mutual gazing and gesticulation which we observe in human infant-adult pairs. Here follow some of my own observations of interaction in captive chimpanzees (cf. also appendix 1 in Bråten 2000).

The below glimpses, narrated in anthropomorphic terms, are from the daily life of a group of half-wild chimpanzees which I have studied through video-recordings, observations and drawings in the Kristiansand Zoo and Wildlife Park in Southern Norway. The group comprises initially two adult males (the Alpha male named Champis and the Beta male Kjell), three females (Josephine, Biny, and Dixie) with offspring, including a male youngster named Jesper. Later, others became part of the group, including Dixie's offspring – the male youngster Tobias and his younger sister Jane.

### Imitation of odd walking and "baby-sitting" posture

The five-year-old youngster Jesper is often at play with either of the two grown up males, with Champis who is the largest, and with Kjell who is smaller and slightly deformed and walks in a peculiar manner. In play sequences with each of the two male adults which appear very spontaneous, Jesper appears to be deliberately imitating what the adult is doing. Most striking was the way in which Jesper once followed Kjell around, walking behind him in the same peculiar manner of asymmetric limping as the ground movements exhibited by the adult Beta male.

This Beta male, Kjell, is used by one of the mothers, Biny, to watch her infant (one year) while she goes away for a while in search of food or drink. When preparing to go away she gives a sign to Kjell who immediately comes and assumes a position and bodily posture almost identical to the way in which Biny had been sitting, watching her offspring. This Beta male is almost like a social worker: he mediates in conflicts and is allowed – unlike the Alpha male – to attend birth out on the island.

## A mother's "medical care" prevents suffocation and releases holding behaviour

When Josephine's newborn was 25 days old something critical happened. The infant tried to cough and tried to cry, but was unable to cry or cough. Josephine went into action. First she put her small finger inside the tiny mouth of the infant, to no avail. Then she opened her mouth over the infant's head and face. She formed her lips like a track and began sucking and using her tongue. After a while she opened her mouth and extended her tongue to the on-looking attendants. On her tongue was a 6 cm. straw with a catch at the end. By having used her tongue, which she had used also when the infant was born, she saved her offspring from suffocation.



**Figure 5.1.** Josephine, becoming a 'holding' mother after having saved her infant from suffocation (Photo by the author at Kristiansand Zoo and Wildlife Park).

After this event Josephine's holding and caring behaviour radically changed. Since she gave birth, she had been showing signs of not getting accustomed to the motherhood situation. She had lost her first newborn in the water two years earlier, giving birth sitting at a tree branch. Having her second birth, Josephine at first appeared very uncomfortable with her newborn. She would not allow the infant to cling to her body, holding him away from her body, sometimes even upside-down. Now, after this event of saving her infant from suffocation, which may have approached what Stern (2004) terms a 'moment of meeting', she allows her infant to cling to her, and constantly grooms the infant, cleaning his eyes with her tongue, and so forth. She has also become very protective of her infant, and pushes away the youngster Jesper (5 years old) whenever he gets too close, attempting to be allowed to carry her infant on his back.

### Two different "situational definitions" of a similar event

One Friday, Jesper kept pestering Josephine, clearly wanting to hold her infant. When she turns away from him, he gets angry and throws things at her. Finally – after one hour of having been pursued and pestered by Jesper, she "lost her patience" and bit him. At Jesper's shrieking, the whole flock reacted instantly, came running towards them, shrieking at Josephine. Biny, the other mother, usually so close with Josephine, slapped her. Even Kjell, the "baby sitter", pushed her way. On Monday next week, the same development occurred. She lost patience and struck his arm. Again, at Jesper's shrieking, all the others came running. But this time, they focused on Jesper pushing him away from Josephine and her offspring.

### Moving with the mother's movement when back-riding

When riding on the mother's back the infant appears to be moving with her movements as she moves about. In this position infants frequently adjust their head to her head direction, appearing to be following her gaze (cf. Figure 5.2). Such joint movements are less apparent when clinging to the back of a sibling, for example, when Dixie's offspring (6 years) is allowed to carry his sister (5 ½ month).

### An object-oriented imitating attempt by a 22-months-old

Tobias (7 years old) prepares a stick which he can use for obtaining honey from a hole in a tree stump, as he has seen the older chimpanzees doing. He strips a branch of its leaves and inserts the stick in the hole, retrieves it and licks it. This he repeats several times while Jane (22 months) is watching him. Then the mother, Dixie, arrives and grabs the stick, taking it away from Tobias. After a while she drops the stick and leaves. When also Tobias leaves, little Jane grabs the stick, tries to hold it in the position she had seen Tobias held it, and tries but fails to insert

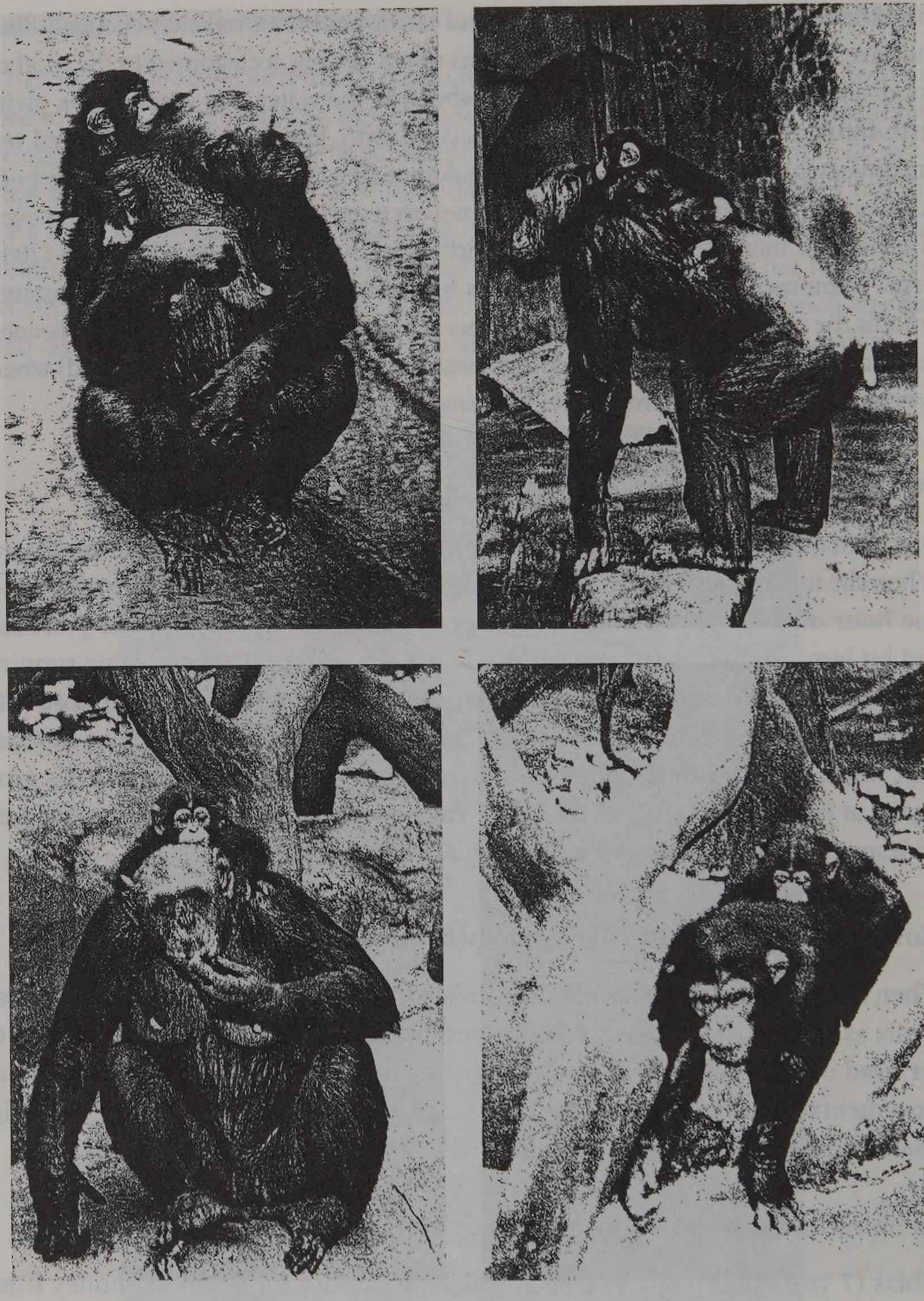


**Figure 5.2.** Back-riding chimpanzee offspring shown on mothers and on a brother (bottom right). (Recordings by the author in Kristiansand Zoo and Wildlife Park).

it into the honey hole. Even if she failed, I found her attempt to be an impressive feat, in particular in view of some researchers, including Tomasello et al. (1993), claiming that chimpanzees could not imitate. What the 22-month-old attempted demonstrates attempts at a rudimentary tool use which is more advanced in the

grown up captive chimpanzees, conforming to the point made by Whiten, Horner and de Waal (2005) about cultural norms of tool usage (cf. also Byrne (1998) on program-level copying in apes).

## Returning to the question of cultural transitions

As for transitions in the phylogenesis and sociogenesis of cultures, we saw in Chapter 3 how Donald (1991) distinguished between various cultural types in terms of different kinds of memory, succinctly recapitulated in Table 3.3. Thus, he emphasizes the crucial role of systems for representation in cultural evolution:

> "Humans did not simply evolve a larger brain, an expanded memory, a lexicon, or a special speech apparatus; we evolved new systems for representing reality. During this process, our representational apparatus somehow perceived the utility of symbols and invented them from whole cloth; no symbolic environment preceded them."
>
> (Donald 1991:3).

True, but environments marked by traces of others and of other things (footprints of hunters or drops of prey), recognized by proto-declarative pointing at such signs would have preceded the invention of symbolic re-presentations. And the imitation and imitative learning from procedural memory entertained in the mimetic (homo erectus) culture would have contained signature elements of re-presenting the model or model act enacted in the past. This pertains to the transition to a mythic (archaic human) oral culture, involving pictorial carvings and speech, and coming to rely on semantic memory. Now, one may ask about the kind of leap entailed by the transition from the episodic (primate) culture, relying on episodic memory of concrete events, to a mimetic culture, involving imitation and imitative learning from procedural memory.

I have voiced some speculations about the selective advantages afforded by learning by altercentric participation for the survival of hominid or human species in the phylogenetic period when ancestral infants could no longer ride on their mothers' back for protection and learning and before the invention of carrying bags of animal skin or other material. In that critical transition period, perhaps in the beginning of the Homo erectus period and before their inventing baby slings, infants and toddlers with an enhanced capacity for learning and listening by other-centred mirror-connectivity with facing distant adults would have had a selective advantage. The mirror neurons discovery indicates as we have seen that in the neurobiology of the primate brain there appears to be a ground for systems that could have lent themselves to adaptations for mirror systems in the human brain that could support such infant learning by altercentric participation.

## No cultural learning in chimpanzees?

Tomasello, Kruger and Ratner (1993) attribute to humans species-specific social-cognitive abilities to engage in cultural learning, entailing intersubjective understanding of others as mental agents. They find no evidence of this ability in our closest primate relatives, the chimpanzees, even when raised in human like cultural environments.

When comparing ordinary children and children with autism with chimpanzees, Tomasello and his co-authors find grounds for considering cultural learning to be a unique human form of social learning. The authors do not specify, however, how cultural learning depends on prior primitive capacities in the learner, even though partly implied by the rich comparative evidence offered.

In their comparison of children and chimpanzees, Tomasello et al. (1993:508) find that there is something acultural about the learning and social lives of chimpanzees. In spite of this, enculturated chimpanzees are found to manifest imitative learning and to demonstrate simple perspective-taking skills. Higher types of cultural learning and the ability to teach depend according to the authors on the understanding of others as mental agents. The chimpanzee, even when raised in human like culture, is in their view without this capacity. Chimpanzees, they claim, can neither teach nor internalize the instructions of others. This is contested by Kim Bard (1993:511–12) who refers to examples to the contrary (see also Bard in Bråten (Ed.) 1998).

Tomasello et al. (1993:509) point out that advanced self-regulated cultural learning, beyond the capacities of children with autism and enculturated chimpanzees, involves recursive intersubjectivity and internal dialoguing between mental perspectives, including a virtual other perspective. We may add here: True, provided prerequisite cultural nurture, the learner's virtual other, in virtue of complementing the bodily self and having the operational efficiency of an actual other, serves *inter alia* later in ontogeny the inner observing function described by Tomasello and his co-authors. But in line with their rejection of any kind of 'nativism' they have left unexamined the socio-emotional and auto-operational roots which the infant brings to bear on these processes. And equally relevant, posited as inherent, not constructed, albeit changed with cultural nurture, the learner's virtual other mechanism permits the learning mind to recreate and transform itself in the form of the dialogical, whether in (i) in self-engagement (with the virtual other), or in (ii) affectively tuned dialogic engagements with actual others, including peers. In this way this inner companion perspective, complementary to the bodily self, allows for learning by altercentric participation in models' movements affording e-motional memory for bodily circular re-enactment. This is not just a common base for the cultural learning mechanisms examined by Tomasello and his co-authors. Serving

as a companion perspective in inner dialogue and self-conversations, the learner's virtual other mechanism provides a basis for the ontogenetic leap to higher-order virtual pre-enactment of others' acts and mental processes later in ontogeny, i.e., to the nurtured rise from bodily re-enactments in felt immediacy to mental simulations of other minds in representation mediacy.

Tomasello et al. (1993) regard the primary evolutionary context in which primate cognition evolved to be a social one and, hence, that most of its unique features stem from adaptations to social challenges such as communication, social learning, cooperation, as well as competition and deception, in which primates are unique social strategists:

> "Our contention is simply that in this context human beings evolved species-specific social-cognitive abilities to understand the psychological states of conspecifics in terms of their perceptions and intentions, their thoughts and beliefs, and their reflective thoughts and beliefs, which allowed them to take the perspective of others and to participate with them intersubjectively."
>
> (Tomasello et al. 1993:509)

Such processes of social cognition, they claim, led humans to the species-specific ways of learning from one another in cultural learning, which then kicked off the evolutionary and historical processes that led to human cultures. While this is a rather cognitive-oriented claim, which invites being complemented by more (e)motion-oriented claims, let us first consider a pertinent radical question.

## Does the chimpanzee have a theory of mind?

In an evolutionary context, Nicholas Humphrey (1984) in his *Consciousness Regained* emphasizes the crucial role of social intelligence. Social primates are required by the very nature of the social system they create and maintain to be calculating beings; they must be able to calculate the consequences of their own behaviour and the likely behaviour of others:

> "Imagine the biological benefits to the first of our ancestors who developed the ability to make realistic guesses about the inner life of his rivals; to be able to picture what another was thinking about and planning to do next; to be able to read the minds of others by reading his own"
>
> (Humphrey (1984) quoted in Baron Cohen 1995:21).

This invites the question about whether chimpanzees have the ability to impute or attribute mental states such as beliefs, desires, intentions, to themselves and others, as a way of making sense of and predicting the behaviours of themselves

and others. This was the question posed by Premack & Woodruff (1978): "Does the chimpanzee have a 'theory of mind'?"

Pertinent are the episodes recorded and referred to by Byrne & Whiten (1985; 1991) who do not hesitate to talk of computation and mind-reading in tactical deception by non-human primates. They suggest that there is a certain mind-reading ability in chimpanzees with reference to episodes involving deceit and deception, i.e., whereby the primate from tactical reasons, such as obtaining some piece of food, hidden from the others' sight, appears to calculate and move in such a manner that the other is deceived by being invited to entertain a false belief (say about the location of the food in question).

## The bonobo Panbanisha subjected to a Theory-of-Mind deception test

An episode apparently demonstrating attribution of false belief by a female bonobo is one of the most telling episodes documented in this video film documentary on Kanzi, his sister Panbanisha (P) and her daughter Nyota, studied by Sue Savage Rumbaugh (Dr. R) at the Language Research Centre of University of Georgia:

P. likes the chocolate balls, M&M and she knows how to use the M&M symbol – in addition to a number of other symbols on her keyboard. What follows here are impressions of episodes in a film documentary by Savage-Rumbaugh, Takayoshi Kanu and Geeny Niio (film director) from the Language Research Centre at Georgia, produced in cooperation with the Kyoto University Primate Research Institute:

> Dr. R. shows M&M chocolate to her helper, Liz, with P. watching, Dr.R. asks "Do you want?" Liz confirms that she wants M&M, and Dr. R. asks: "Panbanisha wants too?".... Dr. R. then says: "I'll put the M&M in this box for you, Liz. Do you want one before you go?" Dr. R. repeats that she has put the chocolate in the box, "in here", and Liz confirms that she is aware of the chocolate being in the red box. Then Liz leaves. All this happens in the presence of P. who is now asked if she wants one, and is then handed one M&M ball. While Liz is away Dr. R., with the aid of P., removes the chocolate from the red box. In stead P. is asked to bring some pine leaves which are then put in the box. P. is handed the chocolate and asked to place the chocolate in her rucksack. P. complies, bringing her rucksack over, and the chocolate is hidden there. And then Liz enters the scene again...and Dr. R ask P. "What is Liz trying to get? What does Liz want?" P. touches her keyboard, marking the "M&M" symbol (and "M&M" is voiced by the system). Dr. R. then asks, addressed to Liz and pointing to the box: "you want what's in here? – in the box?" Liz confirms that she wants what is in the box. At that point P. rolls on the floor, hiding her head with some strings (a knitted white scarf) lying on the floor.
>
> (Impressions of video recorded by Savage-Rumbaugh et al. 1999).

Thus, the female bonobo Panbanisha (15 years old), engaging with her foster mother, Sue Savage-Rumbaugh at the Language Research Centre of University of Georgia, appears to demonstrate awareness of the false belief she believes is entertained by the third participant, Liz, the assistant of Savage-Rumbaugh, who reaches for the box which contained the chocolate before Liz left the room. Panbanisha confirms her knowledge of Liz wanting the chocolate, when asked about what Liz wants, by pushing the symbol for M&M on the keyboard in front of them. As she does so, the phonetic sounds /m/ and /m/ are voiced. In the above scene, holding the box, in which the M&M chocolate has been replaced by pine leaves which Panbanisha has witnessed, Savage-Rumbaugh asks her assistant, Liz, who saw her place the chocolate in the box before Liz went out: "you want what's in here?". As Liz confirms this and reaches her hands forward, Panbanisha grabs the knitted white scarf and rolls on the floor, with the scarf in front of her face. It looks as if she is hiding her face in embarrassment or confusion, apparently entertaining the notion that Liz is being fooled. To use an anthropomorphic term: In the last revealing sequence, Panbanisha appears to be most embarrassed, hiding her head and rolling on the floor. By her reactions she may indeed have indicated her awareness of Liz's entertaining a false belief. Savage-Rumbaugh then opens the box, revealing the pine leaves, and then Panbanisha is asked to fetch her rucksack and disclose the M&M chocolate.

While one may have been tempted to reply in the negative to Premack's and Woodruff's question, it is difficult to discard the possibility that this symbolically enculturated bonobo female showed herself capable of attributing a false belief to the human assistant Liz. Panbanisha has demonstrated that she has learnt to communicate with keyboard symbols and responding to talking (cf. also Savage-Rumbaugh et al., 1998). That being the case, how is it that neither the bonobos, nor the chimpanzees, living on each side of their dividing river, never came close to developing something resembling protospeech, and which would have entailed protospeech learning as well? My reply is this: Even if they had had adequate channels for breathing and producing sounds, and sufficient cranial and brain prerequisites, as long as their offspring in the wild could enjoy the safe and instructive back-riding mode of being held and carried, there was no selective pressure inviting such an evolutionary emergence.

## On the evolution of the brain and of protolanguage

About 5 or 6 million years ago we may have shared with the modern chimpanzees a common primate ancestor the offspring of which, like today's chimpanzees, most likely enjoyed the protective advantage of riding on the mother's back. We cannot

know whether such back-riding also afforded the instructive advantage enjoyed by offspring of the modern chimpanzee. Neither do we know whether those primate ancestors were capable, like the modern chimpanzees, of communicating by virtue of sounds and simple gestures, such as a threatening /hoo-hoo/ or expressing a plea for help with extracted arms and upturned palms. If the chimpanzee's gesture with upturned palm expresses a plea for help then, in order for another chimpanzee to respond properly, the meaning of the gesture would have to be grasped and some sort of empathic understanding of the other's situation would have to be evoked. A number of examples of how chimpanzees may come to one another's aid, suggesting that some sort of empathy is at play, have been given by Frans de Waal (1996) in his volume '*Good Natured*' (cf. also his contribution in Bråten (Ed.) 2007:48–69).

At the Kristiansand Zoo and Wild Life Park in southern Norway, I have noticed that grabbing a bottle, a begging chimpanzee may turn to humans outside the fence, move the bottle with one hand while signing with the other hand, apparently expressing the wish to have it filled or replaced by another filled bottle. John Tierney (2007) refers to observations by Amy Pollack and Frans de Waal at the Yerkes National Primate Research Center about how a chimpanzee can use a palm-up gesture addressing other chimpanzees in request for a grooming session, for sexual interaction, or for food sharing. When spotting humans outside their fence, the chimpanzees at Yerkes may also approach them with their arms stretched out and their palms turned upwards, apparently asking the human visitors for food. This has invited a question about evolution:

> "These observations [at Yerkes, and of bonobos in California, using the palm-up gesture as a request for play] ...led Frans and me to speculate that gestures may have served as the stepping-stone for early hominid communication and, possibly, language"
> (Tierney, *The New York Times* Science and Technology session, October 6 2007).

The pertinent point is made that the same brain area that is evoked upon speech or silent speech in humans, the Broca's region, is also involved in the control of gestures, such as turning a hand, or even imagining one's hand being turned (cf. also Ferrari & Gallese in Bråten (Ed.) 2007:77–78). This does not preclude the possibility of a joint emergence of synchronized gestures and proto-speech, as suggested by Bickertone. Comparing pre-linguistic functional brain units, such as inter alia social intelligence and some sort of pre-conceptual structure as well as motor control of vocal tract and cerebellum involvement with proto-linguistic functional units, he specifies the minimal changes that must have come about with the emergence of a protolanguage, including the novel brain area identified with Broca's region:

> "All that was required was for an area of the brain to develop which would represent the phonetic shapes of the words, and for this area to become linked

> to the areas involved in conceptual structure – those which determine what categories inhabit the world – and to the motor organs controlling the vocal channel, which now add speech to their prior calling and ingesting capacities. This novel area may be identified with Broca's area."
>
> (Bickerton 1998:346 with reference to Wilkins & Wakefield 1995).

To this may be added that the brain region containing this area is also the proximate region for the localization of a mirror neuron system in the human brain (cf. Fig. 2.2, this book) as distinguished by Rizzolatti and Arbib (1998) and Rizollatti's group of neurophysiologists in Parma (cf. also contributions in Stamenov & Gallese (Eds.) 2002 and in Bråten (Ed.) 2007). Examining the experimental results suggesting that a mirror system may be operative in humans, Rizzolatti and Arbib (1998) refer to Donald's (1991) assumption about mimesis as precursor to language, and speculate on the sequence of events that might have led from gestural communication to speech. It is likely, they state, that the human capacity to communicate beyond that of other primates depended on the progressive evolution of the mirror system. I have proposed that such a progressive evolution would have entailed the kind of decentration required for mirroring in face-to-face situations. We had the opportunity to pursue such questions at an international meeting in Delmenhorst July 2000 on "Mirror Neurons and the Evolution of Brain and Language" (cf. Stamenov & Gallese (Eds.) 2002), and which were returned to in a Theory Forum meeting in Oslo October 2004 (cf. Bråten (Ed.) 2007). In their Delmenhorst conference announcement, the organizers Vittorio Gallese and Maxim Stamenov point out that the discovery of mirror neurons sheds new light on the neural correlate of social sharing of intentions and actions. The action of mirror neurons seems to provide a bridge of mapping between one's own behavioural actions (and their potential monitoring) with the observed actions of other individuals. In the development of the language faculty, they suggested, there may be both phylogenetic and ontogenetic links between behavioural action, gesture and communicative verbal action. The mirror neurons discovery may afford parts of a neurobiological basis for accounting for the emergence of language, based on these assumptions, listed by Gallese and Stamenov (1999) in their conference invitation:

a. Language skills have emerged through evolution by means of a process of pre-adaptation in which specific behaviours and the nervous structures supporting them, originally serving other purposes, acquire new functions that side and eventually supersede the previous ones.

b. With the primate premotor cortex as the common ground, an evolutionary continuity to language skill may be traced from pre-language arm- and hand-manual behaviours.

c. The specialization for language of human Broca's region appears to emerge from an ancient mechanism, the mirror system, originally serving action understanding.

The above assumptions may partly be recognized in metaphors reflected by some contemporary languages, such as English, French, Russian and the Scandinavian languages. As previously indicated, they all have words indicating a link between the manual and the mental acts of grasping. For instance, in French the term *'com-prendre'* for comprehend has the root sense of grasping, *'prendre'*. In English the term 'prehension' has the double meaning of 'act of grasping' and 'mental apprehension'. In German the term for conceptual understanding is *'begreifen'* with the root term *'greifen'* which again means grasping by hands. We find the same reflected in Danish, Norwegian and Swedish. In Russian the corresponding terms for the verbs comprehend (*oxvativatj*) and manual grasp (*sxvativatj*) have the common stem word *'xvatatj'* which means grasp.

## Precursory to current systems serving altercentric mirroring in phylogeny and ontogeny

My independent identification of altercentric participation and learning by altercentric mirroring in early ontogeny which led me to voice the expectation that the neurosocial support in the form of an altercentric neural system, or even premotoric altercentric neurons, would be discovered, invites these qualifications of and supplements to the above points:

d. While an evolutionary continuity to language skill may be traced from pre-language arm- and hand-manual behaviours, a somewhat similar continuity appears also in ontogeny; i.e., from manual action learning and understanding to conceptual comprehension and mental understanding.

e. While the phylogenetic specialization for language appears to partly emerge from an ancient mechanism, the mirror system, originally serving early action learning and action understanding in human evolution, that system in adapted form may have been precursory to systems that continue in homo sapiens sapiens to subserve mechanisms in preverbal learners and verbal dialogue partners for altercentric mirroring and participation.

The mirror system has been located to involve human brain areas that subserve speech and mental hand rotation. It has been recorded to be evoked in human subjects when another hand-grasping individual was observed and when the subjects imagined themselves grasping the object without actually moving their hand. I find it highly pertinent that Broca's area, sharing brain location with the mirror system, also becomes active in tasks involving mental hand *rotation*.

It pertains to the kind of altercentric mirroring which may be attributed to intimate dialogue partners who mirror one another's postures and gestures and sometimes complete one another's utterances. And it pertains to preverbal

learning by altercentric participation which must have afforded a distinct selective advantage in phylogeny.

## On cultural learning and evolution: The selective advantage of altercentric learning

The cogent question, then, is this: What kind of selective advantages may have been afforded by the emergence of mechanisms of mimesis, as described by Donald (1991)? With reference to the kind of infant capacity enabling pruning in infant speech perception before 6 months (Kuhl 1998), deferred imitation by 9 months (Meltzoff & Moore 1998), and learning by altercentric participation in face-to-face situations by 12 months (Bråten 1998a), I offer this conjecture:

> In the critical transition period before the supposed invention by Homo erectus of baby slings (produced by animal skin or other material), having to be grounded infants and toddlers with an enhanced capacity to learn to cope by watching and listening to adults would have had a distinct selective advantage.

### On the origin of humankind

In the middle of the 1980's Alan Walker and Richard Leakey uncovered the entire skeleton of a boy in East Africa, who must have died at the edge of an ancient lake more than 1.5 million years ago. This Turkana boy, a member of the species Homo erectus, has inspired Leakey (1995:93–98) in his account of *The Origin of Humankind*. On the basis of the archaeological evidence that he and others have uncovered, he attempts a re-construction of a scene that may have applied to some members of this species, gathered at a stream-side campsite (Leakey 1995:93–97). In his re-construction, they are attributed the invention of a combined baby carrier and food carrier, using skins of animals they have butchered with their tools. Compared to earlier hominid species they have larger brains, and probably a longer childhood entailing a long period of learning and growth, very unlike the progress in great apes which is almost directly from infancy to adulthood. Biological anthropology informs us that human infants, compared to other primates, are in a biological sense prematurely born as a consequence of our large brain demanding growth outside of the womb due to the limits of the human pelvis adapted to bipedal gait and running. This suggests that this prolonged period of childhood may have played a pivotal role in the biological and cultural evolution of humankind.

Now, the question is this: Deprived as they were by their parents' bipedalism of the body-clinging advantage enjoyed by young offspring of apes, how could hominid

children learn to cope and take care, and in turn become pedagogic parents? The reply I offer is this: Not only would they have had to resort to "mental clinging" in Bowlby's sense of attachment. In order to compensate for the loss of the protective and instructive mode of actually moving with their mother's body, they would have had to depend on face-to-face modes of communion and on cultural learning by virtually moving with observed models. Mother-infant pairs capable of protoconversation and joint visual attention, would have had a selective advantage in both contributing to and drawing upon an emerging protolanguage cultural environment, and in particular before the invention of baby-carrying slings, which Richard Leakey attributes to Homo erectus in this scenario:

> "[w]e see a small human group, five adult females and a cluster of infants and youths. They are athletic in stature, and strong. They are chattering loudly, some of their exchanges obvious social repartees, some the discussion of today's plans [...] to gather plant foods [...].
>
> Three of the females are now ready to leave, naked apart from an animal skin thrown around the shoulders that serves the dual role of baby carriers and, later, food bag."
>
> (Leakey 1995:93–97)

How would infants fare when they could not ride on mothers' back and before carrying bags?

Now venturing back a little further than the scene described above, before the invention of carrying bags by using animal skin or other material, how would the infants and toddlers fare, having to be let down on the ground? A cranium found in 1972, at this same lake where the Turkana boy was found, appears to represent the genus Homo (Homo habilis) perhaps two million years ago. They may have been gatherers and scavengers, perhaps not hunters, using stone tools, but probably not tools for baby and food carrying.

Living in the open savannah with few trees to climb for safety from predators, a hominid mother would have difficulties in climbing a tree while holding her infant, who unlike the offspring of apes probably was unable to cling to her by own force. She would be dependent on her kin-based band for the protection and shared caretaking of her offspring. Vegetation she could gather, but only with one hand, and she would have to let down her toddler on the ground as she sorted or worked with the food. Both females and males, when not out foraging, gathering plants or insects or looking for a carcass left by predators, would have to watch the children, protecting them from a variety of dangers, not just predators; they were vulnerable to a number of parasites and pathogens. Children were few and took a long time to learn to take care of themselves. Without efficient direct

infant-adult communication and mediation of coping procedures from adults to children, survival would be difficult. In such critical conditions those would be favoured who managed a leap to a mental architecture that increased the efficiency of direct face-to-face communication and of offspring capacity to learn by inter-generational transmission.

This is a defining characteristic of culture, albeit perhaps not unique for humans (cf. some of the previous episodes recorded at the Kristiansand Zoo and Wildlife Park). Wild chimpanzees living today in West and Central Africa appear to exhibit significant variations, suggestive of culture, for example, in their use of leaves and various objects, such as in fishing for ants and use of sticks, and in their pounding of food. In their reactions to start of rain; some groups even perform some sort of "dancing in the rain" (Whiten et al. 1999). This variety of patterns, revealed by Whiten, Goodal, Boesch and others, synthesizing observations from 151 years of chimpanzee observations, suggests cultural transmission, including learning by imitation. Unlike the late Miocene terrestrial apes, venturing out on the non-wooded savanna and coming to evolve a bipedal gait, the chimpanzee (Pan troglodytes) have remained in tree forests (now threatened by the forest extinction). Chimpanzee offspring is born strong enough to cling by own power to their mothers' fur, and when older the infants ride on their mothers' back. Carrying their young offspring in this manner by virtue of their quadrupedal gait, great apes are able to keep their infants safe, while affording them the experience of orienting themselves in the world from the mother's physical position, moving with her movements. If this way of having the infant hold on to mother was the mode of ancestral apes in Miocene time, then it could no longer be upheld by hominids that had risen to their back limbs, entailing skeleton changes and other adaptations that could accommodate a bipedal gait for efficient locomotion in non-wooden savannah environment.

Killackey (1995:1244) points to these possible advantages of the shift from quadrupedal to bipedal gait: energy efficiency, raising the eyes for a better view over the savannah grasses, and freeing the forelimbs for other functions. Possibly true, but at least one of the mother's arms would have to be used to carry her infant, restricting her foraging, and when squatting to handle the food with both hands, she would have to put the child down – aside or in front to keep an eye on the child, perhaps ready to vocalize in a way that could alert, alarm or sooth the infant as the need might be. As for the infant, deprived of the safe learning by moving with the mother's movements on her back, the child would now have to stay tuned to her vocalizations and to learn from watching her and the others from the ground (cf. the tentative scenario portrayed in Figure 5.3).

While even neonates of great apes are able to physically cling to their parents for safety and in silence, the Homo neonate would have to resort to a sort of early

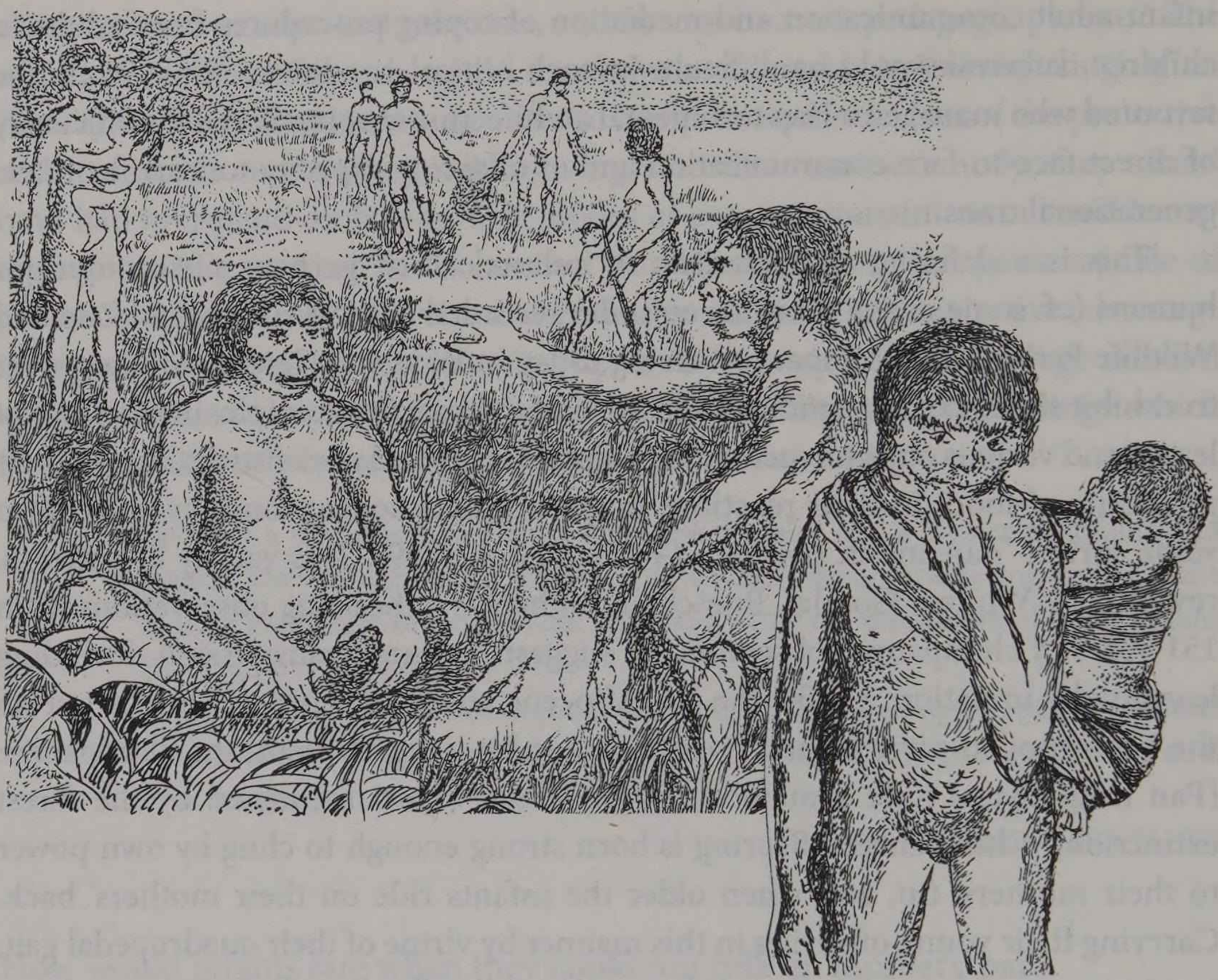


**Figure 5.3.** Could this be a scene typical of the early scavenger-gathering hominids, perhaps even for Homo erectus hunter-gatherers before they may have begun to use animal skin or other material to carry infants, animals and plants (illustrated to the right)? If this were a typical scene, in which adults and offspring were constantly threatened by toxic plants, predators and other forms of hazards, child care and 'baby sitting' would not suffice without children's capacity to learn to cope by watching the adults. Unlike the great apes, with offspring riding on the back of their parent and learning to move and operate in the world from that (egocentric) position, these children may have had to depend for their survival on a kind of alert and attentive face-to-face engagements with the adults, learning from them even when not being hand-guided. If that were the case, then those with a capacity for other-centred mirroring and, hence, for what I term learning by altercentric participation would have had a distinct selective advantage.

"mental clinging" (Bowlby 1969), entailing an evolved mental architecture for interpersonal connectivity that becomes operative even in face-to-face relations at some distance. Taking after the facial expressions, vocalizations and gestures of the other is a way to ensure such mental connectivity in such settings, while being preparatory for learning by imitation. The emerging mechanisms for what Donald (1991) specifies as *Mimesis* and attributes to Homo Erectus (from about 1.5 million years ago, when the Turkana boy is dated) in early Pleistocene time, and the kind of interactions that Leakey (1995) describes in his scene re-construction,

may possibly have evolved as intergenerational means of early child learning in the scavenger-gatherer and hunter-gatherer society.

The conditions for scavenger-gathering hominids, perhaps even for early Homo erectus hunter-gatherers before they may have begun to use animal skin or other material to carry infants, animals and plants (as suggested by Leakey (1995:93–98)) may have entailed constant threats to adults and offspring by toxic plants, predators and other forms of hazards. In such hazardous conditions species survival would depend *inter alia* on child care and children's capacity to learn by watching and listening to the adults. Unlike the great apes, with offspring riding on the back of their parent and learning to move and operate in the world from that position, these children may have had to depend for their survival on a kind of alert and attentive face-to-face engagement with the adults, listening to them and learning from them even when not being hand-guided (cf. Figure 5.3). If that were the case, one may speculate about the possibility that the advent of infant mechanisms for other-centred mirroring and, hence, for what I term learning by altercentric participation (Bråten 1997ab, 1998a) would have been a selective advantage in such conditions, favouring generation after generation over early human evolution. Mentioning these speculations to Fredrik Barth, he told me about a pattern he had observed in central New Guinea when studying the Baktaman (Mountain Ok) in the 1960s (Barth 1975):

> "In this inner New Guinea community, the mother would remain in the birth hut/menstrual hut for approximately the first three months after giving birth, holding the infant in her arms. During this time, the baby was not wrapped in any form of cloth or covering, but held against the mother's skin – the mother herself being uncovered apart from her short grass shirt. Only after the child was regarded as sufficiently robust would the mother start moving around, carrying the baby on her back in a string bag. At this point, the baby would also sometimes be placed briefly on the ground, nested in the string bag. Though Baktaman women had, and generally carried, a tapa cloth head-and-back cape, this cloth material was not, as far as I observed, used to wrap the infant/baby."
>
> (Barth, personal communication 1999).

Indeed string bags, and perhaps also animal skins for carrying, may have been a late invention, perhaps in the later part of the Homo erectus period (cf. Leakey 1995:93–98). What Barth and I find almost inconceivable is how, before the advent of such inventions, Homo erectus offspring-care during the first two or three years after birth could have been coped with – even though there may have been elaborate social group structures for shared responsibilities and "baby sitting". Rather than placing all the emphasis on selective pressures on the adult caretakers, given the long period of infancy development outside the bipedal mother's womb, I venture to suggest that infants and young children with an enhanced capacity for early and rapid imitative learning by face-to-face observation would provide a distinct selective

advantage in evolution. One may even speculate whether it may have furthered also some kind of Baldwin effect in the phylogenesis of warning signal and sound perception. Early infant capacity for imitative learning by virtue of altercentric mirroring may have enabled individuals to modify the learning contexts of intergenerational transmission entailing new selective advantages for future generations. The evolved other-oriented mechanism for learning by altercentric participation may later in phylogeny with the advent of speech have facilitated early learning of articulatory vocal gestures as precursory constituents of speech perception.

Cosmides and Tooby (1995:1208) describe the ancestral hominids *inter alia* as a long-lived, low-fecundity savannah-living primate species with a sexual division of labour between gathering and hunting, involving co-operation and making tools. They were mammals with altricial young, extended period of female investment in pregnancy and lactation, with pair-bonds and long periods of bi-parental investment in offspring. Being omnivorous, feeding on most anything, they were vulnerable to a wide variety of plant toxins and predators, parasites and pathogens. If such were the conditions of a hominid species that may have prevailed for one million years having relatively few offspring with long immaturity and exposure to dangers that required a lot of adult caretaking, we should perhaps regard infant-adult and child-adult communication to pose an adaptive problem perhaps as important as for example food source locations. Gathering and hunting may have profited from an evolved mechanism for allocentric mapping and perception that complemented mere egocentric or body-related mapping. The kind of alert and attentive face-to-face engagements called for by adults and infants, may even have entailed the evolvement of mechanisms for other-centred perception and, hence, for what I term learning by altercentric participation. While threatened by toxic plants, predators and other forms of hazards, in generation after generation over hominid evolutions and before the invention of bags for carrying infants and toddlers, the capacity for such other-centred mechanisms for mirror-connectivity would have contributed to survival. One may perhaps also speculate about whether there may have been an intervening period in which early hominids lived in river delta landscapes, perhaps even were waders and keeping their offspring at hand in the water, safe from water-shy land predators. Traces of such settlements may be difficult to find, but if they indeed lived for prolonged period in such conditions, then again this may have entailed the distinct selective advantage of enhanced child capacity for rapid imitative learning in face-to-face interaction (Bråten 2000:275n).

## Mother nature according to Hrdy

According to Holly Smith (1993) the earliest evidence for long childhood, based on the comparison of fossilized teeth from early hominids with those of chimpanzees,

appears to date from Homo erectus. Their offspring took longer to mature and reached adolescence later than the chimpanzees, but not as late as modern human children. What made possible such hyper-long Homo sapiens childhood, Sarah Blaffer Hrdy (1999:268) asks, and where did the extra subsidies come from needed to rear these especially needy offspring? Compared with the back-riding chimpanzee offspring, the mother has no safe place where she can put her infant to protect against lurking predators and stinging insects while she digs for roots or picks fruits above her. Even when coming to wear a baby-carrying sling, Hrdy points out, the new mother is bound to be less efficient and in need of help. Where did it come from? The answer was according to Hrdy, referring to another anthropologist, Magdalena Hurtado (1985), alloparental safety nets, provided by other women.

## Alloparents

There is this proverb African parents may repeat when a son comes of age and begins looking for a wife, Hrdy (1999:268) writes: "First find yourself a good mother." By the term "good" they do not refer to good qualities which may be inherited by the children, but a mother who has a network of several hard-working and well-connected relatives who can afford a safety net by becoming alloparents of the mother's children whenever needed.

Such a praxis with someone else than the mother affording care, such as carrying her infant, is prevalent in many cultures. For example, in the Gusii culture in Africa, many of the mothers so frequently gave birth that it would have been impossible for the mother to carry and take care of all her children. Here, the siblings make themselves available as carriers of her infants (LeVine & LeVine 1988). Emphasizing being born to attach, Hrdy (1999:273) reproduces a photo of a seven-year-old Pumé girl who is carrying her 18-month-old cousin, who is in her care while her aunt and grandmother are off foraging in the flooded savannah near her wet-season home. Hrdy mentions how older females, past their reproductive careers, have a low threshold for responding to signals from younger relatives; the post-reproductive female makes for an ideal alloparent.

## Neonaticide

With regard to the risk of death after birth, Hrdy points to a unique human characteristic compared to other primates in the free: until accepted through a communal ritual of passage as a child to be reared, the human newborn is not ensured to be granted life and may risk being subjected to neonaticide. This depends on the kind of distinction made by the mother, usually enforced by her community, as to whether or not the newborn is accepted as a child to be reared:

> "In no other primate do mothers appear to distinguish between a new baby and a new baby that will be kept. Nothing is known about when in the course

> of hominid evolution such distinctions came to be emphasized. My own guess is that mothers grew more discriminating as they were increasingly called upon to simultaneously provide for multiple offspring of different ages. If this is correct, mothers faced with the prospect of provisioning a staggered clutch of slow-maturing, highly dependent offspring would already have been somewhat discriminating prior to the Neolithic. After it, mothers would have become more fastidious still as settled living brought with it birth intervals shorter still."
>
> (Hrdy 1999:470–471)

This is quite contrary to what we mean when using the term 'maternal instincts', contained in the subtitle of Hrdy's book: "Maternal Instincts and How They Shape the Human Species". In addition to such possible self-interest one may guess that pressure towards infanticide – at odds with her own maternal instincts – may have been brought to bear by the mother's culture and community. This cultural pressure might have been easier to bear before the onset of lactation. As Hrdy points out, there appears to be a physiological lag between the onset of lactation and the emerging sense of mother-infant unity, and

> "cultural concepts have been used to elaborate this period of grace between a woman post-partum and a full-fledged lactating mother..[...] Once lactation is established, with all its attendant hormonal changes, the mother is physiologically and emotionally transformed in ways that make subsequent abandonment unthinkable."
>
> (Hrdy 1999:471).

Hrdy refers to eight-century Holland as an example: among the still-pagan Frisians, infanticide was permitted, but only as long as the child had not yet tasted "earthly food." She refers to a cross-cultural study by Minturn and Stashak (1982). Comparing 57 different cultures they find that in 49 of these cultures full human identity was only given the newborn after some specific postpartum milestone or rite of passage. For those deprived of that, and with mothers being typically the primary decision-makers or agents, infanticide was socially accepted in more than half of these 57 cultures. As pointed out by Hrdy (1999:470), nothing is known when in the course of hominid evolution such distinctions came to be emphasized. In China, families do not traditionally confirm a new birth until the newborn is one month old. Here is a tradition which has entailed a high infant mortality. In India today, abortion is favoured over neonaticide of female newborns.

Even though other primates in natural and free surrounding may not reject own offspring, rejection and even killing of own offspring may occur in captivity. I have observed a rejected chimpanzee infant who had to be adopted by human foster parents and who, incidentally, could engage in turn-taking with them. And

I have observed a chimpanzee mother, Josephine (Figure 5.1) as recounted above, who initially rejected her offspring, refusing to let the offspring cling to her, but who – after having saved the offspring from suffocating – completely changed her behaviour and became a holding mother in Winnicott's sense (Bråten 1998:239–240; 2000:283). In the wild, chimpanzees may resort to killing offspring of an intruding group who ventures into their territory. The territorial males may counter-attack at night-time, isolate a female among the intruders and eat her offspring. But infanticide on *own* offspring may be unique to the human primate mother. Perhaps she also may be said to have been in a sort of captivity, and caught in a culture of norms which have demanded neonaticide of unwanted newborns.

## The hominin infant decentration hypothesis

Given this double risk of being killed after birth by predators or by a rejecting maternal culture, and given the long period of maturation when allowed to stay alive, those hominid or Homo offspring, deprived of the back-riding advantage of other primate offspring, who could manage 'mental clinging' and learning by (m)other-centred participation to cope and take care would have had a critical selective advantage. Actually, with regard to the period before the baby sling was invented, it is hard to conceive how they could have survived unless preparing for this kind of mental clinging, addressing the mother or alloparental care-person with bodily and facial gesture as if expressing this plea: 'Here I am. I am like you, and I like you, and I shall do like you; teach me!'

John Bowlby had emphasized how human infants, unlike another primate offspring, lack the strength and possibility to cling to their mother by own force. He highlighted the mental attachment between child and care-person that comes about 9 month of age. But clearly, the critical precursory has to be operative already immediately after birth to reduce the risk of being left alone to die or even becoming a victim of infanticide, demanded by the mother's culture. Hrdy stressed the burden thus laid upon the new mother:

> "By endowing human infants with a long mother-centred primate heritage, by envisioning infants with special needs and mothers as creatures especially designed to satisfy them, and by situating an infant's sense of security and self in the availability of this specially equipped mother, evolutionists like Bowlby and Trivers appeared to be imposing on women painful choices no man need ever make: her aspirations versus her infant's well-being; vocation or reproduction. Twenty years later, I still return to this topic with trepidation."
>
> (Hrdy 1999:490).

Yes, such 'a long mother-centred primate heritage', and particularly before the invention of baby slings would have made critical the infant's capacity for learning by mother-centred participation and to react to sounds and gestures inviting the infant to cope and take care.

## The critical importance of distant learning and the pertinent discovery of mirror neurons

Hominid species may have been faced with extinction, I have submitted, if their young offspring was unable to cope with face-to-face learning and listening by altercentric mirroring. Exposure of infants, toddlers and young children to hazards (predators, parasites, poison, etc.), may have favoured those that had an enhanced capacity for rapid learning by observation and listening in face-to-face settings. Infant and early child adaptations for efficient learning by altercentric perception and participation in facing adults' activities may constitute the phylogenetic roots of the kind of reciprocal mirroring we may observe in early human ontogeny, and indeed throughout normal human life, for example in the intimate dialogue between two teenagers.

And in the primate neurobiology there appears to be a ground for systems that would have lent themselves to adaptations for systems in humans that could support such altercentric participation. As has been described in Chapter 2, mirror neurons have been found in the macaque monkey brain to discharge both when another is observed grasping a piece of food and when the monkey is preparing for grasping the piece by itself (Di Pellegrino et al. 1992). On the basis of studies of human subjects, Rizzolatti and Arbib (1998) refer to evidence which suggests that in humans a similar mirror system may be allocated to Broca's area, which not only serves speech, but appears to come active during execution and imagery of hand movement and tasks involving mental hand rotation.

For the infant learner in face-to-face situation this would somehow presuppose altercentricity on the part of the learner to acquire a shared motor representation from the experience of feeling to virtually co-enact the execution observed in the facing instructor or model. In face-to-face exposure a perceptual mirror reversal is required for the "translation" into a proper premotor programme for circular re-enactment execution by the learner.

Also, the human conversation partner who virtually participates in the speech listened to by mirroring what she hears and sees the dialogue partner to be doing, is able to do so, I have posited, not merely by mirroring the other from her own (egocentric) stance, but by a virtual circular reversal enabling her to simulate speech processes from the other's stance. The key feature here is speech perception, studied in preverbal infants by Kuhl (1998) and which may indicate that children

perceive speech by overtly or covertly co-enacting the vocal-oral movements that produced them rather by mere auditory processing of the speech sounds. This may be similar to what occurs in an intimate verbal conversation in which the adult listener does not perform an acoustic analysis, but rather unwittingly mirrors the speaker's process of producing the utterance, post-dicting, as it were, the oral-vocal movements (cf. Bråten 1974; Liberman 1957, 1993 – referred to also by Deacon 1998:359). This entails speech perception by altercentric participation in the other's speech production. Kuhl (1998) finds that already by six months infants have narrowed their speech perceptual space to exclude sound distinctions that make no difference in the native language. This may perhaps involve the mechanism of learning by altercentric participation in familiar sound productions, long before acquisition of meanings.

Enculturated chimpanzees can learn some sign language, while lacking this capacity to move in the "other's shoes", as it were, from the other's stance. I expect such participation by sensori-motor reversal to be unique to humans. It may have evolved from selective pressure on infants to learn from face-to-face interaction – unlike offspring of non-human primates, riding on the back of adults and facing the world with them as instructors without transcending their body-centred perspective. That is why the mirror system found in human subjects would differ in terms of orientation and perceptual shift from mirror neurons found in non-human primates. They are probably similar in the sense of evoking matching resonance upon observation of a goal-directed act by another individuals, but would differ when it comes to imitative re-enactment requiring perceptual reversal by virtue of altercentricity probably unique to the human system. Unlike human infants and toddlers who during some critical period in human evolution had to cope by face-to-face learning and listening, the infant offspring of non-human primates can ride on the adults' back and experience the world and events and others in it from that body-centred and safe position. By turning allocentric, i.e., place-independent, the mirror system in grown-up non-human primates transcends that egocentricity, but I do not expect it to be altercentric like the mirror systems in humans which, I submit, would have had to become by necessity fundamentally other-oriented for the human offspring to survive in the critical period before baby slings were invented. There would have been a definite selective advantage to early humans, not to non-human primates, of a kind of mirror system adapted to subserve participant learning from a distance and in face-to-face situations to cope and take care; i.e., (m)other-centred learning to cope by altercentric participation.

The evolved capacity for this kind of participatory attunement to the gesture and sound producing movements and object-handling of models and teachers has favoured the infants and young children of our surviving ancestors. In this,

I attribute much of the survival value to vigilant and efficient infant capacity, not just to vigilant adult child care under such critical ancestral conditions.

## The hypothesis about decentration of the mirror system in human evolution

In a *Behavioral and Brain Sciences* article Dean Falk (2004) has proposed a hominin mother-infant model that highlights certain hypothetical aspects of pre-linguistic evolution in early hominins. In her response to commentators she writes about the 'putting the baby down' hypothesis, and on bipedalism and baby slings, pertaining to my commentary. In my commentary, voicing the hominin infant decentration hypothesis, I point out that her model presupposes an emerging infant capacity to perceive and learn from afforded gestures and vocalizations. Unlike back-riding offspring of other primates, in no need to de-centre own body-centred perspective, a mirror system may have been adapted in hominin infants to subserve the kind of (m)other-centred mirroring we now see manifested by human infants soon after birth. A necessary condition for the selective advantage and protolanguage emergence and propagation specified by Falk may have been an emerging infant capacity to perceive, understand, and learn from the gestures and vocalizations afforded by the vigilantly attending mothers. Pertaining inter alia to meaning identification, acquisition and propagation, I proposed this hypothesis: Compensating for the loss of the body-clinging advantage that enables offspring of other primates to perceive and learn without having to transcend own body-centred perspective shared with the carrying mother, those hominin offspring able to learn by (m)other-centred perception of distal vocalizing and gesture articulation to cope and take care, would have had a selective advantage and a contributing impact.

In her reply, Falk acknowledges this, pointing out that among her commentators, only I explicitly acknowledge that early hominins could have been faced with extinction as they refined bipedalism in the duration that preceded the invention of baby slings:

> "Braten's hominin infant decentration hypothesis is particularly significant because it specifies how mirror neurons could have been of major importance during the period of evolution when hominin infants lost the ability to ride clinging to their mothers' backs and, thus, to automatically share perceptions from (literally) her point of view."
>
> (Falk 2004b:532)

Before the supposed invention of baby-carrying facilities, attributed by Leakey (1995:97) to early Homo erectus, hominid species may have been faced with extinction when turning bipedal, I have submitted, if their young offspring – deprived of the instructive and protective back-riding advantage of other primate

offspring – were unable to listen and learn by (m)other-centred participant mirroring to cope and take care (Bråten 2000:275).

May such a phylogentic adaptation of the mirror system enabling it to support altercentric mirroring, open a window also for altruism in young children? That is the question for the next chapter.

CHAPTER 6

# On prosocial behaviour in adult apes and young children

## Roots of genuine altruism?

In this chapter questions and conjectures are offered about the evolution of altruism, not in the rational choice theoretical sense of 'reciprocal altruism', but in the sense of tending others at one's own expense without expecting any reward in the future. Given documentation of altruism exhibited by one-year old infants, such as reported in Chapters 3 and 8 in this book, and as mutually afforded by the 3-year old orphans rescued from Nazi concentration camps, as reported by Anna Freud, we are faced with the possibility of an innate basis which invites questions about evolution. Do other primates exhibit help and consolation beyond own children or family or group members, and for which an account in terms of 'selfish genes' does not hold? And again, as touched upon in Chapter 3, what may be entailed by the discovery of mirror neurons and the identification of capacity for altercentric mirroring in human infants?

### Moving with the (m)other's movements

In our culture much of infant-caretaker interplay occurs in face-to-face situations, even when the baby is lying at the nursing table. That is pertinent to my theme of postures and perspectives. Such face-to-face interplay may be contrasted to other cultures, for example the Gusii culture, in which infants are carried on the back of their older siblings (Levine & Levine 1988).

It may also be contrasted to other species, carrying their offspring on the back, such as shown by the lowland gorilla rescuing a boy who had fallen down in the gorilla pit (Figure 6.1). This prosocial act occurred in the Brookfield Zoo outside of Chicago on 16 August 1996. A three-year-old boy fell into the gorilla pit, plunging 18 feet to the hard floor. The gorilla mother, Binty, picked up the unconscious boy, carried him across the pit, and laid him gently at the exit door, while zoo keepers came to and kept the other gorillas at a distance with a water hose. (That rescue was captured on video and broadcast on television around the world, and Binty was named The Hero of the Year in the special Winter 1997 issue of *Newsweek*).

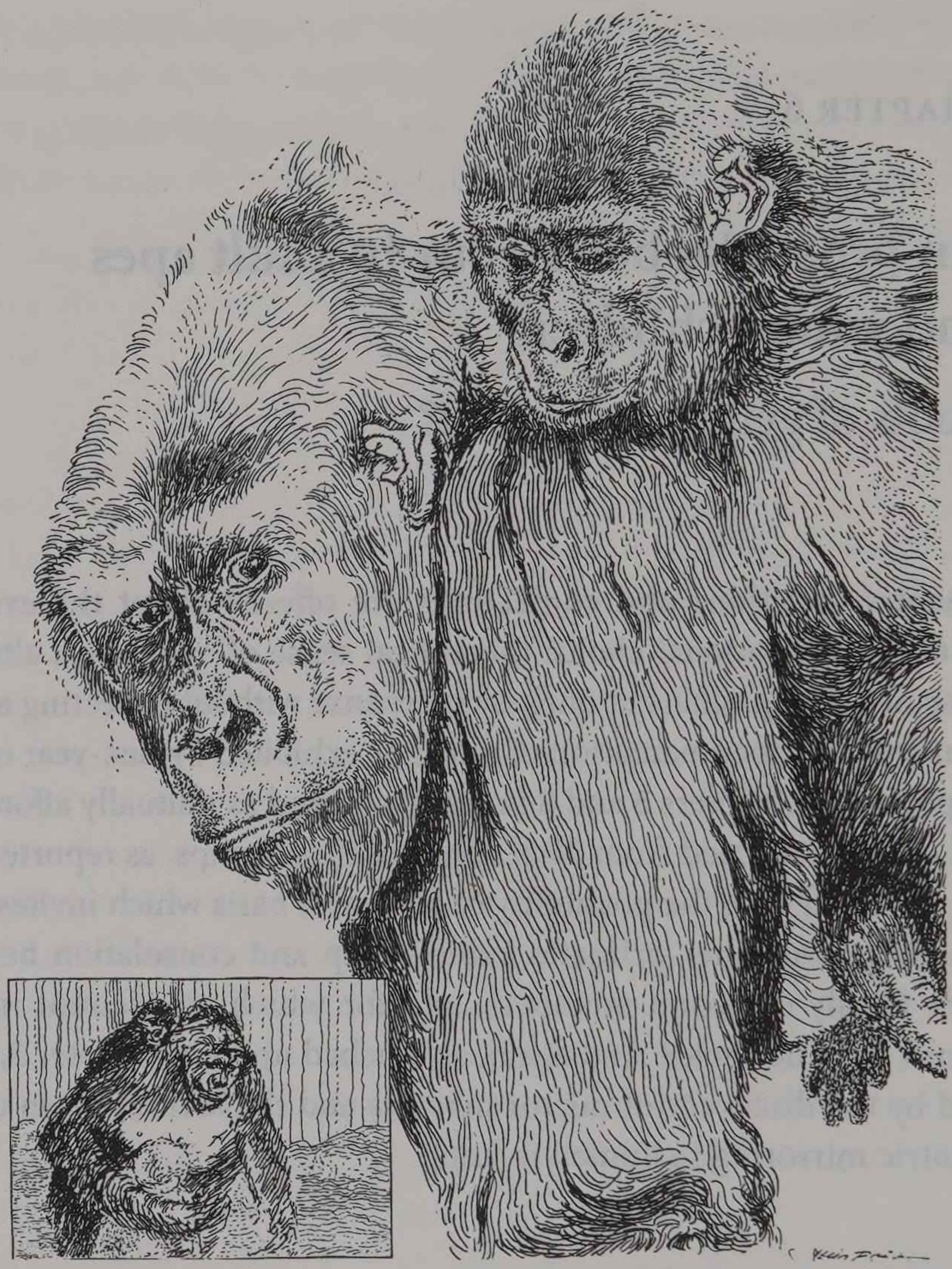


**Figure 6.1.** Gorilla-mother with her offspring and (*lower left*) the way in which she came to the rescue of a boy who had fallen down into the gorilla pit. This prosocial act occurred in the Brookfield Zoo outside of Chicago on August 16 1996. A three-year-old boy fell into the gorilla pit, plunging 18 feet to the hard floor below. The gorilla mother, Binty, picked up the unconscious boy, carried him across the pit, and laid him gently at the exit door, while zoo keepers came to and kept the other gorillas at a distance with a water hose. (The rescue was captured on video and broadcast on television around the world, and Binty was named "The Hero of the Year" in the special winter 1997 issue of *Newsweek* (the main drawing is based on its cover photo)).

In this episode we see demonstrated a clear case of prosociality in one of our closest species relatives. It serves to remind us of the double sided nature-nurture equation of the aetiology of prosociality. But it also serves to illustrate these three pertinent aspects: First, the way in which the offspring bodily moves with the mother's movements. Second, the offspring experiences to be moving with the mother from the mother's perspective; there can be joint attention from

the offspring's body-centred perspective, without transcending or reversing the mother's perspective. Third, from this perspective the offspring is even afforded the bodily experience of participating in the mother's rescue of a third person.

When old enough to ride on their mother's back, offspring of gorillas and chimpanzee, in wildlife as well as in captivity, ride in this manner. This means that the offspring on their backs of the mothers are afforded to move with the mother's movements and to see the world and other subjects and things in it, from the mother's position. From such a position they may learn to see and manoeuvre in the world from the ego-centric perspective which they are afforded in virtue of riding on their mother's back (cf. also the photos in Figure 5.2 in the previous chapter).

But returning to main point here, Binty's rescue operation extended beyond own offspring and offspring of her own species. Resembling the size of her own offspring, perhaps the fallen boy somehow had evoked some sort of empathy that triggered the rescue. Frans de Waal and I share such an opinion.

## Chimpanzees can offer consolation; monkeys cannot

Reviewing expressions of empathy in nonhuman primates, de Waal (1996; 2007) presents a tripartite model of how they may perceive one another, and Preston and de Waal (2002) have specified the ultimate and proximate bases of empathy, pertaining to an evolutionary understanding beyond so called 'reciprocal altruism'. They specify a Perception-Action mechanism providing the basis for higher layers in which there is an increasing distinction between self and other, so that the other is recognized as the source of felt emotions. This permits responses to be geared more specifically to the other's situation, thus increasing the effectiveness of sympathetic support, care, or reassurance. Such responses have great survival value in cooperative animals, de Waal argues. The highest layer involves the appreciation of the other's perspective, situation, and intentions. As in a Russian doll, each earlier layer plays a role in the higher layers, so that even a fully developed empathic layer of attribution and perspective-taking (layer 3) includes and builds upon unconscious emotional reactions (layer 1). Here is an affinity and consistency with the layers of intersubjectivity laid out in Chapter 3. The inner core of de Waal's 'Russian Doll' model, entailing motor mimicry and emotional contagion, partly corresponds to the first layer or mode of primary intersubjectivity. While the innermost, automatic core of empathy is distinguished by de Waal (2007:49–69) in terms of affective resonance in an immediate sense, the higher-order layers entail empathy in a cognitive sense and through intersubjective perspective-taking. In these terms he gives many illustrations of consolations and helping by great apes. An example is illustrated in Figure 6.2 showing an adult female chimpanzee feeding a sugar cane to an unrelated juvenile.

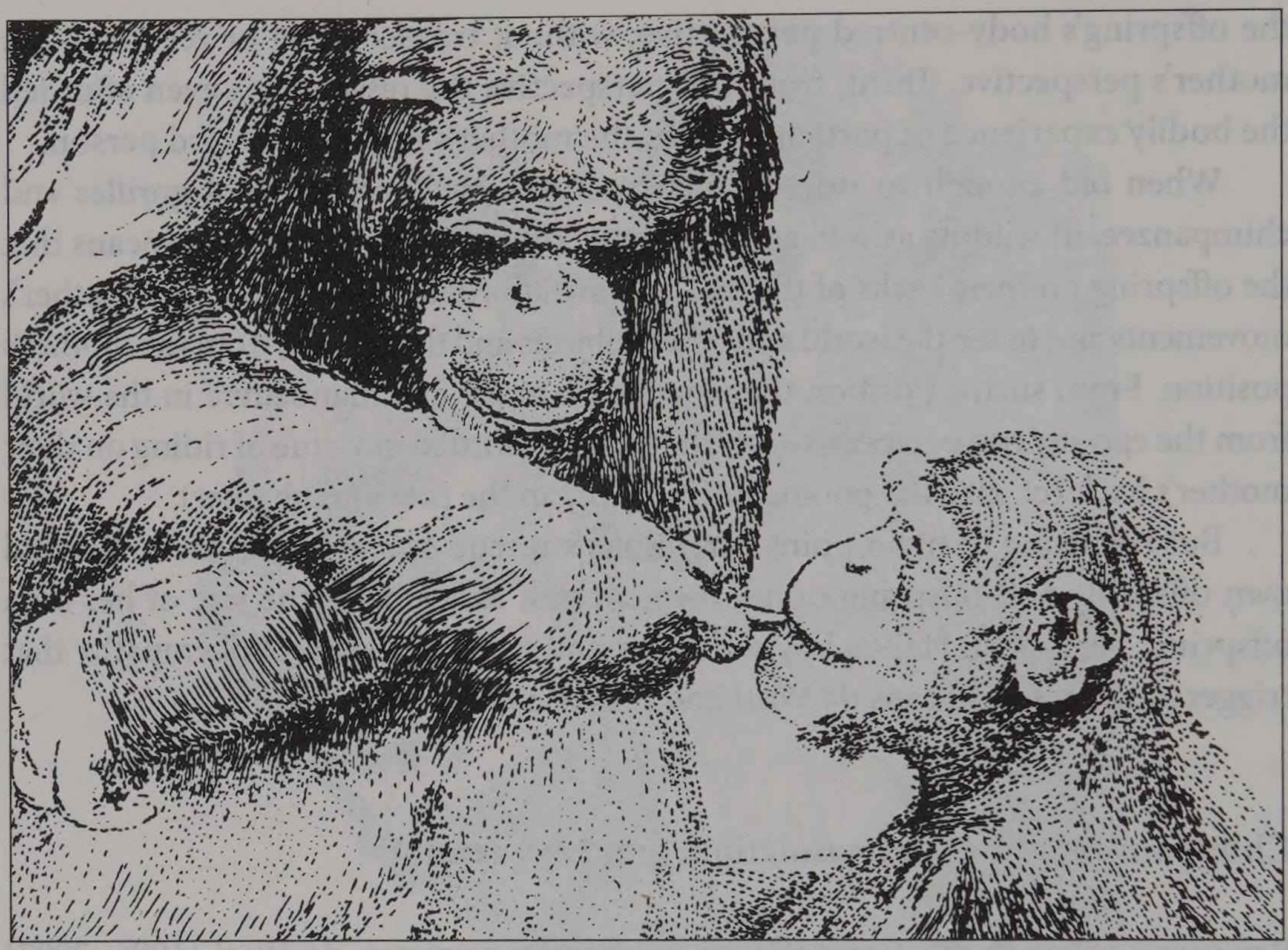


**Figure 6.2.** Adult female chimpanzee feeds a piece of a sugar cane to an unrelated juvenile at the Yerkes field station (Based on a photo by Frans de Waal (1996:136f) in *Good Natured*).

In Figure 6.2 we see demonstrated by the chimpanzee rudiments of the capacity to hand out or give (which a monkey would be lacking). Does this illustrate giving or is it merely holding the cane for the other to lick? Having not seen any give-act by chimpanzees I asked Frans de Waal about whether they are able to give, and he confirmed that they could. Anyway, it suffices to hold the cane for the youngster to lick. In turn, the younger chimpanzee's licking may very well have elicited empathy and invited participant perception in the older provider, albeit not in the nature of manifesting by mouth movements by virtue of other-centred participation, such as exhibited by the human infants portrayed in Fig. 2.1.

Frans de Waal has documented several episodes in which chimpanzees afford one another consolation, for example, in one instance how a juvenile puts his arm around a screaming adult male after he had been defeated in a fight with his rival (cf. photo illustration in Bråten (Ed.) 2007:57). He points out that so far consolation behaviour has been demonstrated in great apes only, not in monkeys:

> "Consolation has thus far been demonstrated in great apes only. When de Waal and Aureli (1996) set out to apply exactly the same observation protocols as used on chimpanzees to detect consolation in macaques, they failed to find any. Despite numerous attempts to demonstrate it, consolation has thus far

> not been found in monkeys (Watts et al. 2000). One recent monkey study even failed to find alleviation of another's distress in the one relationship category in which one definitely would expect it: between mother and offspring (Schino et al. 2004). Mother macaques do not provide spontaneous reassurance to distraught offspring."
>
> (de Waal 2007:57).

He also refers to observations of monkey mothers who, when diving for food, may disregard their own infants at risk of being drowned (de Waal 1996:88). Why is this difference between monkeys and apes so significant? Bearing in mind that mirror neurons originally have been discovered in the macaque monkey brain (in the kind of experiments portrayed in Fig. 2.1 (bottom)), this implies that even though mirror neurons are available, this kind of neurosocial support is not sufficient to ensure empathic identification with the sufferer, invoking coming to any aid. Frans de Waal (2007:57–58) points out that targeted helping and consolation may require a distinction between self and other which enables that the situation of the one in distress is distinguished from own situation, while the emotional link that motivates prosocial behaviour is activated. He refers to Gallup (1982) and the documented fact that adult chimpanzees, unlike monkeys, are capable of self-recognition in the mirror, reflecting a self-other distinction awareness which would be required when responding to the other's distress call. Gallup speculated about the possible connection between mirror self-recognition and cognitive empathy. Pointing to the phylogenetic relevance of occurrences of complex helping behaviours in the Homonoids (humans and apes), but not other primates, de Waal refers to the emergence of mirror self-recognition in children correlating with their tendency to afford help. However, while mirror self-recognition is most clearly documented in children of 18 months or older, examples will be referred to in this chapter of such prosocial and altruistic tendencies even in younger children at the end of their first year (cf. e.g., nearly 12-month-old Oda in Figure 6.3 later on in this chapter). As has been suggested, and will be returned to, the documented evidence of so young infants being able to engage with others in an other-centred manner, suggest that they profit from a phylogenetic adaptation of the mirror system in a manner that even entails mirror reversal in face-to-face situation, and which may be beyond the capacity of great apes.

As referred to earlier, there has been some discussion as to whether chimpanzees can imitate or not (Tomasello et al. 1993; Byrne 1998). I believe they can – at least from what I have observed of chimpanzee behaviour in captivity. For instance, in one episode (reported in the previous chapter) a 22-months-old chimpanzee took after the elder youngster (5 years old) who had just peeled off a stick and used it to extract honey. The younger one picked up the stick and made an

attempt, inserting somewhat clumsily the stick in the hole in the tree trunk. But her attempt at imitation does not entail the capacity for other-centred participation and mirror reversal required in face-to-face situations. Ferrari and Gallese (2007) has documented neonatal imitation of tongue protrusion even by a one week old macaque in captivity after repeated exposures to the human model gesture. In a period of 20 seconds the adult model repeated the tongue gesture 8 times, which sufficed to evoke the tongue protrusion by the macaque without any accompanying movements of other kinds (cf. the photo in Bråten (Ed.) 2007:81). That suffices to demonstrate that neither references to mirror neurons by themselves, nor to documented mimicry, suffice in an explanation of helping or consolation behaviour. In spite of their having mirror neurons, macaques can neither give nor show empathic response.

## Reports by Anna Freud and others on early prosocial behaviours in children

In Chapter 1 we noted how Freud suggested infants' nature to be closed off from social reality and that Piaget in addition attributed egocentricity. While their perspectives came to prevail throughout most of the last century, a publication in the middle of the century at odds with these ideas passed almost unnoticed. This was the report by Freud's daughter, Anna Freud (1951), about six 3-years-old orphans rescued from the Nazi concentration camps and brought to Bulldog Banks in UK. One telling episode is about the children sitting around a table eating cakes. John was the first to empty his plate. When he sat there looking with envy at the others, two of the girls, Ruth and Miriam, took pity on him and emptied their plates on John's, clearly enjoying his eating their cakes. Here we see altruism at play on the part of three year olds, rescued from the most horrible of circumstances, devoid of any attending care environment.

And, then, in a wartime report from the Hamstead Nurseries 1939–45, Anna Freud and Burlingham (1973) tell inter alia about Rose (19 month old) drinking her cocoa when the younger Edith stretches out towards her cup. Looking at her, Rose then stops drinking and turns her cup so that Edith can have the rest of the cocoa which Rose initially had been set to drink for herself. This is another instance of altruism and in this episode afforded by a one-and-half-year old.

Why were these reports not taken much notice of? Probably because they were completely at odds with the prevailing model monopoly enjoyed by Piagetian and Freudian thoughts at the time, and had to be written off as being due to atypical and special circumstances. And then, the more general prevailing rational choice and game theoretical view invited ignorance on such matters. Egoism and own interests were re-introduced by defining altruism in rationalistic terms

of 'kinship selection' and return (if I help you I expect you to help me at the next turn), the way Trivers (1971) announced in his paper of the evolution of reciprocal altruism.

In spite of such dominant paradigms, empirical reports on children's prosocial behaviours began to appear. In their book on *Children in Different Worlds*, Whiting and Edwards (1988) documented prosocial or helping behaviours by children from 3 to 10 years in ten different cultures on four continents. They also report, however, that in three of those 10 cultures *some children showed a decline* in the frequency of prosocial behaviour with increasing age. They attributed this decline to parental influence, pushing the children to watch out for their own interest.

And then, Zahn-Waxler et al. (1979) had reported on the prosocial behaviour by children less than 2 years old who reacted and tried to come to aid when a sibling or mother or father appeared to be hurt. In one episode, Julia (18 months old) reacts to the baby's crying, pats the baby's head, offer some cookies, and when nothing helps, goes to fetch her mother to bring relief. As pointed out by Rheingold and Emery (1986:76), children can offer care at a relatively earlier age and to more varied recipients, including dolls imbued with a life of their own.

Here is another example, from my own recordings, illustrated in Figure 6.3: Oda (nearly 12 months), sitting on her father's lap, is being spoon-fed by her mother. When Oda from time to time is allowed to take the spoon in her own hand, she feeds her mother in return, and she even let her sip of her juice bottle (cf. Figure 6.3).

What Rose does in the middle of her second year, and what Oda does before her first birthday anniversary, may appear puzzling to researchers who approaches behaviour in terms of short term or long term gains for rational agents. Before returning to such episodes illustrating early prosocial and altruistic behaviours, let us first have a look at how altruism may be dealt with in rationalistic terms.

## Various rationalistic perspectives on altruism

In his critique of various theories of altruism, Khalil (2004) compares three theories or approaches advanced in a rational interaction perspective, respectively by Axelrod (1984), by Becker (1976), and by Simon (1990) and others, with normatively oriented theories, such as advanced by Kant and by G.H. Mead. The three interactional and rationalistic perspectives on altruism are differentiated by Khalil in terms of being, respectively, 'egoistic', 'egocentric' and 'altercentric', defined in theses ways:

*"egoistic"* – altruistic assistance is afforded if one expects future benefits. This parallels Trivers' (1971) theory of reciprocal altruism, and in the context of games,

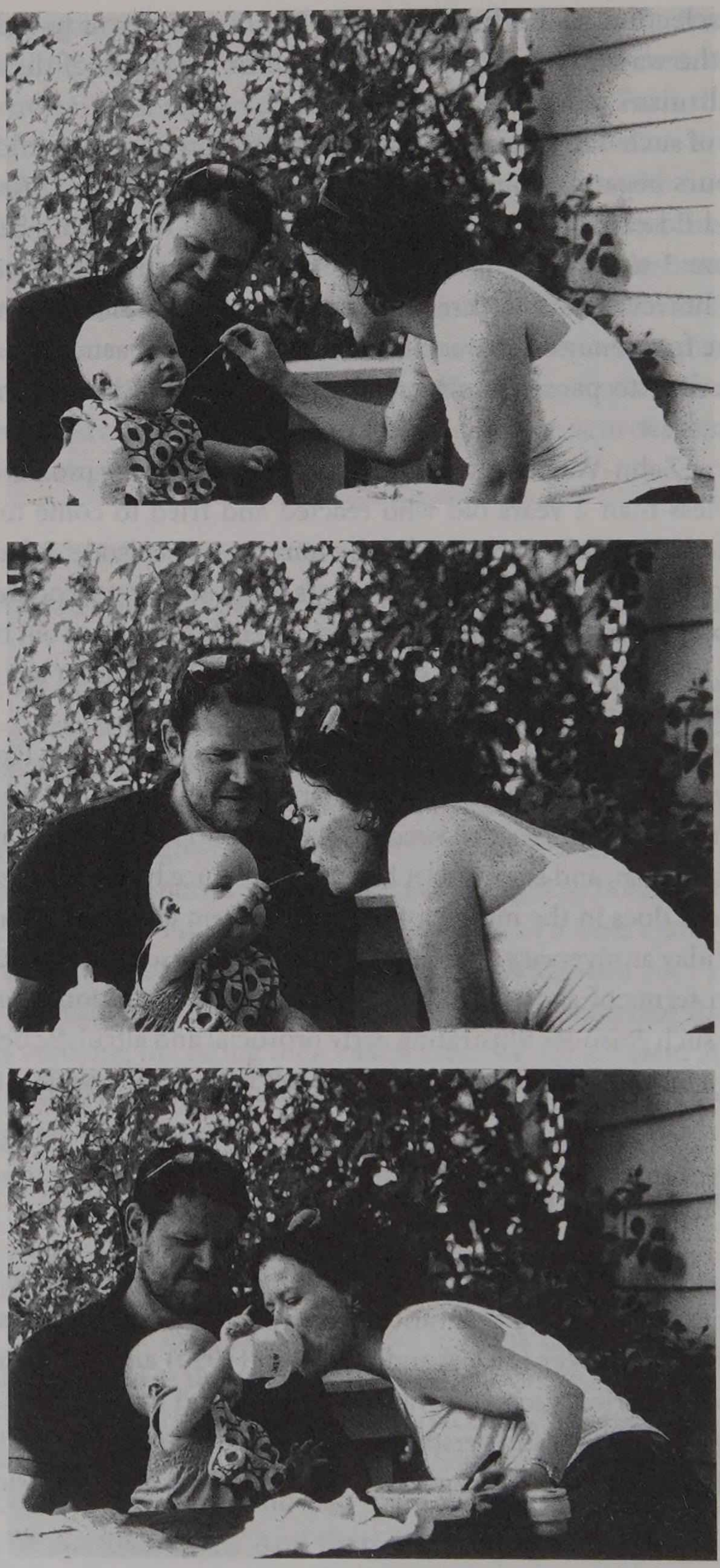


**Figure 6.3.** Oda (not yet 12 months) at the lap of her father, reciprocating her mother's spoon-feeding, and even letting her share her juice-bottle.

such as Prisoners' dilemma, presupposes repeated games such that moves from self-interested strategy invite future co-operation;

"*egocentric*" – the altruistic donor enjoys watching the recipient's satisfaction in consuming the gift compensating for the donor's lost satisfaction in consuming that which was donated;

"*altercentric*" – the benefactor's altruistic act stems from socially learnt proper behaviour as a result of an evolutionary successful mechanism for social selection based on human "docility", which Simon (1990:1666) uses in the dictionary sense of "disposed to be taught":

> "The altercentric view can account for resource sharing where the agent does not stand to collect a benefit in the egoistic form or in the egocentric form. It maintains that the agent, at least in some occasions, may share income because he is built with a pro-social trait. However, such a trait is not modeled as the desire to enhance the welfare of recipient, but rather modeled as springing from, what one may call, a "moral gene".
>
> The moral gene seems to dictate upon the agent to place himself totally in the shoes of the potential beneficiary and, hence, to adopt the other's utility as his own."
>
> (Khalil 2004:102–103)

Also in Becker's "egocentric" model the altruist affords help because of utility function of the patient being embedded in the helper. In the "altercentric" perspective, as Khalil terms it, there comes in addition a "moral gene" for proper pro-social conduct. And then, in the altercentric models, pro-social actors proliferate because conspecifics like them that way. In Simon's model, altruism is defined in a manner that differs from the forgoing of goods, wealth or power, and which is called altruism in common discourse. Defining altruism as a partial sacrifice of genetic fitness, i.e., as a behaviour that increases, on the average, the reproductive fitness of others at the expense of the fitness of the altruist, Simon (1990) points out that whether defined socially or genetically, altruism in that sense is compatible with natural selection as an important determinant of human behaviour. He proposes a robust mechanism, partly based on human dispositions for social learning and bounded rationality that may account for the evolutionary success of altruistic behaviour. Because the human disposition for receptivity to social influence, which Simon terms "docility", contributes to the fitness in the human species, it will be positively selected. This is not inconsistent with neo-Darwinian assumptions, Simon claims, and we may add that it is rather consistent with the Baldwin effect (cf. Chapter 4).

As for the Prisoner's Dilemma, referred to in egoistic terms, this appears to exclude the possibility of mutual cooperation to emerge in a one-move game; while given a series of successive games, mutual cooperation may emerge (Axelrod & Hamilton 1981). It has been suggested, though, that even a one move game could

yield such an outcome if prosocial feelings were at play in the participants (Bråten 1998/2004:146–149). And then, a neurophysiological (fMRI)-scan study involving 36 female subjects was reported by Rilling et al. (2000), each of them asked to participate in a repeated prisoner's dilemma game with one another. It turned out that mutual concern (for the welfare of the other) coincided with enduring activation of brain areas usually associated with experience of rewards. The researchers suggest that activation of such neural networks re-enforce mutual altruism and, hence, motivates the subject to resist the temptation to make an egoistic move that may come to be at the other's expense. Demonstrating that so-called 'rational choice' requires background feelings in order to be sensible, Antonio Damasio considers these research results to be not surprising at all, the game situations

> "led to the activation of regions involved in the release of dopamine and in pleasure behaviour, suggesting, well, that virtue is its own reward."
>
> (Damasio 2003:151).

## How to account for altruism in toddlers?

May reference to such an activation pertain to an explanation of altruistic behaviours in toddlers? It is clearly pertinent, but not sufficient. There is the added impact of empathic identification with the other in the operational sense of altercentric participation, and which may also be activated in the case of the other being observed to be in pain.

Let us first return to Rose, who held her half-emptied cup so that Edith could drink the rest of her cocoa. By actually turning the mug, Rose has demonstrated her ability to share Edith's bodily centre. If such altercentric participation on her part allows her to empathically identify with and experience in a mode of felt immediacy Edith's desire for cocoa, then she may also experience relief when Edith is allowed to drink even if Rose is deprived of the rest of her cocoa.

Let us also return to Oda who reciprocates her mother's spoon-feeding and even lets her mother drink of her juice bottle, as pictured in Figure 6.3. This is clearly a prosocial act, and if Oda treasures the sweet juice and would have preferred to drink it herself, her sharing is altruistic. This differs from Thomas, of the same age, who reciprocated his sister's spoon-feeding (Figure 8.2) sharing his porridge with her, but when they came to his sweet dessert he kept it to himself. No more reciprocal feeding. I have records of another infant, Emilie (11 ½ months), in the same situation of being fed by her mother. When I asked her mother to leave the spoon with porridge on the table, Emilie reciprocated, and she even did so when they came to the sweet dessert.

And then, the two orphan girls who took pity on John who had eaten his cakes and let him have theirs, while joyfully commenting his eating. This is

clearly altruism. So, what occurred here? By virtually participating in his desire for more in virtue of their capacity for altercentric participation in his suffering or state of need, they are overwhelmed by his feeling of wants, and come to his rescue even though it costs them eating their remaining cakes. But then, by virtue of their capacity for altercentric participation in his enjoying the cakes as if being virtual co-authors of his eating them, they are also intrinsically awarded. Thus, even in this account of altruism there is a payback. And then, when perceiving that someone else is in pain, shared pain processing may be activated which means that coming to aid to relieve the other of pain entails relief also for the helper. Let us succinctly look into this aspect.

## On shared pain-processing in self and other

When we observe another in pain and emphasize with her and step forward in attempt to relieve her of her pain we are certainly behaving in a prosocial manner. But does this entail any altruism on our part – in the sense that we attempt to help the other at our own expense? The answer is probably no. Why is that? It appears that pain-related neurons are activated in our brain not only when we ourselves experience pain, but also when we observer someone else in pain. More specifically, such pain-related neurons are located inter alia in the anterior part of the cingulate cortex (marked by small crosses in the brain diagram in Figure 6.4), as found by Hutchison et al. (1999). In a more recent functional magnetic resonance imaging (fMRI) study by Singer et al. (2004), it was found that the anterior cingulate cortex as well as cerebellum and brain stem were activated during the experience of a painful stimulus and during the observation of pain in others (referred to by Decety 2004:80). As no activity in the somatosensory cortex was detected when pain in others was observed, the researchers specify that empathy for pain involves affective but not sensory components for pain. And, then, quite recently common and distinct neural systems subserving perception of pain in self and others have been identified by Ochsner et al. (2008).

Thus, when we experience pain or observe someone else in pain, neurons in the forefront (anterior) of the cingulate cortex of our brain have been found to respond to such experience or observation of pain. In their *Nature Neuroscience* report on "Pain-related neurons in the human cingulate cortex" Hutchison et al. (1999) report from their microelectrode exploration of the anterior cingulate cortex of 11 patients (while otherwise being treated for severe psychiatric disorders). When exposed to mechanical pinprick stimuli applied with a force transducer the patients were asked whether the stimuli were painful or merely warm, cold or innocuous; and they were free to withdraw at any time. Pain-related neurons in

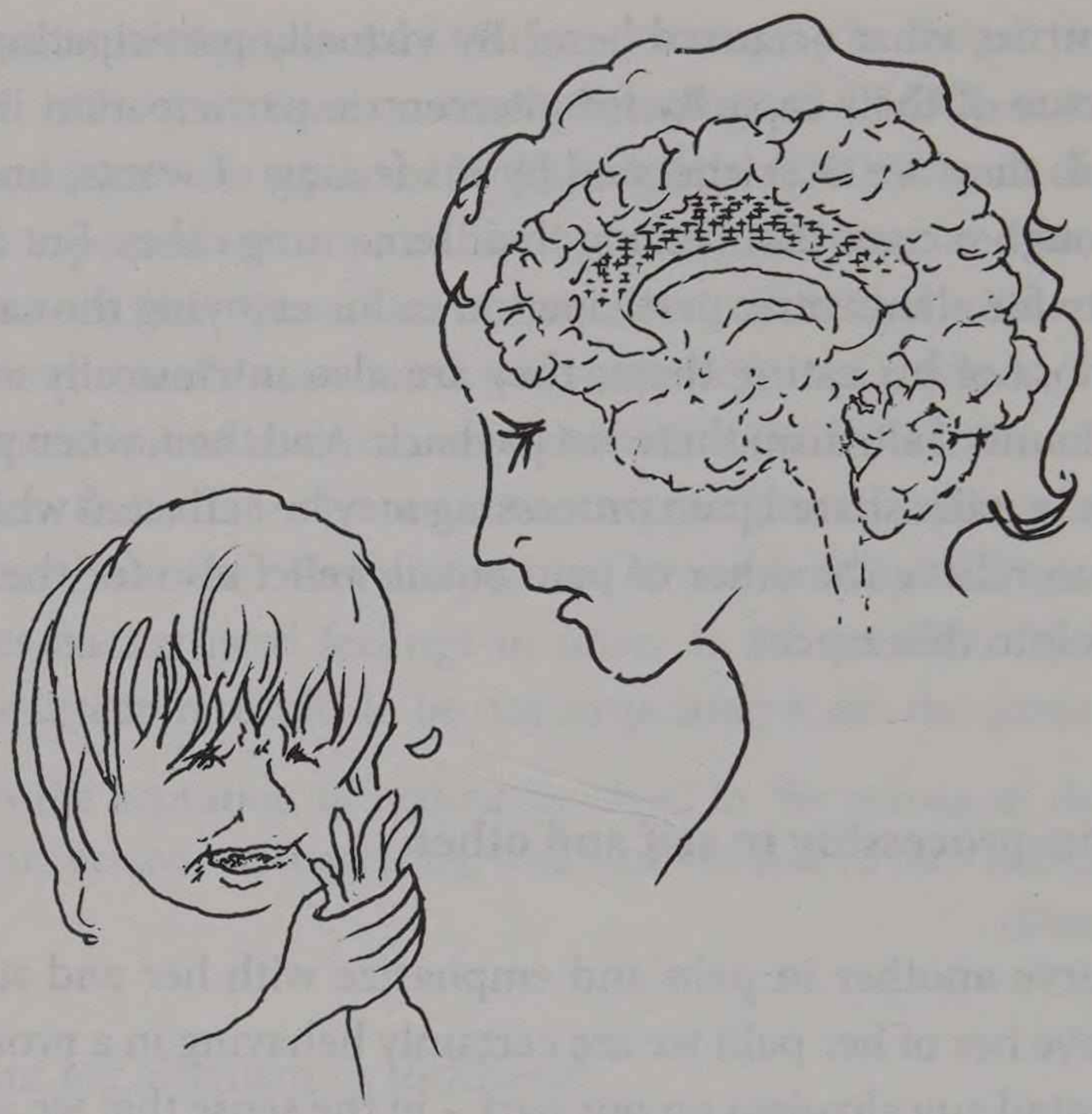


**Figure 6.4.** Shared pain processing: When we experience pain or observe another one in pain, pain-related neurons are activated in the anterior (frontal part of) cingulate cortex (marked by small crosses in the woman's brain diagram) as found in a single-neurons study of some patients reported *inter alia* by Hutchison et al. (1999), and supported by a functional MRI study of typically developing children by Decety et al. (2008).

the cingulate cortex of the brains of some of these patients became spontaneously active both when they experienced painful pinpricks and when they observed pinpricks delivered to the examiner, albeit with less excitation than when the patients actually experienced the pinpricks themselves. The researchers also report that in "three cases, neurons seemed also to respond to anticipation or observation of potentially painful stimulus" (Hutchison et al. 1999).

## Shared pain-processing system pertaining to empathy, but not altruism

Then, there is a pertinent investigation through a functional MRI study of the neural underpinnings in empathy for pain in school-aged children. In a recent article on shared pain processing related to empathy and intentionality in children Jean Decety et al. (2008) reports on a functional magnetic resonance imaging study of 17 typically developing children (7–12 years old) who were exposed to short animated visual stimuli depicting painful and non-painful situations. After scanning the children rated how painful they found the viewed situations to be. The perception of other people in pain in the children was associated with increased

hemodynamic activity in the neural circuits, including the anterior midcingulate cortex, involved in the processing of first-hand experience of pain.

As Hoffman (1987) has predicted, the rudimentary capacity for resonating with the pain of others can trigger empathic distress in the percipient and, hence, provide an affective and motivational basis for moral development and – we may add – for prosocial intervention and attempts to relieve the other's pain.

Is this pertinent for the question of early altruistic behaviours in children? Yes, it is pertinent in the sense that if watching another in pain causes painful reaction in the watcher, and the watcher then seeks to reduce the other's pain, this would entail that the watcher thereby also reduces her or his own resonant pain. In that case it does not make sense to specify such prosocial behaviour as being altruistic in a pure sense. But, still, coming to the aid of another in pain is clearly prosocial behaviour, for example, when an 18 month-old boy fetches his mother to comfort a crying friend (Hoffman 1987:51).

Another pertinent question is this: Does resonant pain-processing in self and the other entail or involve activation of the mirror neuron system? Or in other words: Do the shared circuits of pain-processing involve the shared mirror (neurons) system circuits identified by Rizzolatti and his co-researchers? The answer appears to partly be in the negative, in so far as the anterior cingulate cortex involved in empathic pain processing entails other brain areas than those usually associated with mirror neurons activation. However, the reply need to be qualified: In the case of the other in pain showing clear facial and body movement expressions of pain, such observed expressions and movement may be expected to elicit mirror system activation in the percipient, inviting similar expressions and rudimentary movements. This mirror resonance pertaining to movements has to be distinguished, however, from the more comprehensively shared pain-processing circuits in the resonating percipient. Both kinds of mirror resonance, the one activated upon participant perception of the other's moves and the other entailing shared pain-processing upon participant perception of the other's pain experience, invite qualifications in terms of a more comprehensive intersubjective mirror system supporting resonance in the percipient.

## Recapitulation of episodes and definitions in accounting for early altruism

While altruism is explained (away) by Trivers (1971) in terms of 'reciprocal altruism' entailing a return pay utility calculation (cf. also Ridley (1997) on *The Origins of Virtue*), we define:

(Def) Altruism – unselfish behaviour that benefits others at one's own expense.

And then, regard again these episodes with wartime children deprived of parental care or parents – the first from a wartime centre in UK, the second at Bulldogs Banks upon reception of orphans rescued from Nazi concentration camps:

(#1) Rose (19 months) sat at the table and drank her cocoa. Edith (17 months) climbed up and tried to take the mug from Rose's mouth. Rose looked at her in surprise, then turns the mug and holds it for Edith so that she could drink the cocoa. (Anna Freud & Burlingham 1973)

Rose's reaction to Edith's clumsy attempt to get cocoa is most telling, not only because of her nurturant act, helping Edith to drink cocoa at the cost of stopping her own drinking, but because of the way in which she reverses the mug in view of Edith's bodily position. By turning the mug so that Edith can drink from *Edith's* position, reverse to that of her own, Rose here demonstrates her capacity to transcend her own bodily ego-centric perspective. She gives evidence of alter-centricity.

(#2) "John [3 years 11 months] cries when there is no cake left for a second helping for him. Ruth [3 years 7 months] and Miriam [3 years 3 months] offer him what is left of their portions. While John eats their pieces of cake, they pet him and comment contently on what they have given him." (Orphans rescued from Nazi concentration camps, reported by Anna Freud (with Dann) 1973:175)

Below (#3) is again illustrated how spoon-feeding is reciprocated by an Oslo-girl before her first birthday:

(#3) Emilie (11 ½) month) is being spoon-fed by her mother, and when they turned to the sweet dessert, she also shared that with her mother (Bråten 1998/2004:25).

Here is another example, from another culture, previously referred to, as captured by Eibl-Eibesfeldt (1979) during his observations and photo recordings of the Yanomami-people in Amazonas:

(#4) A girl (probably less than one year old) feeds a morsel into her big sister's mouth. As her sister opens her mouth to receive the food she opens her own mouth, and when her sister closes her mouth on the morsel, the little girl tightens her own lips.

This Yanomami-girl (#4) illustrates with her accompanying mouth-movements what I have identified as altercentric participation:

(Def) Altercentric participation is an innate capacity, supported inter alia by mirror neurons, and entailing that your focus of orientation is centred in the other that you observe as if you were a virtual co-author of what the other is doing or trying to do (Bråten 1998a; 2002).

(P1) By virtue of this innate capacity for other-centred participation in the patient's distress or felt need as if experiencing that from the patient's centre, there is

a natural proclivity in the child to feel concern and sometimes, if situational and motoric resources permit, to attempt to help the patient, which also would reduce the altercentrically felt pain in the child.

(P2) If such helping is done at the child's expense, even though if feels good to see Edith's enjoying the cocoa (#1), or John's happily eating one's cakes (#2), or Emilie's mother enjoying tasting Emilie's sweet dessert (#3), then such a prosocial act per definition entails altruism.

(P3) Given that altercentric participation entails emotional contagion and empathic identification from virtual other participation in an other in a state of need or deprivation, as well as in another's state of gratification and satisfaction, in which the other's pleasure becomes one's own and the other's dissatisfaction is experienced as one's own, altercentricity invites altruism, such as exhibited by Rose (#1), by the two three-year old orphans who took pity on John (#2), and by Emilie (#3) and Oda (Fig. 6.3) who even shared their sweet dessert/juice with their mothers.

Even though "The evolution of altruism, a behaviour that benefits others at one's own fitness expense, poses a Darwinian paradox" (Jansen & van Baalen in *Nature*, 2006:663), there is no paradox if altruism – in line with (P1–3) – is a product of the evolution of altercentricity, supported by a mirror neurons system adapted in hominin phylogeny to subserve mother-centred participation.

## Pertinent for the evolution of (proto)language?

The above, however, invites inter alia this question: How may altruism have played a role in the emergence of (proto)language? As touched upon in Chapter 4, here will be succinctly referred to two pertinent replies concerning this question about how mechanisms for (reciprocal) altruism may pertain to the phylogenetic and sociogenetic emergence of (proto)language.

First, as pointed out by Bickerton (2000:270–271), when there is reciprocal altruism at play, as well as cheating, a social calculus is useful for keeping track by means of abstract representations of thematic roles. Initially, he suggests, our hominid ancestors may have had an extremely primitive and structureless protolanguage which prevented mapping of such a social calculus assigning roles to participants in action, preserved in episodic memory:

> "Now given that there are obvious social benefits from enhanced communication, it would have been in the interests of hominids to attempt to map their role-assigning representations of events onto their protolanguage."
>
> (Bickerton 2000:271).

But for two million years, the level of signal coherence of the brain was too low to allow for such a mapping of the thematic structure of the social calculus onto utterances, and only within the last two hundred thousand years was an adequate coherence level achieved in a group that became the ancestors of modern humans (Bickerton 2000:281). That would have made a difference with respect to merely keeping track in memory of debts and obligations, becoming able to construct and communicate fragmentary narratives to offspring and other members in the group.

Second, the very act of exchanging useful information is prosocial and may sometimes be altruistic in a reciprocal sense. Dessalles asks: When information is given to another individual at the provider's expense, or when information is given to another in return for previous useful information provided by the recipient, which of these two scenarios is the correct model for language in a Darwinian perspective? Natural selection should have favoured non-cooperative participants who listen, but return no information. Like sharing food, sharing information can be altruistic. By talking together, interlocutors give pertinent information to one another, and Dessalles (1998:135) draws attention to the origin of relevance (mostly lacking in computers) such as when interlocutors draw attention to a problematic situation, acknowledge the fact that it is problematic, and even contribute to do away with its problematic nature. The phenomenon of relevance invites us to realize that utterances are profitable to the listener. But, then, the ability to engage in relevant discourse would also serve the speaker. Quoting Pinker's (1995:369) stating that "anthropologists have noted that tribal chiefs are often both gifted orators and highly polygynous", Dessalles (1998:141) points out that language could even be considered as an advertising device, reflecting high status correlated with high reproductive success.

PART III

# Intersubjective steps to speech and mind-reading in ontogeny

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CHAPTER 7

# From newborns' imitation

## On primary intersubjectivity and perturbations

Most parents and caretakers have experienced how their babies in the first months of life appear to complement them in a finely tuned interplay of mutual fulfilling and follow-up of gestures and expressions. Even in the first weeks after birth mother and child can achieve such coordination of expressions and movements in a sort of circular dance of mutually completing and inter-woven bodily motions. When engaging with the baby at the nursing table, parents and care-persons – when they are not stressed or pressed for time – frequently experience a kind of dancing-like or dialogue-like mutual interplay. In Chapter 1 was illustrated, for example, snapshots of a girl, 11 days old, at the nursery table in a dance-like communion with her mother (Fig. 1.2). Here you may recognize dancing like movements and gestures in an interplay in which the newborn baby girl engages with her whole body a in mutually shared communion of feelings.

### The discovery of neonatal imitation

Newborns from about that age were reported by Meltzoff and Moore (1977) to take after facial gestures, such as tongue protrusion and enlarged mouth opening of the kind illustrated in Figure 7.1. While these newborns were rather "old" – between 12 and 21 days of age – Meltzoff and Moore (1983) later reported neonatal imitation even in the first hour after birth, as did Kugiumutzakis (1998) with his 1983 records from Crete. When we study his records of imitation even in 20-minute-olds, we note how the newborn infant apparently makes an effort to communicate by way of coming up with a similar gesture. It is not easy, and it takes time. Hence, if the adult is too hasty and does not allow for the baby to establish a connection of communion, no imitation will follow.

Evidence of such early imitation conflicted with traditional theories of child development, and when first reported such findings were explained away in terms of coincidences or simple reflexes beyond the baby's control and capacity or met with outright rejection by those who failed to replicate their findings having overlooked the kind of patience and perfect state variable values required to come

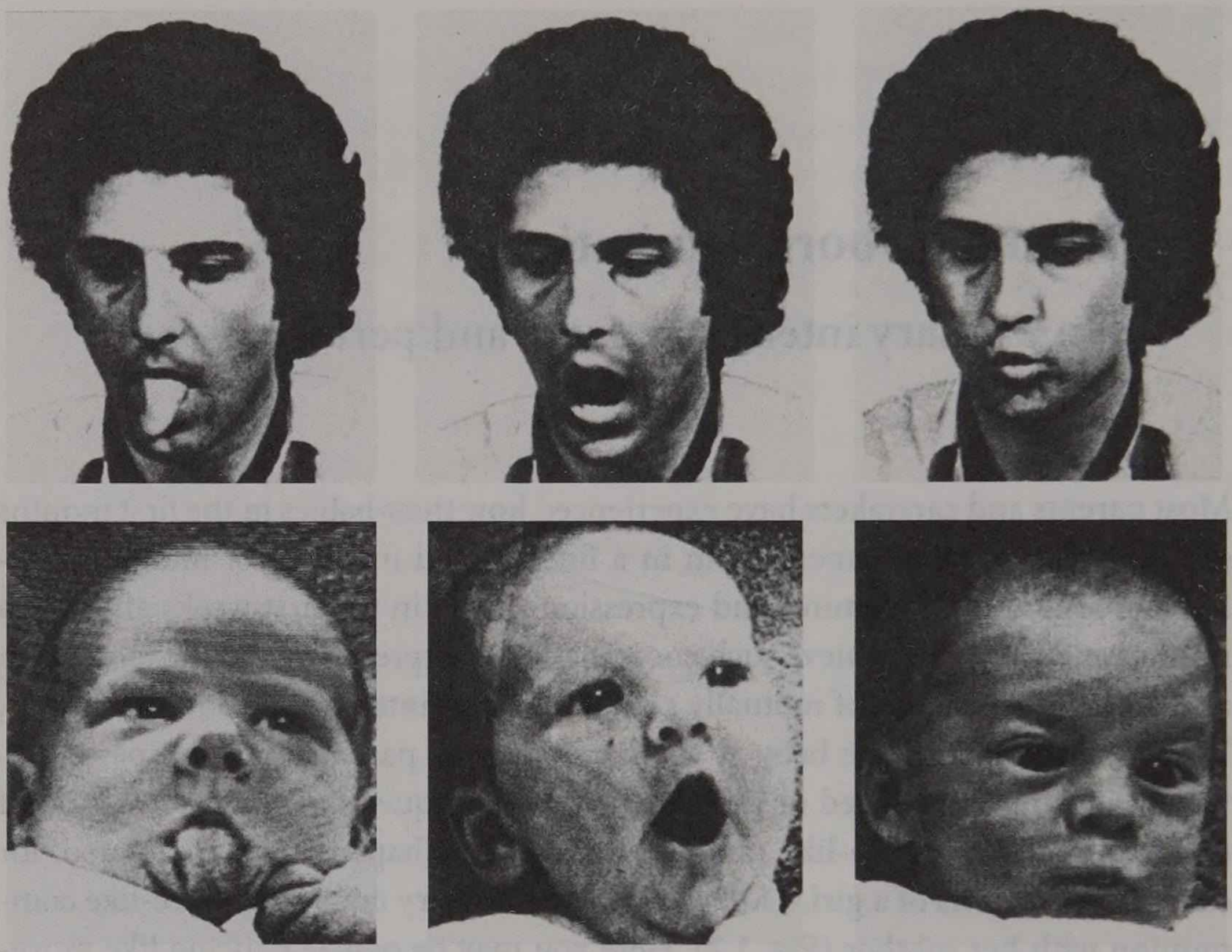


**Figure 7.1.** Neonatal imitation of the adult's gesture of tongue protrusion, wide mouth opening, and lip protrusion, as reported in *Science* by Meltzoff and Moore (1977). (Reproduced with Andrew Meltzoff's permission).

up with such results. Gradually, however, replicate evidence began to accumulate from a number of laboratories around the world.

But how, it has been asked, can the neonate convert the image of tongue protrusion into a proprioceptive equivalent? How can the visual input from a gesture that begins before the adult opens her mouth be translated into an analogue motor output and be executed by the infant not seeing himself? When the infant is viewed as a separate information processing system or as a monadic organism somehow copying the act of an adult other who is outside the operational circuits, such questions have turned out to be difficult to answer. Consider, however, that newborns share our capacity to feel own body movements in an immediate sense, including protrusion of own tongue without seeing it by virtue of what we term "proprioception" (*proprio* for own + *ception* for perception). Now, consider the possibility that we also have the capacity to perceive *others'* body movements in such an immediate and direct sense. Trevarthen has termed such an immediate other-sense '*alteroception*'. Like the proprioceptive sense, alteroception is not mediated by conceptions and other higher-order means beyond neonatal

capacity. This invites us to be open to the possibility that the newborn engages with the adult in a circular form of self-other organization in which they both – the baby and the adult – complement and complete each other in an immediate sense, much like the newborns can feel their own bodily movements in a direct manner. Then neonatal imitation need no longer be seen as a mystery, but as a manifestation of newborns seeking to establish connections with adults. In his theory of baby-mother attachment Bowlby (1969) gives a functional argument for such communicative readiness on the part of the human newborn, consistent with the lines of arguments developed in Chapter 5. While newborns of other higher primates, like chimpanzee offspring, have the physical strength to cling to their mother for survival, human babies lack such strength (as well as a fur to cling to). Hence, one should expect their seeking to establish face-to-face connection by mobilizing their primordial capacity to engage with the movements of others in the same kind of bodily felt immediacy in which the neonates can feel their own body movements by way of proprioception.

For the way in which others can be directly perceived in a phenomenological sense, one may use the term 'presentational immediacy' (Whitehead 1956) or even speak of 'sympathy', the capacity for which Adam Smith (1759) and Darwin (1872) suggested to be innate. Smith proposed that natural sympathy is a primordial capacity in humans. He used the onlookers of a French line dancer as a manifesting example of sympathy: As the line-dancer moves on the slack line, the spectators lean over with the dancer, bodily sharing in the dancer's effort to keep the balance in an immediate and un-reflected manner, not mediated by conceptions, as if they were there on the line with the dancer. We may add: they behave as if they were virtual co-authors of the dancing. This resembles the kind of reactions which I have observed and recorded in audiences exposed to Kugiumutzakis' video record: As they watch the newborn girl preparing to take after his' wide mouth opening, some in the audience unwittingly open their own mouth as if coming to her virtual aid. Such matching resonance in the form of spectators' virtual participation in what the performer is doing or about to do we may now assume to be neurosocially supported by an other-centred mirror system. As will be illustrated in Chapter 8, even infants towards the end of their first year are capable of such virtual participation as if being a virtual co-author of what the other is doing.

## The discovery of protoconversation

Let us now return to occurrences of early mutual infant-adult interplay, such as introduced by Figure 1.2 in Chapter 1, showing an 11-days-old girl at the nursing table with her mother. That kind of mutual dance-like interaction when tending

the baby on the nursing table most of us will recognize and acknowledge as a sort of communion. The dance-like interplay is expressive of sympathy in an immediate sense of shared feelings. The baby engages with her whole body, accompanies and completes her mother's movements with gazes and expressions tuned to her mother's expressions and gestures. Like the adult care-giver who may raise her right hand and right side of her mouth in her expressions, so the baby may exhibit asymmetry in the raising of arms and legs in the dialogue-like dancing with the adult caretaker. Here we see the germ of verbal conversation characteristics. It looks as if there is innate basis for engaging with others in mutually attuned proto-conversation, revealing itself already in the first months and even weeks of life.

## 'Duet' before term with a prematurely born

Mutual interplay is even documented in video records of interplay between parents and prematurely born babies in the first weeks of their life. A beautiful example is afforded by the recordings by van Rees and De Leeuw (1993) of a girl, born three months before term, in mutual engagement with her father when she was three weeks old (Figure 7.2), and then, three weeks later, in a duet with her father while keeping her eyes closed (cf. also Schögler & Trevarthen 2007:282).

When she was three weeks old, and her mother had to have an operation, her father began his interplay with her. In the snapshots from the video recordings (Fig. 7.2). we see mutual engagement with smiles, gazing and finger movements. When she is six weeks old we hear her hardly audible /*ah..*/ and his light sotto voiced /*AH..*/ in this turn-taking duet:

*ah..AH..ah..AH..ah..AH..ah..AH..ah..AH..ah..AH..ah.....*

The duet continues for a while with her eyes closed, and then she falls asleep (cf. Stephen Malloch's spectrographic analysis of the "duet", reproduced by Schögler & Trevarthen 2007:282).

This also illustrates how the newborn not just engages with the mother – although she has a natural advantage. While the mother is a natural candidate for becoming an actual companion by virtue of her familiar smell and voice melody and rhythm, any sensitive human being will do, and not just the father as illustrated in Fig. 7.2. Men and women, older children and siblings – if they only are patient and sensitive enough and adhere to their natural inclination to lighten their voice as the father does in the above case – can be invited to share in such intimate communion with babies.

## When protoconversation was first revealed by film analyses

Such first interplay and protodialogic duet and dancing (as in Figure 1.2) provide social emotional nurture for change and development, permitting more complex

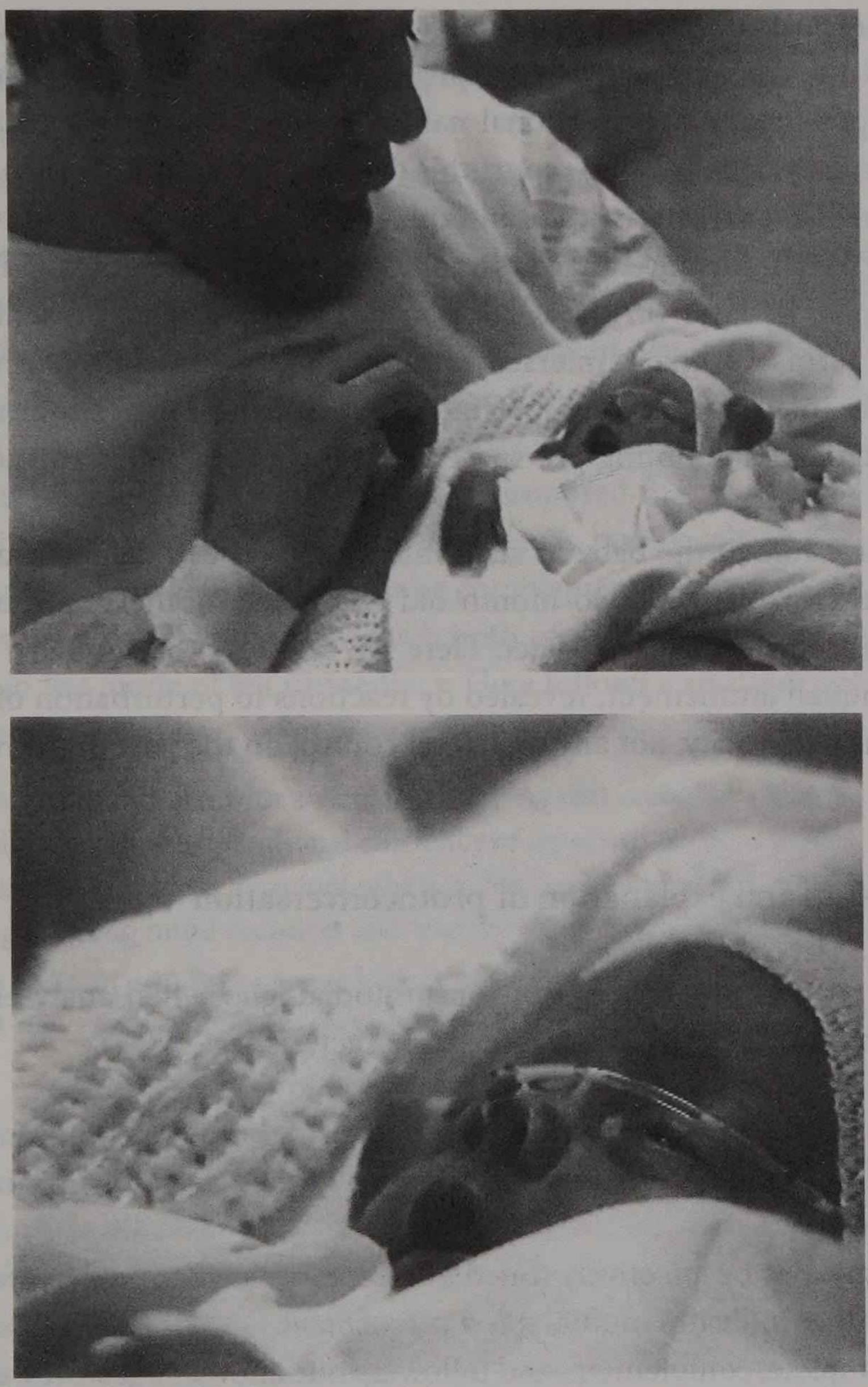


**Figure 7.2.** Prematurely born baby girl (born three months before term), in mutual contact with her father when she is three weeks old. Three weeks later – with her eyes closed, looking like she is asleep – she engages in a barely audible duet with her father, responding to his AH… AH… with her ah...ah... in a turn-taking manner (From video recordings "Born too soon" by Saskia van Rees (van Rees & De Leeuw 1993), reproduced here with the permission of Saskia van Rees).

modes of self-dialoguing and dialoguing with actual others, and yet maintaining the basic self-organizing dyadic format. Such interplay is clearly reciprocal, and not just controlled and managed by the older partner.

Mary Catherine Bateson (1971, 1975) documented the turn-taking and reciprocal characteristics of such early dialogue-like interplay. Based on her detailed-level

analyses of records of mother-baby interaction, she proposed to term such early interplay in the first months of life "proto-conversation" by virtue of its turn-taking and precursory conversational nature. Independently and consistent with her findings, Trevarthen (1974) reports his discovery of such early turn-taking and conversation-like characteristics of interplays between mothers and two-month-old babies. From his detailed analyses of finely tuned co-ordination and synchrony of expressions, he later on the basis also of brain research presents evidence of what he terms "primary intersubjectivity" in early infancy. We may notice in such early interplay also the first indications of the infant's tuning in to the adult's speech and attempting pre-speech motions (Kuhl 1992; Trevarthen 1974, 1979, 1986).

The active role of the baby in such interplay has been demonstrated in perturbation experiments with two-month-old babies and mothers in Murray's video replay design, to be turned to later. Here we see how the mothers and babies engage in mutual attunement, revealed by reactions to perturbation of that interplay. There is reciprocity, not any unilateral control on the part of the mother.

## Characteristics and explanation of protoconversation

We use the term 'protoconversation' or 'protodialogue' when analyses of unperturbed infant-adult interplay reveal these characteristics:

- Both takes their turn (*turn-taking*) in pausing and watching and listening to the other in a manner that appears finely tuned and synchronized in time and space.
- Both appear to be affectively tuned to each other's emotional expressions in a manner that indicates mutual *affect attunement.*
- Both complete, complement, and follow up one another's gestures, expressions and movements in ways that suggest *matching resonance* and, sometimes, imitation (in order to imitate, however, the infant requires time – the younger the infant, the more time is required).

If the adult is too fast, has too loud or too dark a voice, is stressed, depressed or in other ways out of tune with herself or himself, or the infant is sleepy, in pain, hungry or thirsty, or in other ways feels uncomfortable, then no such mutually and finely tuned interplay may be expected of them. If not in pain, a crying baby will stop crying and engage in interplay in response to lightly toned and inviting gestures by the adult. To repeat, such proto-conversational engagements are not an exclusive mother-child phenomenon, even though it was first studied as such.

Anyone of both sexes and of various ages – if they are not too impatient or stressed – can so engage as a protoconversational partner.

## Explanation in terms of the virtual other postulate

It is hard to conceive how such mutual infant-adult protoconversation can come about if one of them is considered egocentric or closed off from social reality, or if both of them are viewed as monadic organisms in need of cultural windows to establish a link. Somehow, there would have to be an innate ground for readiness to join in a dyadic union of felt immediacy by virtue of which the protoconversational music and dance come about. I have proposed that by virtue of the infant's inborn virtual other, complementing the infant's bodily self in the same operational manner that an actual other can be complementary, the infant and adult can constitute such a dyadic union in which both of them complement one another's bodily self in the mode of felt immediacy. Here follows a succinct statement of the virtual other postulate:

(P) The infant is born with a virtual other (*A) that complements the infant's bodily self (B) with the operational efficiency of an actual other and, hence, invites and permits fulfilment by actual others in felt immediacy. Thus the typical developing learning mind recreates and transforms itself as a self-organizing dyad

(B *A) in self-engagement with the virtual other, as well as

(B A) in engagement with actual others who fill and affect the companion space of the virtual other and, hence, are directly felt in presentational immediacy, precursory and a prerequisite for later representations of others in re-presentational mediacy (Bråten 1986/1988; 1988).

Complementing the infant's bodily self, the postulated infant's companion space with an inborn virtual other invites to be filled by the actual other in the dialogical mode of felt immediacy. Thus, replacing the infant's virtual other, when engaging in protodialogue, the mother fills the infant's companion space in the place of the infant's virtual other, and afterwards, the infant may recreate that protodialogue with the infant's virtual other, having the operational efficiency of an actual other. And, then, if the care-person is self-centred and in a state of distress, unable to engage in mutually attuned communion with the infant, such as in cases of post-natal depression, the infant may have to fall back on self-engagement, albeit with the infant's virtual other, or as, Winnicott puts it, with a transitional object.

In her *Infant Mental Health Journal* article on infant intersubjectivity and infants of postpartum depressed women, Lynne Murray (1991:228–229) points out that early mother-infant interaction may be significantly jeopardized by depression: "Instead of the preoccupation with the infant that enables the mother

to take the place of the "virtual other" in infant experience, and thereby provide a complementary form of responsiveness, the depressed woman's awareness is dominated first and foremost by her own concern and needs." Murray lays out the virtual other postulate in the following manner:

> "Braten argues that the prerequisite for intersubjectivity is the inherently dyadic organization of the individual subject. He proposes that, within the central nervous system of the newborn, there are circuits that specify the immediate co-presence of a complementary participant, which he terms the "virtual other", in place of which the actual other may step. The virtual other is not only the operational prerequisite for intersubjectivity, but a "felt perspective", an as yet unrealized otherness that is realized by the actual other taking their place in the dialogic circle. Hence, the patterns of perfect timing and turn taking that have been documented by researchers in mother-infant relations are conceived as natural patterns of one, albeit asymmetric, dialogic organization, completing its own operationally defined circuits, and not the outcome of two monologic organizations attempting to be in concert."
>
> (Murray 1991:221)

Hence, the infant B with the infant's virtual other *A, and the adult caretaker A with her or his virtual other *B, combine by filling one another's companion space so as to constitute the baby-adult BA-union by virtue of this transition:

$$B\,{}^{*}A \;\&\; A{}^{*}B := BA$$

Here the transition symbol ': =' denotes 'becomes' (as used in *Simula* or other object-oriented programming languages). In a metaphorical manner this is illustrated in Figure 7.3.

Murray (1991:222) links implications of the above postulate not just to the work of Winnicott, but also to that of Bion's (1962) view of how, when the mother and infant are adjusted to one another, the infant behaves in such a way that projective identification as a normal phenomenon entailing that the infant's experience is "projected into" or felt to reside in the actual other.

In his book on children's mind, the German sociologist Martin Dornes (2006) also makes a link between implications of the virtual other postulate and Bion's theory:

> Close to Bråten's theory lies Bion's idea that the breast sucking infant has an inborn preconception of the breast, when breast is being understood as a metaphor for object or object-relation. Also his [Bion's] idea of preconceptions which have to be met by their realization in order to become conceptions is astoundingly close […] The shared basic assumption is that the infant has inborn expectations, the realization or non-realization of which – or in Bråten's terminology fulfilment or non-fulfilment – will influence further development.
>
> (Dornes 2006: 88; transl. SB)

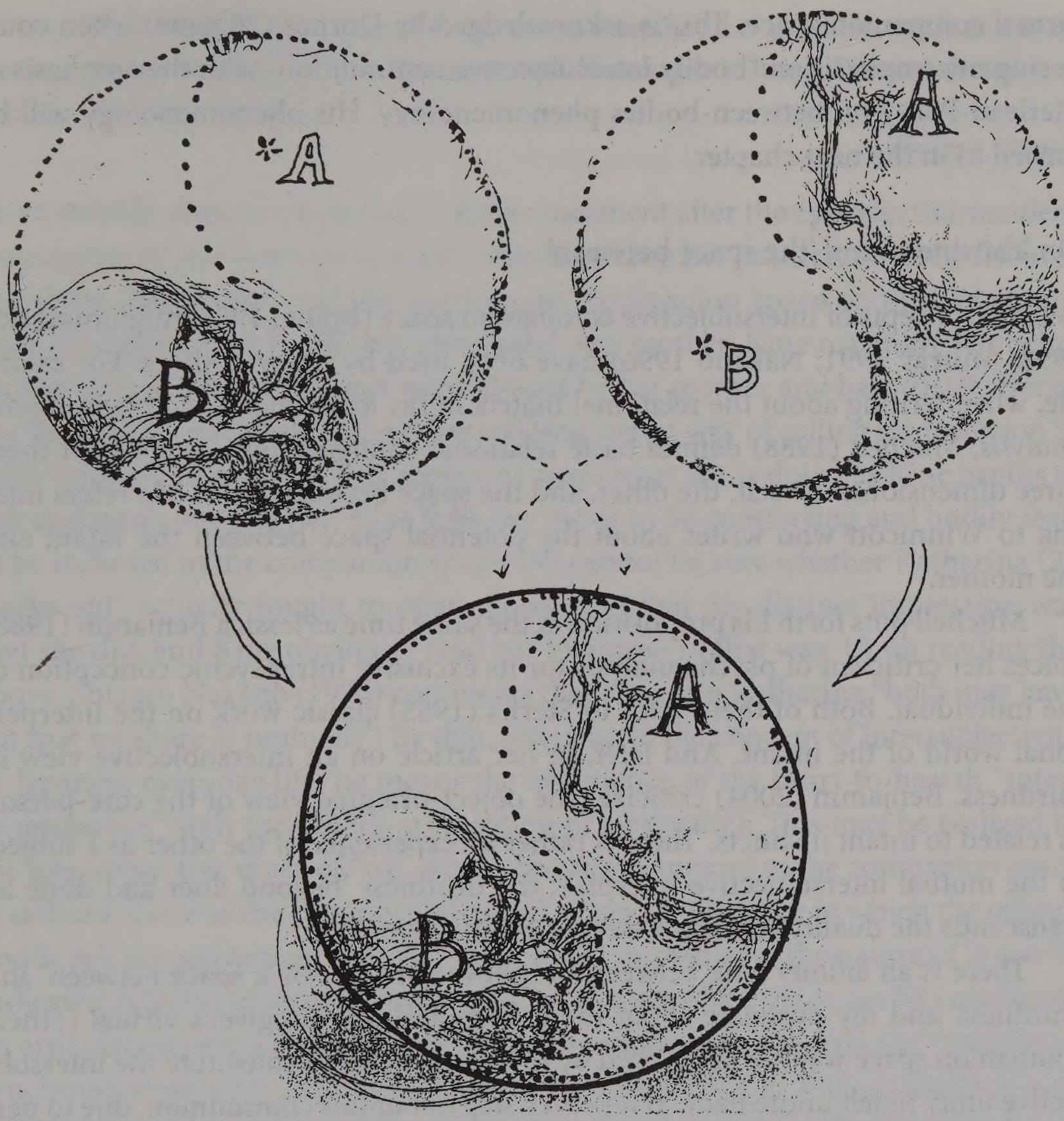



**Figure 7.3.** A metaphoric illustration of the posited inborn companion space with a virtual other, marked by *, inviting to be filled by an actual other in the same operational format

(*Top left*) The infant's constitution (B*A), with its virtual companion space marked by *A

(*Top right*) The adult with a similar constitution with *B marking the virtual companion space

(*Bottom*) Infant and adult fill one another's virtual companion space, constituting the dyadic union BA in the same operational format. Thus B*A & A*B : = BA (Upon perturbation or dissolution of this dyadic union (BA), transition arrows would point in the reverse direction of the arrows marked in the illustration, entailing this return BA : = B*A & A*B at which the infant and the adult are left with engaging with their respective virtual others).

When Dornes (2006:89) questions whether such a new terminology is needed, one should point out the critical difference between Bion's attributed "inborn expectations about the breast" as metaphor for an "object", and the essential subject-subject communion which is opened for when the caregiver is included in the infant's

virtual companion space. This is acknowledged by Dornes (2006:98) when comparing my emphasis on "bodily intersubjective communion" with the emphasis of Merleau-Ponty on between-bodies phenomenology. His phenomenology will be turned to in the next chapter.

## On 'thirdness' and 'the space between'

Related concepts of intersubjective companion space (Bråten 1988, Kugiumutzakis 1998; Murray 1991; Nakano 1996) have been used by many authors. For example, when writing about the relational matrix in his *Relational Concepts in Psycho analysis*, Mitchell (1988) defines basic relational configurations in terms of these three dimensions: the self, the other, and the space between them. He refers inter alia to Winnicott who writes about the potential space between the infant and the mother.

Mitchell puts forth his proposition at the same time as Jessica Benjamin (1988) voices her criticism of psychoanalysis for its exclusive intrapsychic conception of the individual. Both of them refer to Stern's (1985) classic work on the interpersonal world of the infant. And later, in her article on an intersubjective view of thirdness, Benjamin (2004) criticizes the object-oriented view of the care-person as related to infant instincts. There is rather an experience of the other as a subject in the mutual intersubjective interplay; the thirdness 'beyond doer and done to' transcends the duality (cf. also Veseth & Moltu 2006:925).

There is an affinity here between the above concepts of 'a space between' and 'thirdness' and my postulate about the infant's and the caregiver's virtual (other) companion space waiting to be filled by the actual other to constitute the intersubjective unity in felt immediacy. When they step out of this communion, due to perturbation or in the natural course of event, each may individually resort to dialogue with one's virtual other, or with what Stern terms an 'evoked companion'. This is precisely what Winnicott's infants do when re-creating the previous infant-mother interplay by resorting to a transitional object, such as letting a dummy or a hair lock be their virtual or evoked companion. And if the mother withdraws into herself, as she may be doing if suffering from post-natal depression, becoming self-absorbed and self-centred as described by Murray (1991), then she may close her companion space and devote herself exclusively to self-engagement with her virtual other.

The proprioceptive and alteroceptive space in which the infant's bodily self is complemented by the other in felt immediacy is here termed 'the companion space'. Its pertinence may be illustrated by an incident occurring in a summer cabin in Norway with Katharina (26 weeks) reacting to the sobbing of her sister Kine (4 years), in bed with their mother:

> The mother had the baby on her stomach who was fingering a piece of paper. Her big sister Kine was lying beside, begging for a juice bottle. Kine started sobbing.

> Katharina stopped what she was doing, stretched her arms outwards and leant over towards Kine. Their faces touched. Kine began to laugh. "She comforted me," she later explains.
>
> (Bråten 1996a).

To an outside observer, unaware of Kine's comment after the episode, this incident may appear to be a random incident: unable to keep her balance, the baby fell over her sister. But in terms of the participants' companion space another phenomenon emerges: Lying beside her baby sister and mother, Kine may have felt being excluded from the companion space shared by her mother and baby sister. Hence her begging for a juice bottle and her sobbing were a way of calling for inclusion in their companion space. When Katharina stops what she is doing as Kine begins to sob and leans towards her, Kine feels her move to be comforting and bodily feels to be included in the companion space. We cannot be sure whether Katharina (26 weeks old) actually sought to offer consolation, but my distinct impression was that she did, and Kine obviously read her intention in that way. Upon reading the above, Shigero Nakano (1996) comments that Kina and Katharina "both may have felt that *we* share *jo* mutually". By that, referring to the concept of intersubjectivity in Japanese everyday life, he means the experience of the heart-to-hearth "inter-*jo*-resonance" with the other's *jo* (emotion or sympathy). This may be realized in the intersubjective space of "we", which Nakano compares to the companion space as defined above as the proprioceptive and alteroceptive space in which the infant's bodily self is complemented by the other in felt immediacy. The nature of *jo* can be indicated in terms of resonance or "voice". A nuance of the voice can be considered an articulation of the movement of *jo,* and its expression is always the outcome of synchronization with other persons' moods or atmosphere. Thus, as Nakano puts it, "Kine's laughing indicated her excitement of feeling Katharina's *jo*, sympathy. At the same time, her laughing seems to have conveyed intimacy with her *jo*."

## On the musicality and dance-like movements in early infant-adult interplay

Synchronization and musicality manifest their fundamental features in the cultivated expressive ways human bodies move. The ways in which infants move in interaction with the rhythmic vocalizations and gestures of their adult care-givers attest to musical and affect attunement:

> "A newborn knows the mother by the tone and inflections of her voice. When a six-month-old smiles with recognition of a favourite song, and bounces with the beat, it is like knowing his or her name, displaying a social 'me' within the family's affectionate pleasure of sharing."
>
> (Trevarthen 2002:21).

Happy mothers tend to vocalize through the octave above middle C, while depressed mother's speech falls below this range, usually failing to engage a young infant's attention. Like the rhythm of steps is to the pulse of dance, the musical pitch range and its expressive modulations in song appear to be innate attributes of human vocal communication, inviting empathic fellow feelings and movements in sympathy (Panksepp & Bernatsky 2002).

The Papouseks (1981) and Stern et al. (1985) have in different ways brought our attention to the 'musicality' of expressions in communication with infants, produced intuitively by parents and expressive of what has been identified as 'affect attunement'. Observations of infants' active participation in mothers' nursery songs and body games show how interested they are and how willingly babies move with the music. Mazokopaki and Trevarthen (2007) report that an infant of 6 months will turn still on hearing music, orient, smile and then join in with rhythmic movements as he or she 'picks up' the music. Infants of 3 or 4 months and more learn songs quickly, move with them, and demonstrate to familiar others their pride in being able to act with the rhythms and melodies.

Malloch (1999) has demonstrated that the sounds of a recorded protoconversation between a 6-week-old Scottish girl, Laura, and her mother could be analyzed in rigorous musical acoustic terms of rhythmic base, qualitative control of melodic expression in pitch and timbre, phrasing of utterances with bar structure, and progression over tens of seconds in narrative cycles of energy and excitement. (cf. also Schögler & Trevarthen 2007).

The mutual attunement and musical ways in which the infant and the adult in protoconversation or in a conversation-like dance resonate with one another and complete or fulfil one another's sounds and moves, attest to 'the muse within' (Björkvold 1992) and may be compared to some of the characteristics of intimate verbal conversations in which mature partners complete one another's utterances.

This might suggest that phylogenetically, music evolved as a by-product of speech. But that is found to be unlikely by Patel (2006) and Sacks (2008:242–243): While rhythm – in the special sense of combining movement and sound – appears spontaneously in children, it does not in other primates; rhythm entails a kind of perception and synchronization of beat that appears to be unique to music, differing from linguistic rhythm. As for dance-like movements, these are for both humans and animals a way of expressing or releasing powerful feelings, such as joy, impatience, or anger. And for the spectators, as pointed out by Mackrell (1991:936), when being drawn into the rhythms and patterns created by the dancer's movements, the spectators may come to share in the emotions being expressed by the dancing movements and – what is more – the spectators may come to "feel an echo of the dancer's movement and rhythm in their own nerve endings." (Mackrell 1991:936). That indicates participant perception and even altercentric mirroring.

And, then, as pointed out by Storr (1992), in every culture people sing and dance together demonstrating the primary function of music and dance to bring and bind people together in a communal and moving collective. Sacks (2008:244) emphasizes how rhythm turns listeners into participants:

> "[This] makes listening active and motoric, and synchronizes the brain and minds (and, since motion is always intertwined with music, the "hearts") of all who participate. It is very difficult to remain detached, to resist being drawn into the rhythm of chanting or dancing
>
> (Sacks 2008:245).

Rudiments of such dance-like interplay may be seen already in the interplay between the mother and the 11-days-old girl at the nursing table (Fig. 1.2), and in the video recordings by van Rees and de Leeuw 1987 of the premature Nasseria (Fig. 7.2), 'innate rhythms' have been revealed in the spectrographic analysis of the "duet" by Stephen Malloch (reproduced by Schogler & Trevarthen 2007, cf. their Fig. 1 in Bråten (Ed.) 2007:282).

## Infant sensitivity when protoconversation is perturbed

Thus, there is reciprocity in early infant-adult interplay and not – as previously thought – the baby being played upon as an 'instrument' for the controlling mother. Particularly revealing are the results of experimental perturbation of infant-adult interplay. A series of perturbation experiments, reported by Murray and Trevarthen (1985, 1986), demonstrate the mutually felt reciprocity in the interplay between mothers and their two-month-old children, even when only audio-visually connected, as revealed by their reactions to being unwittingly exposed to a replay companion during the perturbed sequence.

Before such a perturbation, in spite of being deprived of smell and touch, most mothers and children soon come to engage in "happy" protoconversation, exhibiting turn-taking and tuning emotionally in to each other's gestures and expression. Then, after a brief pause, they resume the interplay. But now their situation has been experimentally changed: Each of them is unwittingly exposed to a *replay* of their live companion from the previous happy interplay. Both mother and child react by significantly changing their behaviour. Besides demonstrating how they both – the two-month-old and the mother – play a crucial part in the live interchange, a lot more may be learnt from their reactions to the replay. Murray and Trevarthen (1985, 1986) report, first, how the mothers reacted, and then, the infants.

When the mother is exposed to a replay child, the mother talks to the replay child, albeit now in a mother-centred and imperative manner. Feeling that

something is wrong due to the absence of adequate responses from the child, even though the replay child exhibits the happy complementary activity from the live interplay, the mother continues to talk to the (replay) child, trying to restore communication: "Look at me, Peter!" "Mammy is here!" "Don't you want to...?"

When the infant is exposed to a replay mother, the reactions are different and, after a while, the baby may turn away. Below, illustrated in Figure 7.4, we see the difference in the infants' reactions during the live interplay and upon exposure of replay of the mother from the previous live interplay. Upon exposure to the replay mother, the two-month old infant, after casting some inquiring glances at the monitor, as if looking for the actual mother, apparently finds no contact with the replay mother and now turns to itself, sometimes touching itself, while giving signs of being out of touch.

These experiments with mothers and their babies in Murray's replay design reveal several keynote features. First, they demonstrate that the baby is as sensitive to the mother's behaviour as she is sensitive to her baby's expressions. Second, the experience of affect attunement during the live interaction is shown to be mutual and shared, not just unilateral on the part of the mother or child. In the live interplay they apparently engage in a sympathetic mode of felt immediacy which is clearly reciprocal, as contrasted to the ways of their reaction to the exposure to a switched replay companion. Third, the results demonstrate how they are mutually dependent on one another in order to realize and experience proto-conversation as a dialogue-like patterns of interplay. The result of this experiment, then, became a decisive demonstration of the way in which both the adults and the infants in the first months of life play a reciprocal part in proto-conversation, discovered by Mary Catherine Bateson (1975) and Colwyn Trevarthen (1974).

Given that the adults and infants before the perturbed sequences manage to establish a "happy" exchange in spite of their being deprived here of smell and touch, the infants are not fooled when afterwards exposed to the replay mothers. After some repeated glanced at the monitor, the babies react to the replay mother by turning away with indications of distress and gaze avoidance (interrupted by some brief gazes at the monitor) and sometimes exhibits self-touching in a coherently self-engaging and circular manner.

In the unperturbed sequences, in spite of being deprived of smell and touch, some of the infants engaged with their mothers in the mode of felt immediacy in the shared phenomenological space which we term their intersubjective companion space (Bråten 1988; Kugiumutzakis 1998). In virtue of sharing that space they combine to constitute an operationally closed dyad in which each directly sense and attune to the bodily movements and vocalizations of the other. This is a radically different mode from the mode that the mothers engage in, when unwittingly faced with the replay child. Upon exposure to the replay companion, there is no longer any actual other to fill that space. The mother turns imperative, demanding

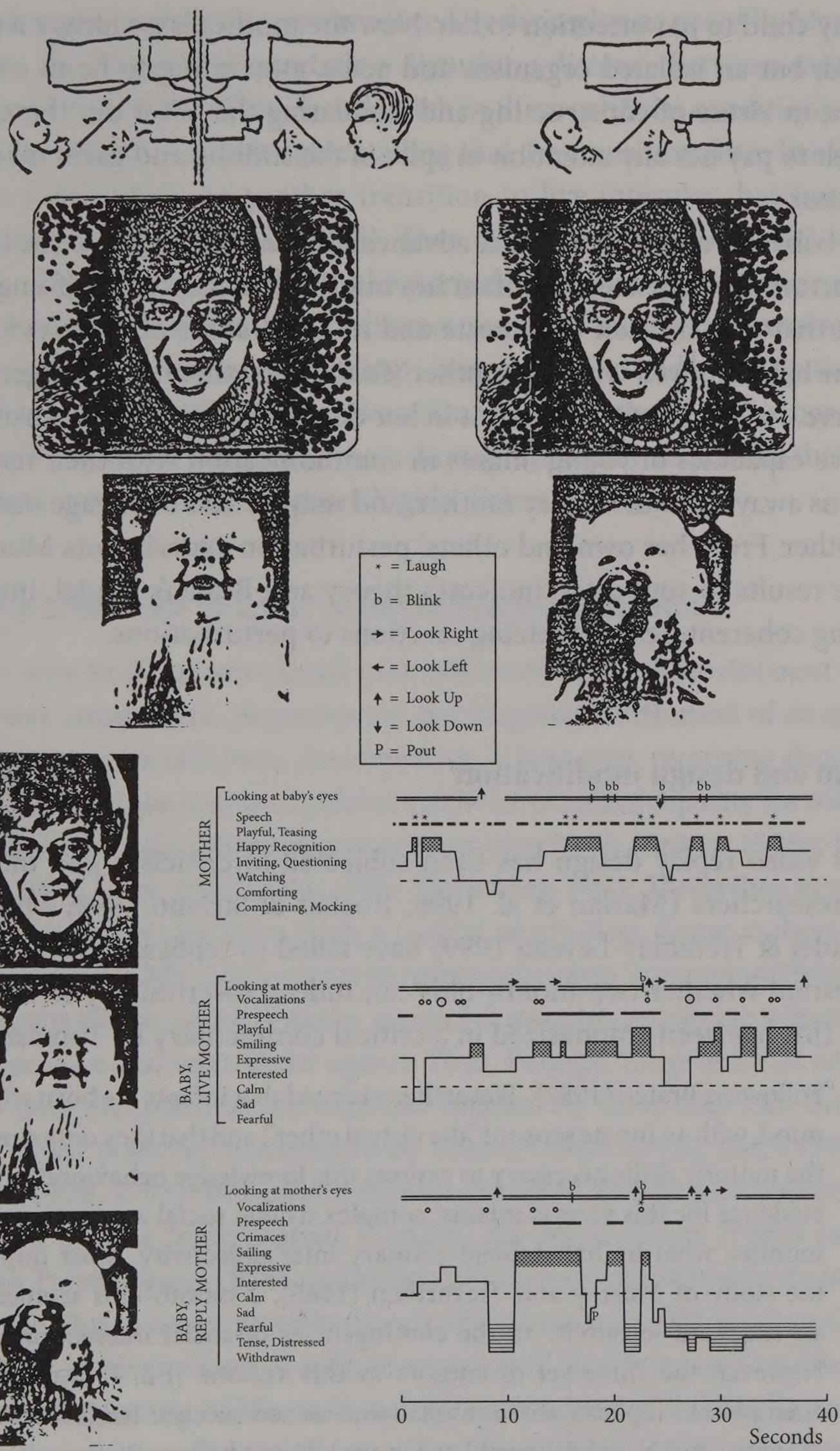



**Figure 7.4.** The double video (replay) design demonstrating the infant's sensitivity. Mother and child (2 months) are first in audiovisual contact mediated by the monitors they are facing. In spite of that they usually manage to engage in mutual protoconversation, as attested by the mother and infant profiles. This changes dramatically for the infant when the situation is as to the right with the infant being exposed to a replay of the mother from the previous live interaction. As shown by the bottom photo and profile the infant begins touching itself and tends to show tense or sad expressions. (Photos and diagrams have been supplied by Murray and Trevarthen 1985).

her replay child to pay attention to her. Now the mother is no longer a participant of a dyad, but an isolated organism and actor, attempting to be in concert with the other, in virtue of constructing and simulating the other out there who is no longer felt to pay her any attention in spite of the smiling and gazes manifested on the monitor.

The baby has access to no such advanced means. Deprived of the live mother in the perturbed sequence, the infant has but the alternative to self-engage, but in a format that may be seen to recreate and re-enact some of the previous closure which the baby enjoyed with the mother. To the baby there is no longer any actual other there. As Murray (1980) puts it in her doctoral thesis on the sensitivities and expressive capacities of young infants in communication with their mothers: The baby turns away from the replay mother, and may be said to engage instead with a virtual other. From her own and others' perturbation experiments Murray (1991) finds the results to support Winnicott's theory and Bråten's model, implying and predicting coherent, self-organizing reactions to perturbations.

## Criticism and design modification

Murray's video-replay design has been subjected to criticism and modification. Several researchers (Marian et al. 1996; Rochat & Striano 1999; Muir & Hains 1999; Nadel & Tremblay-Leveau 1999) have failed to replicate the results. Hence, they question whether two-month-olds can indeed discriminate in such circumstances. This has been emphasized in a critical commentary by Tomasello:

> "Following Braten (1987), Trevarthen claimed that infants are born with a dialogic mind, with an innate sense of "the virtual other", and that they only need to acquire the motoric skills necessary to express this knowledge behaviorally. Trevarthen's evidence for this view is infants' complex dyadic social interactions in the early months, what he has dubbed primary intersubjectivity. Most impressively, in the study of Murray and Trevarthen (1985), 2-month-olds seemed to display an exquisite sensitivity to the contingencies of social interaction with others. However, the three set of authors in this volume [Ed. P. Rochat] who have attempted to replicate these results (with mixed success: Rochat & Striano, Muir & Hains, and Nadel & Tremblay-Leveau) do not believe that sensitivity to social contingencies reveals an innate sense of other persons but only that it provides a starting point from which infants may learn about other persons and how they work."
>
> (Tomasello 1999:304)

Parts of the failure to replicate, however, may be due to the replicating experimenter's failing to allow mother and baby sufficient time to establish a mutual happy

interplay before the perturbation is introduced by the replay, as noted by Marian et al. (1996). Even the live interplay entails a disturbing distance between mother and child, deprived as they are of smell and touch in these artificial conditions. A modification of the double-video design entailing that the transition from live interplay to replay is followed up by another transition to live interplay, has been developed by Braarud and Stormark (2006). They document sensitivity of 2–4 month old infants – if not too stressed – to the perturbation by replay of their mothers. On the basis of their emotional and distress response during the experiment the infants were distinguished in terms of high-negative-affect and low-negative-affect. While the low-negative-affect infants were found to look significantly more at their mothers during the live sequences than during the replay sequence, this kind of sensitivity was not shown by the more highly distressed infants.

## Some earlier objections to layers of intersubjective attunement

In Table 3.1 new findings were listed with reference to the three different layers of intersubjective attunement. In contrast to the Piagetian attribution of an *egocentric* point of departure for children's development of language, requiring decentration as the child matures, we may now refer to evidence of infant capacity for *altercentric* mirroring and self-with-other resonance soon after birth (Bråten 1998a; Bråten & Trevarthen 2007; Stern 2000, 2004, 2007; Trevarthen 1998; Trevarthen et al. 1998).

But not everyone join us in such a radical attribution. Some authors, following Tomasello (1999:302–304), prefer to reserve the term 'intersubjectivity' for the second domain (II) in which infants, around 9 months, recognize others as subjects of experience and intentional agents. Thus, Fonagy, Gergely, Jurist and Target (2002:210) take exception to the nativism implied by what they call 'the "strong intersubjectivist" position' represented by Bråten (1988, 1992), Stern (1995), and Trevarthen (1979, 1993). But earlier we had not quite shared that position. In his original book on *The Interpersonal World of the Infant,* Stern (1985) had taken exception to Trevarthen's (1979) attribution of primary intersubjectivity in the first months of life. But in a new introduction to the paperback edition Stern (2000:xx) declares a shift in his position in light of recent evidence that suggests "that, probably from the beginning of life, infants have the capacity for what Braten (1998) terms altero-centric participation or what Trevarthen (1979) has long called primary intersubjectivity":

> "In light of new evidence of other-centered participation shown by infants in their many forms of imitation, as well as the new findings on mirror neurons and adaptive oscillators, I am now convinced that early forms of intersubjectivity exist almost from the beginning of life."
>
> (Stern 2000:xxii).

All three of us insist on the critical intertwined interplay between nature and cultural and interactional nurture throughout ontogeny and from the outset. The melody of the ambient language may begin to make itself felt even before birth. And when Kuhl (1998:306), for example, demonstrates how speech perception in early infancy changes speech perception by narrowing the perceptual field to sounds that make sense in the ambient language, accounting for the acquisition of a life-long dialect, she also assumes that "there are innate links between perception and action".

When Tomasello et al. (1993) take exception to 'nativism' and regard the capacity for cultural learning to be the unique human characteristic, this actually implies a strong statement about innateness, namely about a unique inborn capacity for cultural learning, but which necessarily depends – like other innate intersubjective capacities – on the cultural and interactional nurture in operation all the way.

## Perturbation of infant-adult interplay due to postnatal depression

Postnatal depression can temporarily affect the mother's ability to engage in mutually attuned infant-mother interaction. She may turn self-centred and unresponsive, losing her ordinary capacity to engage in protoconversation with her infant. This in turn may have an impairing impact on the child's development (Murray & Cooper 1997). Instead of affectively tuning into her infant's state and movements she may come to express herself without pleasure, with flat affect, without any musicality in her voice. She is turned inward, in some silent dialogue with her virtual or evoked companion, rather than engaging with her child as her actual companion. This is reflected in her erratic timing of own behaviours which may collide with, rather than match the infant's responses, and which is noticed by the infant. Rather than the two of them constituting a dyadic unity of communion, each completing one another in their shared companion space, there is isolation, and the infant may indeed be handled as an object by the mother muttering to herself with a rather detached gaze at the infant. Murray's analysis of maternal speech during interplay with the infant at 2 months postpartum revealed that compared to well mothers, depressed mothers were less likely to acknowledge their babies as active subjects, were more preoccupied with their own experience and less focused on the infant. This was reflected in the maternal speech which could be linked to the poor performance of their infants in later tests. The depressed woman will typically talk of her own experience, and demand that the infant behave according to the agenda that she dictates. This Murray finds to be related to the infants' impaired capacity to later distinguish between self and other, as manifested by poor results

of object concept tasks. Not only was the infants' performance on cognitive tasks impaired; the impaired quality of the early mother-infant interactions in which the depressed mothers fail to identify with infant experience and instead were preoccupied with their own concerns appeared to invite insecure attachment.

As stated by Murray et al. (1993), the depressed mother's "self-referred, unresponsive state" may come to invite distress and avoidance in the infant, and which affects the infant – even as early as 6 to 12 weeks of age. There may also be longer-lasting impact. At 18 months of age compared to control infants, children of postpartum depressed mothers were found to show more adverse outcomes on a number of measures. They exhibited mild sleep disturbances, and were less likely to be securely attached to their mothers. Their performance was significantly worse on object concept tasks and, independent of success and failures on such tasks, they showed more displacement activities and more distress, and were more hesitant during testing than the control group infants (Murray 1991). The infant's attachment to the mother was influenced as revealed by infant behaviours in 'strange situations': Infants of mothers who had experienced depression were less able to handle the distress of a short separation from the mother and responded with avoidance and disorientation or resistance upon her return. As for therapeutic guidance of mothers with postnatal depression, this will be succinctly touched upon towards the end of Chapter 10 with reference to Vik and Bråten (2009).

### 'Strange situations': Infants react differently upon the return of the absent parent

As this is being written, there is an ongoing debate in the leading Norwegian newspaper *Aftenposten* (March 5–8 2009) about whether or not it is to be recommended that one-year-olds be regularly sent to day-care centres (Kindergarten). That is a critical question. Currently, more than 70 % of Norwegian one-year olds are to be found at Kindergarten in the week days, as compared to only 15 % in 1990. So the question is: May it be advantageous or harmful, say, for a fifteen-month-old toddler to be separated in this way from the parent(s) most of the day during the week-days, meeting peers to play with as well as being exposed to other children and jointly learning to cope with new experiences? One obvious advantage is this, as will be illustrated in the following two chapters: Live interaction and playing with peers afford nurturing experiences that differ from and complement interaction with adults. This pertains inter alia to language acquisition, critically dependent on live interaction in varied situations. The parent's linguistically guiding tour at home through a map with a toy car affords one kind of nurturing experience, while two peer children's running comments during a joint pretend play of

driving the chair as a car in the Kindergarten, makes for another and equally valuable experience, nurturing the acquisition and use of language. Thus, home and Kindergarten may complement each other in a fruitful and nurturing manner.

But could there also be potential disadvantages of sending a one-and-half-year-old toddler to the Kindergarten? The reply depends on the particular child, contingent upon the personality, previous experience and home environment characteristics of the individual child. This may be revealed by the way in which the toddler receives the parent coming to fetch the child at the end of the day. So-called attachment experiments with so-called 'strange situation' (Ainsworth et al. 1978; Bowlby 1991) may provide clues. These are situations in which the mother and the infant enter a room, meeting a stranger, and then the mother goes out of the room and leaves the infant with the stranger for three minutes or so, before returning. As can be expected, different infants react differently upon the mother's return – ranging from (i) secure to (ii) insecure-avoidant or (iii) insecure-ambivalent, as well as some other kinds of insecure displays. Drawing inferences from these experimental results, one may suggest that in the beginning some of the Kindergarten children, 15- or 18-month-old or so, might come to react in one of these different ways upon the parent's returning to fetch them:

For some, the parent is met with a calm welcoming in a secure mode, and intimate interplay is resumed with full gaze and positive affect. This may signify that it has been a good day. The infant feels secure and re-engages with the parent in felt immediacy. As reflected in good enough holding, the child feels a safe base for exploring the world.

For some others, upon the parent's arrival the toddler ignores the parent, exhibiting minimal response, perhaps even with gaze-aversion and turning away. This has been classified as '*insecure-avoidance*' behaviour and may perhaps be compared to the way the distressed infant reacted to the (absent) replay mother in Murray's double video experiments, turning to itself and not being open to engagement with the actual parent, rejecting offers of consolation or help.

And, then by others, feeling insecure, the parent is met by a whimpering child who both wants to be held and yet wishes to punish the parent for having been absent. Such clinging in a whiny and dissatisfied manner has been classified as an '*insecure-ambivalent*' mode. While failing to engage with the parent in securely felt immediacy, the infant cannot let go and self-engage (with the infant's virtual other) (Bråten 1993b).

However, older children (2.5-year-old or older) who may feel insecure have resort to other means for assuming control of the reunion and overcoming confusion by means of working models, engaging with and even trying to manipulate the parent in representational mediacy: "What sweets have you brought me?

What toys?". In the long run, however, too much stress from insecurity could be harmful, dependent upon the child's dispositions.

If and when the child overcomes insecurity, however, or is already entertaining a secure sense, as signified by (i), then of course the Kindergarten offers all kinds of nurturing and developing experiences with other children, some of which may be imposing or challenging or even opening windows to other languages. Still, one could wish that grandparents, if available as in traditional societies, could be mobilized to a greater extent as support persons for their grandchildren in the Kindergarten – being there in the case an attachment figure was needed for consolation of a hurt child, and as an extended complement to the attending staff.

To return to the critical question, this tentative and contingent reply may be offered dependent on three conditions: First, if the child's parents experience their infant to be reacting in an insecure-avoidant or insecure-ambivalent mode when picked up at the Kindergarten and, hence, feel uncertain about their child's sense of security; second, if no grandparent is available as a support person during the Kindergarten stay and, third, provided that rich opportunities are afforded for playing with peers and other children at home or in other homes, then perhaps it is advisable – if possible – to postpone Kindergarten attendance until the child has reached about 30 months of age.

CHAPTER 8

# From object-oriented joint attention and other-centred infant learning

In the preface and the previous chapter I referred to a video record of how early newborns can begin to investigate your face if allowed to. Recorded at a maternity hospital in Crete in 1983, Giannis Kugiumutzakis invites facial gestural imitation of newborns, some of them 20 to 30 minutes old. Before trying to and sometimes succeeding in coming up with a semblant gesture, the gaze of some of these newborns appears to be very intense as they scrutinize his face making the gesture, such as tongue protrusion or wide mouth opening (of the same kind that Meltzoff & Moore (1977) reported in their *Science* paper). As previously mentioned, when a lecture audience sees this video, when for example the little girl, 20 minutes old, after having been exposed to the experimenter's wide mouth opening, is preparing herself to attempt to do the same, there will be people in the audience who open their own mouth – as if virtually trying to come to her aid. Upon my returning to the speaker's platform and pointing this out, laughter breaks out. If they had been aware of what they unwittingly were doing, they would have closed their mouth. What they did there illustrates a keynote of the present chapter: participant perception as if being a virtual co-author of what the other is doing or about to do, and the role that such virtual (other) participation plays in infants' object-oriented cultural learning.

When a care-person is watching a child, 9-months-old or so, playing with a toy, the care-person's participant perception of what the child is doing, may be manifested by the accompanying sounds and utterances made by the care-person: "That's nice!" "mm, take care!" "Oh, that was a near miss!" The child is of course aware of such accompanying commenting, which may be expressive of what Daniel Stern (1985) terms affect attunement. He has reported from his study of mothers with children less than one year old in which he asks some of the mothers to overplay or play down their natural accompaniment of the child's playing. The child is playing with some toy with the mother in the background accompanying the child's play with vocalizations in tune with the child's play. There is a sharing of perspectives and joint emotional referencing. The adult accompanies the child's play with encouraging sounds tuned in to the mood and activity of the

child. When mothers in such situations upon Stern's request force themselves to get out of tune (which some of them found very hard) the infant invariably stops playing and turns to look at the mother. The previous affect attunement is revealed in the observation space only upon its break-down. Such occurrences are significant in highlighting the peculiar aspect of mutual intersubjective attunement which other studies of infant-adult interaction have revealed, as we saw in the previous chapter. Participants feel to be engaged in that state, while the phenomenon can only be revealed to the observer upon perturbation or break-down of that shared state of intersubjective attunement. Such episodes illustrate several aspects of what Trevarthen and Hubley (1978) terms secondary intersubjectivity to which this chapter is devoted. The child is engaged in object-oriented manipulation, and there is joint attention even though the mother with her commenting may be behind the child. There is a subject-subject-object triangle which is then broken upon the experimental perturbation inviting the child to study the mother as an object of observation.

## Being hand-guided – actually or virtually – by the instructor

Sometimes object-oriented learning occurs in a manner that entails actual physical (hand) guidance, such as illustrated by Gregory Bateson's photos of the Balinese boy Karba (11–12 months) being taught by his parents. Karba is being taught to pick food by his mother and to play an instrument by his father (Margaret Mead's appendix in Darwin 1955). Facing the same direction as his parent, and in virtue of being hand-guided, Karba bodily feels to be moving with his parent's movements (cf. Figure 8.1 (top)).

### Virtually moving with the model's movements as if the learner were hand-guided

Now, Karba's posture is quite the opposite of the face-to-face situations in Meltzoff's (1988) deferred imitation experiments, in which nine-month-olds face the model's performance on an object out of their reach (cf. Figure 8.1 (bottom)), replicated also by Heimann and Meltzoff (1996). These infants are able to re-enact that performance on the next day, in spite of their having been *face-to-face* with the model's enacting his performance. This face-to-face issue has not been paid attention to by infancy researchers. Now, both the pair of Karba and his parent, and the pair of the nine-month-old and Meltzoff as model, may be specified in the same operationally closed format of a dynamic dyadic system, entailing bodily engagement in felt immediacy: In the Balinese case it is manifested by the actual bodily movements



**Figure 8.1.** Infants in different learning situations:
(*Top left*) The Balinese boy Karba in a fruit-picking situation being held and hand-guided by his mother and facing the same direction as she
(*Top right*) Karba in playing instrument lesson with his father – again facing the same direction and being hand-guided due to the complexity of the task at hand (left and right illustrations are based on G. Bateson's photo records in M. Mead's appendix to Darwin 1955).
(*Bottom*) Nine-month-old learner facing the instructor pushing a button on a box (reported by Meltzoff 1988), re-enacting on the next day what the infant saw done as if having been hand-guided by the instructor the day before.

in concert through actual hand-guidance by parents facing the same direction as the infant. In the deferred imitation experiment the infant was facing the experimenter, and yet the subsequent re-enactment on the next day suggests that the nine-months-old has virtually been moving with the performing model during the previous model exposure as if having been *virtually* hand-guided.

The latter presupposes, however, a perceptual reversal of the model's movements as felt by the learner. And in a pre-conference talk on imitation in Paris

1. June 1994, I posed this question, which to my knowledge hitherto had never been asked: What underlies *the perceptual inversion* entailed by such re-enactment of the other's enactment experienced in a face-to-face situation? With reference to Trevarthen's (1986) distinction of 'alteroception' as the motivated perception of others that depends on the specific cerebral response to the other's body movements (analogue to proprioception of own body movements), and to my definition of the virtual other as a non-specific companion perspective that complements the bodily self perspective with the operational efficiency (*virtus*) of an actual companion perspective (Bråten 1988), I offered this reply: Body movements of actual others included in the companion space of the virtual other afford crude alteroception in an appropriating sense, which in face-to-face situations entails perceptual inversion. Hence, the model and the learner need not face the same direction or use a mirror, unless the novel movements are very complex, or the child has (autistic) learning problems (Bråten 1994; Chapter 11, this volume).

What is important here is that the typical child has the innate capacity to experience, usually out of awareness, what another is doing or experiencing as if the child's centre of orientation and perspective were centred in the other, as Stern (2004:241) puts it. We may speak here with Hobson (2006a:134) of "non-inferential empathy, the direct perception of and affective responsiveness to the bodily affective expressions of others", as a principal mode of intersubjective communion in felt immediacy. He refers to how Merleau-Ponty (1964:146) quotes Husserl's dictum that the perception of others is like a phenomenon of coupling, emphasizing the "simple fact that I live in the facial expressions of the other, as I feel him living in mine".

## In front of the mirror: Merleau-Ponty's phenomenology of perception

With reference to Max Scheler's (1928) phenomenological work on the nature and forms of sympathy, Merleau-Ponty (1945/1962:164) emphasizes that when witnessing gestures the spectator does not look within herself for a personal experience to discern the meaning of the gestures she is witnessing. Faced with say, an angry gesture, I have no need to recall in myself the angry feeling I entertained when using such a gesture. The gesture does not make me think of anger; it is anger itself! The sense of the gesture is seized upon by an act on the spectator's part which should not be confused with cognitive operations. I do not understand the gesture by virtue of some act of intellectual interpretation. I join it in a kind of blind recognition:

> "The communication and comprehension of gestures comes about through the reciprocity of my intentions and gestures of others, of my gestures and intentions

> discernable in the conduct of other people. It is as if the other person's intention inhabited my body and mine his."
>
> (Merleau-Ponty 1962:185).

Merleau-Ponty emphasizes that upon bodily perception of the body of another person, one discovers in that other body a miraculous prolongation of one's own intentions, a familiar way of dealing with the world:

> "Henceforth, as the parts of my body together comprise a system, so my body and the other person's are one whole, two sides of one and the same phenomenon, and the anonymous existence of which my body is the ever-renewed trace henceforth inhabits both bodies simultaneously."
>
> (Merleau-Ponty 1962:354)

An episodic example is given of how a toddler (15 months) opens her own mouth as Merleau-Ponty playfully takes one of the toddler's fingers in his own mouth and pretends to bite it. As the toddler feels her own mouth and teeth from the inside as such an apparatus to bite with, and sees his jaw from the outside as capable of the same biting, then biting – even in this playful pretend case – achieves an immediate intersubjective significance. The toddler perceives the intentions in her own body, and his body with her own, and thereby his intentions in her own body:

> "Between my consciousness and my body as I experience it, between this phenomenal body of mine and that of another as I see it from the outside, there exists an internal relation which causes the other to appear as the completion of the [self-other] system."
>
> (Merleau-Ponty 1962:352).

The key here, according to Merleau-Ponty, is the body image, or perhaps we should say, bodily schema, as a system of equivalents entailing "this immediately given invariant whereby the different motor tasks are instantaneously transferable – not only from experience of own body, but from own body in the world". He illustrates with reference to imitation in a face-to-face situation: In order to imitate the action of someone facing me and performing something with his left hand, it is not necessary for me to be aware of the fact that 'the hand which appears on the right side of my visual field is for my partner the left one'. Such an account may be required for subjects with imitation impairments, while for typical subjects in normal imitation the subject's left hand is immediately identified with that of the partner's with his action, inviting immediate modelling. The capacity for the transformation of left-right "co-ordinates is pre-eminently embodied in this existential process", i.e., in this face-to-face situation by virtue of the body image as a system of equivalents, not just as a system of present body positions, but an open system of a variety of equivalent positions and moves directed to other ends (Merleau-Ponty 1962:141).

Thus Merleau-Ponty writes about the face-to-face imitation situation in which the subject projecting himself and loses his separate reality in the other, becoming identified with the model, by virtue of the existence of an internal relation which causes the other to appear as the completion of the [self-other] system. This points in the direction of the virtual other postulate about each of us having a virtual companion space which may be completed by the actual other, opening for altercentric participation. But there is this difference: Merleau-Ponty regards the primordial *me* as virtual or latent, and attributes an initial *egocentrism* to be "the attitude of me which is unaware of itself and lives as easily in others as it does in itself – but which, being unaware of others in their own separateness as well, in truth is no more conscious than of itself." (Merleau-Ponty 1964:119). Thereby, even though he speaks of the body image as pre-eminently embodied, he almost excludes the possibility of intersubjective communion in a mutual sense of bodily felt immediacy which we now have uncovered already in the first weeks and month of life. But while not taking into account occurrences of such early mutual infant-adult communion during the first weeks or months of life, his phenomenology of perception may still be said to be about primary intersubjectivity as it unfolds later in childhood and life.

While his expression "pre-eminently embodied" could invite the interpretation that Merleau-Ponty regards the body image to be innate and to be operative even in the newborn, this is not the case. In line with Wallon (1934) he assumes that neonates in the beginning are incapable of sensation and perception in an outward sense (extroception), implying that their experience begins with inwards experiences (introception). Between introception and extroception, interaction begins according to Merleau-Ponty (1964:122) between the age of three to six months, and with outward sensation and perception by virtue of formation of the body schema when the infant is about half a year old. He refers to Guillaume (1925:107–108) who with his infant studies of imitation emphasizes how early relations to others mature. But when truth be told, Merleau-Ponty states, these studies do not concern visual perception of others, but rather concern introceptive data. Only at about 6 months of age, he claims, can infants perceive their own body, and only when the body image becomes operational, can others be perceived. This account is criticized by Gallagher and Meltzoff (1996:213) in view of recent experimental findings on neonatal imitation, such as reported by Meltzoff and Moore (1977) and others referred to in the previous chapter. Merleau-Ponty (1964) denies the possibility of newborns' capacity for proprioception, required for their later documented occurrences of neonatal imitation. He regards toddler's perception of own body to come about by their recognition of their own body in the mirror.

The classic test, applied by Gordon Gallup also to adult non-human primates, amounts to see how the child reacts when noticing in the mirror a mark placed on the child's nose or forehead. Only when they are between 15 and 18 months of age or older do they usually raise their hand to touch the mark (cf. also Hobson 2002:81), and only about this age do they start to make faces or stick their tongue out even though they may at a younger age react with interest and pleasure at the image they see in the mirror, perhaps touching the mirror.

### Children in front of the mirror according to Zazzo

Noticing the reactions of his own two-year old son in front of the mirror René Zazzo (1993) began to make systematic studies of children's behaviour in front of the mirror. Here are some of his observations:

0–10 months: this "other" infant in the mirror evokes interest

10–18 months: the mirror image invites to be touched and be imitated

17–24 months: some children are immobile or avoidant in front of their mirror image

18–28 months: children touch their own face and by two years most of them attribute their own name to the mirror image, while becoming embarrassed when being asked who this is. For example, when Zazzo's son, Jean-Fabian, is a little more than two years old (25 months and 12 days), his grandmother holds him in front of a mirror and Zazzo asks: "Who is that?" there is no reply, and the grandmother repeats the question. Jean Fabian looks embarrassed and turns away from the mirror. Grimace and confused smile. Sudden blush. Then pleasant withdrawal from the mirror with a farewell gesture: "*ava bébé séhi*" (*au revoir bébé chéri*; [fare well, dear baby]). (Zazzo 1993:13)

28–33 months: now everyone is able to reply "this is I" or "this is me" and some may turn around and dance in front of their mirror image. (Zazzo 1993:14)

This is about the time when what Stern terms 'the narrative self' begins to make itself felt as a basis for narratives about oneself and others, and when children begin to engage with peers in co-ordinated pretend play: YOU MOMMY, ME DADDY, DINNER READY.

### On toddlers in front of the mirror in phenomenological light

Merleau-Ponty (1964:131) refers to Preyer's (1887) reports on Preyer's son at 57 weeks who, in front of the mirror looking at the image (of himself) passed his hand behind the mirror, then brought his hand back and looked at it. On the next day

he turned away from the mirror. Also at 61 weeks the boy touched, licked, struck and played with the image in the mirror, indicating according to Merleau-Ponty that there was not yet full understanding of the mirror image. This would be consistent with what has been found in recent research that only about 18 month of age or later, when capable also of using personal pronouns, like 'me' and 'you', do children fully recognize themselves in the mirror. Some researchers of infant and toddler behaviour suggest, however, that already at one year of age toddlers reveal an emerging recognition of their mirror image as their own, and with humorous interplay occurring sometimes even before that (cf. Lökken 1996; Reddy 1991).

From her studies of toddler interaction, Lökken (1996:71) reports how two toddlers (13 months) were standing in front of a mirror, repeatedly babbling with loud voices, sometimes self-directed, sometimes at one another, accompanied by laughter. Upon my question about possible self-recognition in the mirror, Lökken (personal communication 2005) later reports that they appeared happily and actively to be looking at one another and at the mirror image not as accidental figures, but as "there/here I am" and "there/here are you" and "there/here are we".

She also reports on another mirror episode in which three two-year-old girls were jointly engaged in pretend play in front of a large mirror. They were running a train, which they had made up by placing chairs in a row. A one year old boy is a spectator, and tuning in to his [astonished] expression in a sensitive and friendly manner, they invite him to join them on the train. At one point the three girls leave the train and stand besides one another in front of the big mirror which they support with their hands.

Merleau-Ponty (1964:135) points out that when the child looks at itself in the mirror and recognizes its own mirror image, identification is entailed. Transition to such a 'mirror-I' invokes an 'I' that emerges in a primordial format which makes itself into an object in a dialectical identification with the other. That makes it easier to comprehend that my image in the mirror portrays to me the other's view upon me, and what is more, I may grasp how the other perceives those aspects of me which I see in the mirror (Merleau-Ponty 1964:138–139). This is a self-reflective reaction, radically different from the kind of matching mirroring in an unreflective mode of participant perception manifested by the infant we shall now turn to.

## When infants reciprocate spoon-feeding: Moving with the other's mouth movements

In Figure 8.2 we see illustrated how a Norwegian boy Thomas (11 3/4 months), is being spoon-fed by his big sister and then reciprocates her spoon-feeding (Bråten 1996b). Let us first look at the way in which Thomas is being spoon-fed (Figure 8.2 (top)).

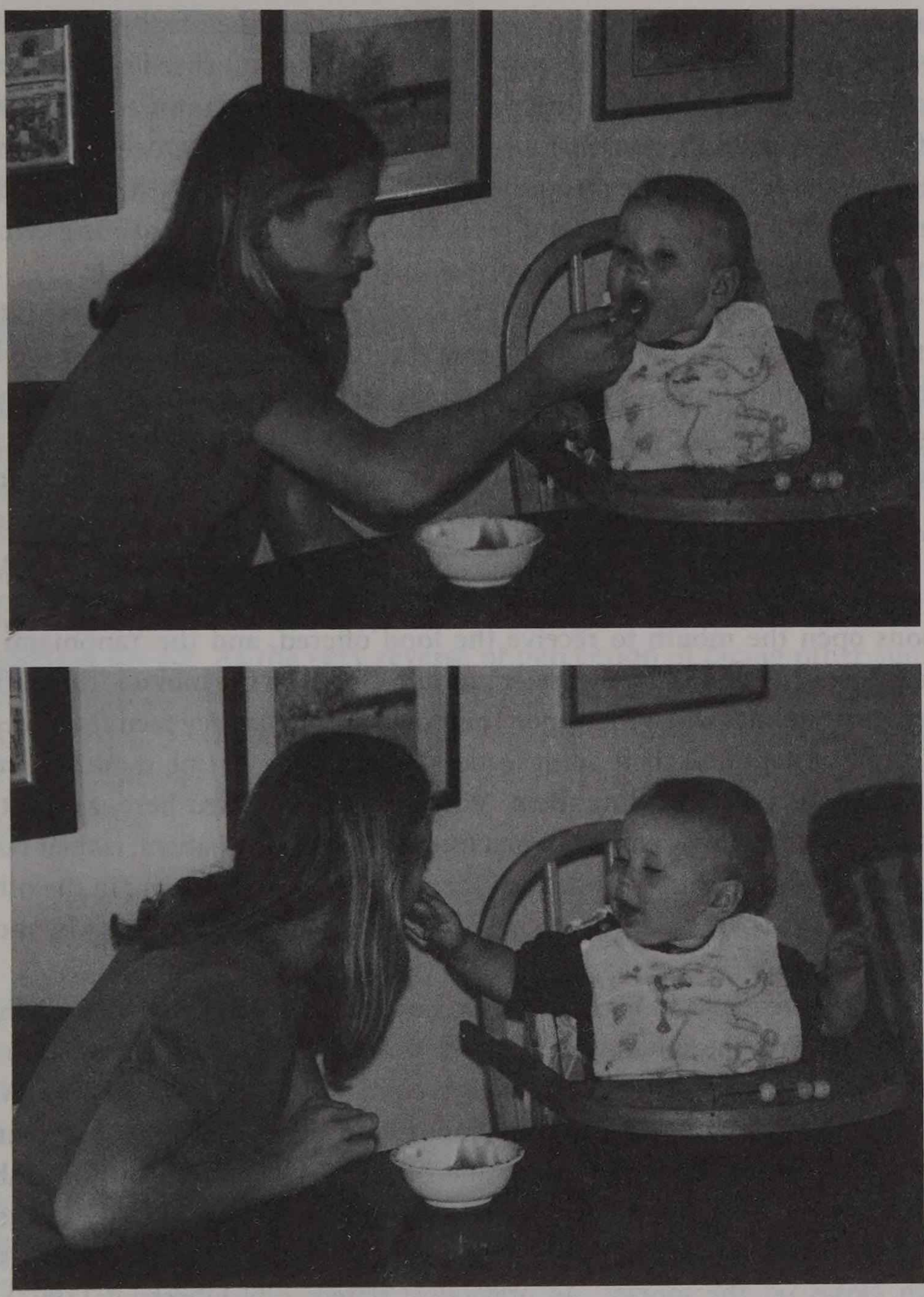


**Figure 8.2.** The Norwegian boy, Thomas (11 3/4 months), reciprocates his big sister's spoon-feeding (Bråten 1996b). Notice how he opens his own mouth as he clumsily tries to push the spoon-full into her opening mouth. While executing the spoon-feeding, his own mouth opening shows him to take a virtual part in her food intake.

While on the surface we are used to see such feeding situations as being a unilateral, one-way situation (the feeder is active feeding the baby who more or less passively received the food), there is reciprocity and mutual engagement going on beneath the behaviour surface. In order for infants to be able reciprocate the

spoon-feeding to which they have been subjected before their first year's birthday, they must somehow have been able to virtually partake in the feeder's activity as if they were co-authors of the feeding, even though the adult was the actual author of the feeding. That enables *learning by altercentric participation*, defined as imitational learning reflecting the manner in which the enactment is felt to be virtually co-enacted and the feeling that directs the co-enactment, enabling circular re-enactment from procedural memory of such virtual co-enactments.

The same capacity for participant perception is manifested by these infants when they reciprocate the spoon-feeding they have thus learnt. When we look at Thomas' mouth in the bottom picture, we see how he opens his own mouth as he clumsily tries to push the spoonfull into her opening mouth. While executing the spoon-feeding, his own opening mouth shows him to take a virtual part in her food intake. Thomas was also portrayed in Figure 2.1 (Chapter 2, this book) alongside with drawings based on a record from Amazon of a girl feeding her big sister. Both infants are opening their own mouth as their companions open the mouth to receive the food offered, and the Yanomami girl even tightens her lips as her big sister's mouth closes on the morsel. This suffices to demonstrate that when they open their own mouth as they feed their feeders this is not imitation of their adult feeders' previous unwitting mouth-opening when the adults were feeding them. What you see revealed here, as what the adult usually unwittingly exhibits when feeding a child or a patient, is their taking a virtual part in the patient's intake of the food, as if participating in the other's eating from the other's stance, or virtually helping the other to grasp by mouth the food offered.

I recorded Thomas in his home when he was spoon-fed by his sister. When I asked her to leave the spoon with porridge on the table, Thomas picks it up and attempts to put it into her mouth, actually reciprocating her spoon-feeding. When that was published in the CAS information letter in 1996, Eibl-Eibesfeldt sent me some pictures of his recordings of an Amazon tribe, in which a baby girl of about the same age feeds a morsel to her big sister. As the Yanomami-girl feeds the morsel to her big sister, she opens her own mouth, while tightening her lips as her sister's mouth closes on the morsel. As previously stated, Eibl-Eibesfeldt (1997) has termed this 'with-movements' (*Mit-Bewegungen*), and I have accounted for such phenomena in terms of 'altercentric participation' (Bråten 1997; 1998). I thereby designate the infant's other-centred capacity to virtually participate in what the other is doing or trying to do as if being a virtual co-author of the other's doing or attempt by virtue of the infant's orientation and perspective being centred in the other. Such spontaneous and unwittingly evoked co-movements tells us that the feeder or the spectator participates in the other's (expected) performance from the other's centre, the centre of *Alter* (hence the term *Alter-centric*) and – for

the feeder – even concurrently with his or her execution of the feeding act. As pointed out by Stern (2004:241–42), such altercentric participation is an innate intersubjective capacity that not only enables imitation, but makes empathic identification possible, and we may add, provides a possible basis for altruism (cf. Chapter 6, this book).

## Some pertinent illustrations, definitions and propositions

If we use the terms "Ego" and "Alter", then alter-centric participation may be defined as Ego's other-centred participation in Alter's act or state as if Ego were a virtual co-author or co-executor of Alter's act from the centre of Alter (cf. Bråten 1999:247, 273). Such a participation on the part of Ego in what Alter is about to do becomes alter-centric when Ego, as it were, enters the centre of Alter's bodily stance, and from there virtually and unwittingly attempts to assist Alter in completing his act. As the very reverse of perception of facing other subjects from an ego-centric perspective, other-centred participation entails the empathic capacity to identify with the other in a virtual participant manner that evokes co-enactment or shared experience as if being in the other's bodily centre. I define

> *Altercentric participation*: ego's virtual participation in Alter's act as if ego were a co-author of the act or being hand-guided from Alter's stance. This is sometimes unwittingly manifested overtly, for example, when lifting one's leg when watching a high jumper, or when opening one's own mouth when putting a morsel into another's mouth (and differs from perspective-taking mediated by conceptual representations of others)
>
> (Bråten 1998a; 2000:297–298).

A more extended definition, with which I concur, has been provided by Daniel Stern in the glossary to his latest book on *The Present Moment in Psychotherapy and Everyday Life*:

> Altero-centered participation (Braten 1998b) is the innate capacity to experience, usually out of awareness, what another is experiencing [...] as if your center of orientation and perspective were centered in the other. It is not a form of knowledge about the other, but rather a participation in the other's experience. It is the basic intersubjective capacity that makes imitation, empathy, sympathy, emotional contagion, and identification possible. Although innate, the capacity enlarges and becomes refined with development"
>
> (Stern 2004:241–242).

And what is more, as partly described in Chapters 2 and 6 and returned to herein, it helps to explain the efficient cultural learning capacity and altruistic tendencies shown by children even in the first year of their life. For example, while 11-month-old Thomas shared his porridge, while keeping the sweet dessert to himself, Emilie of the same age even shared her sweet dessert with her mother (Figure 8.3 (middle)).

Circular re-enactment of care-giving from e-motional memory

When Thomas and Emilie reciprocate their care-givers' spoon-feeding they demonstrate an impressive learning capacity. From previously being spoon-fed by their caregivers, they have learnt to take delight in spoon-feeding others in return, and to do so before their first birthday. Such an impressive early feat of cultural learning now permits specifications in terms of other-centred participation:

> Care-giving situations, which may appear to be unilateral activities, invites to be re-defined as reciprocal activities by virtue of the infant's taking a virtual part in what the caregiver is doing, and thereby learns from alter-centric participation in that very care-giving.

Elsewhere has been indicated how this very same altercentric capacity invites in the child as a subject of care or abuse a mode of imitative learning which creates virtuous and vicious circles of re-enactment (Bråten 1999; 2007:305–307). Let us now offer definitions of some terms pertaining to object-oriented cultural learning (see also the glossary at the end of this book), pertaining also to deferred imitation, as well as manual realization of an act attempted by the experimenter, such as demonstrated in Figure 8.3 (top and bottom).

Now, with reference to the situations illustrated in Figure 8.3, it may be objected in terms of a Gibson's view of perception by virtue of affordance that a button on a box invites to be pushed, a spoon with food invites to be put into a mouth, and a dumbbell invites to be pulled apart. Thanks, however, to Meltzoff's ingenious control experiment, exposing toddlers to a mechanical device which "attempted, but failed to" pull the dumbbell apart, leaving few of them with any initiative to pull it part by themselves, such objections in terms of affordance do not hold for these situations. What is involved here is the imitative re-enactment invited by the learner's participant perception of what the model has been doing. Let us now define some of the pertinent concepts required for an adequate account.

*Vitality Contour*: term introduced by Daniel Stern (1985/2000) for the temporal contour of feeling flow patterns with a characteristic intensity time-course of *vitality affects* reflecting the manner in which an activity has been enacted and the feeling that directs the enactment.

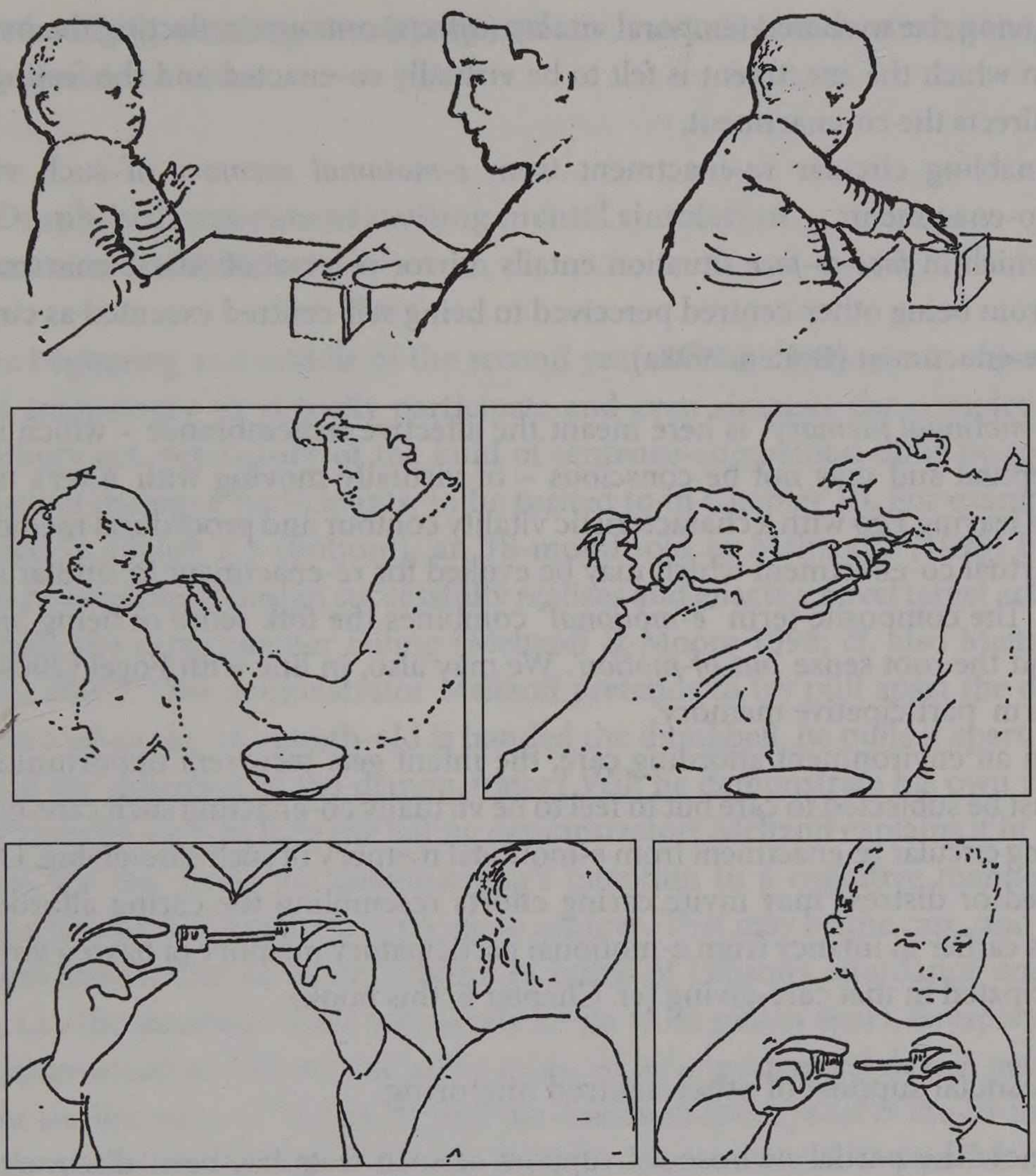


**Figure 8.3.** Face-to-face situations inviting perceptual reversal in the re-enacting infant – shifting from other-centred participation in the model's move to body-centred execution of own re-enactment (after Bråten 2007c:117).

(*Top*) 9 month old imitate by pushing the button the day after the initial exposure (cf. Meltzoff 1988)

(*Middle*) 11 ½ year old Emilie demonstrate having learnt to spoon-feed (drawing based on photo illustration in Bråten 1998:15).

(*Bottom*) 18 month old pulls the dumbbell apart after having seen the experimenter failing to do so (cf. Meltzoff & Moore 1998:52; Meltzoff & Brooks 2007).

*Learning by altercentric participation:* defined as imitational learning by Ego's virtual participation in Alter's act in felt immediacy which

1. evokes sensori-motor engagement in Alter's movements in a participatory sense involving virtual co-enactment of Alter's movements as if Ego were hand-guided and a co-author of Alter's act,

2. giving rise to shared temporal *vitality (affects) contours*, reflecting the manner in which the enactment is felt to be virtually co-enacted and the feeling that directs the co-enactment,
3. enabling circular re-enactment from *e-motional memory* of such virtual co-enactments,
4. which in *face-to-face* situation entails mirror reversal of Alter's enactment – from being other-centred perceived to being self-centred executed as circular re-enactment (Bråten 1998a).

By *"e-motional memory"* is here meant the affective remembrance – which is not conceptual and may not be conscious – of virtually moving with Alter's movements leaving Ego with a characteristic vitality contour and procedural memory of the virtual co-enactment which may be evoked for re-enactment in similar situations. The composite term *"e-motional"* combines the folk sense of being '*moved by*' and the root sense '*out-of-motion*'. We may also, in line with Fogel (2004) use the term 'participative memory'.

In an environment affording care, the infant gets recurrent opportunities to not just be subjected to care but to feel to be virtually co-enacting such care-giving, inviting circular re-enactment from e-motional memory of such care-giving. Others in need or distress may invite caring efforts resembling the caring afforded by others earlier in infancy from e-motional participatory memory of having virtually participated in that care-giving (cf. Chapter 6, this book).

## Neurosocial support of other-centred mirroring

And now the partial neurosocial support of such feats has been discovered, as recounted in Chapter 2. The discovery of mirror neurons and the electrophysiological experimental evidences of a mirror system in the human brain inform about the kind of neurophysiological system, a virtual mirror system, which is the likely support of altercentric participation. The mirror neurons, first found in macaque monkeys to discharge both when another is observed grasping a piece of food and when the monkey is preparing for grasping the piece by itself subserve a system that appear to match the act perceived done by another individual with a semblant, internally generated enactment in the perceiver (cf. Di Pellegrino et al. (1992) and contributions by Rizzolatti, Fadiga, and others in Stamenov & Gallese (Eds) 2002). They refer to further experimental evidence suggesting that such a system exists also in humans, in the brain region that contains Broca's area, which not only serves speech, but appears to come active during execution and imagery of hand movement and tasks involving hand-mental rotation (cf. Fig. 2.2 in Chapter 2, the present book, and contributions by Fadiga & Craighero, Ferrari & Gallese, and by Hari in Bråten (Ed.) 2007). The mirror neurons system subserves matching resonance and sometimes even muscle activation in the perceiver of another's

object-handling, entailing virtual participation in and simulation of what the other is doing or about to do.

## The Dumb-bell experiment inviting mental simulation and manual realization

At the beginning and middle of the second year infants demonstrate object-oriented competence to virtually participate and even simulate the completion of the other's act, precursory of the kind of sentence-completion done by speech-competent dialogue participants, to be turned to in Chapter 10. For example, as featured in Figure 8.3 (bottom), an 18-month-old in Meltzoff's (1995) behavioural re-enactment design successfully realizes and enacts a novel target act from watching the experimenter failing (Meltzoff & Moore 1998; cf. also Meltzoff & Brooks 2007). Qua demonstrator Meltzoff pretends to try pull apart the dumbbell, and when the 18-month-old is handed the dumbbell, he pulls it apart. Does he read the intention of the demonstrator? Will he demonstrate his own cleverness? Does he want to help the failing demonstrator? Meltzoff explains it in terms of how the boy reads the demonstrator's intention in a cognitive manner and infers what the demonstrator is trying to achieve. That may be the case, and Meltzoff has shown that an interpretation in terms of Gibson's affordance does not hold, i.e., the dumbbell does not simply invite to be pulled apart, irrespective of any demonstration. When Meltzoff is replaced by a mechanical device performing the similar move of "trying" to pull the dumbbell apart, most of the 18-month-olds do not follow up with any behavioural re-enactment (cf. Meltzoff & Moore 1998:50–52; Meltzoff & Brooks 2007:162). They demonstrate the child's capacity to "read the model's intention" (Meltzoff & Moore 1998:50–52). But more is involved, and which may be specified in terms of altercentric participation: Virtually participating in the model's attempt as if being a virtual co-author of the experimenter's effort to pull the dumbbell apart, the 18-month-old simulates completion of the attempted act in his companion space as the basis for his completed re-enactment – perhaps feeling to afford help.

Thus, Meltzoff's behavioural re-enactment experiment invites several explanations. Strictly speaking, however, the subjects do not read the actual intention of the demonstrator which is to lure the subjects to do what the pretending demonstrator fails to do. Here, then, is a complementary explanation (as laid out in Figure 8.4 (bottom)): The 18-month-old participates in the demonstrator's manual effort by virtue of altercentric participation, which evokes an internal simulation of a successful completion of the movement. That affords the basis for the ensuing actual completion by pulling the dumbbell apart (Bråten 1998a:110–113).

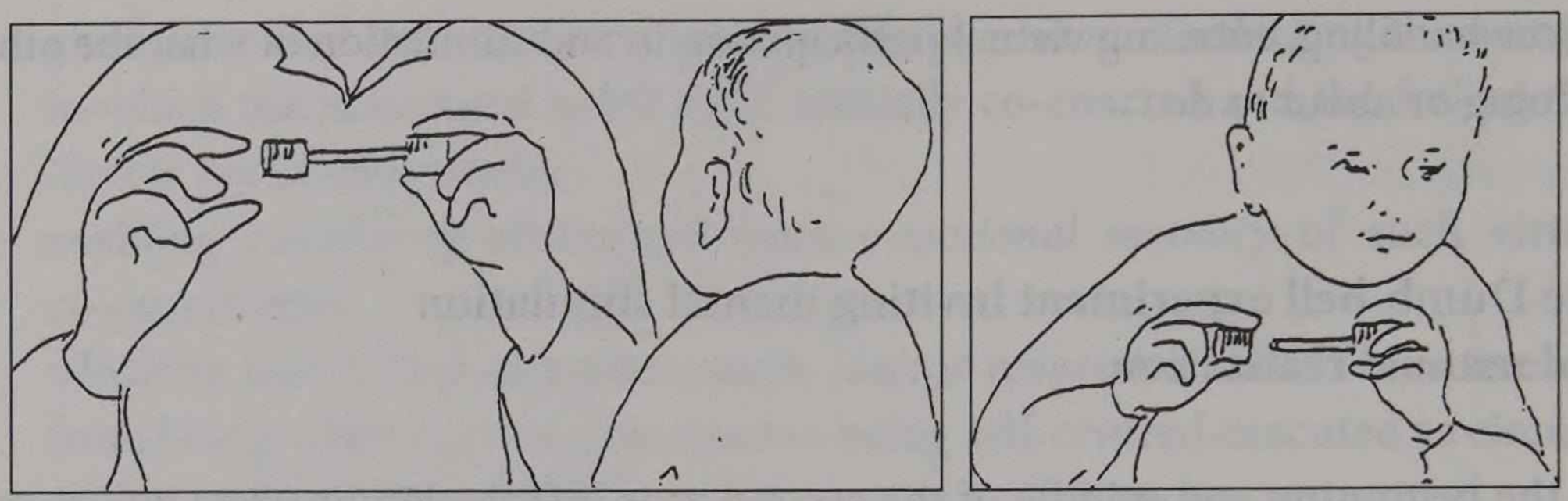



**Figure 8.4.** Meltzoff's dumbbell experiment interpreted in terms of participant perception of the experimenter's effort evoking mental simulation of its completion, inviting manual realization by the toddler. (Bråten 1998a).

One of the pioneers in advocating the simulation version (ST) of Theory of Mind (to be turned to in Chapter 10) is Alvin Goldman who supports such an explanation of the experimental process and outcome:

> "Braten's plausible interpretation is that the child, in watching a model, "virtually" tracks the model's performance from an actor's perspective in his own companion space. The child then proceeds to imitate what he imagined as the action's goal, not what he has actually observed. It is noteworthy that Meltzoff and Moore (1998, p. 2), in a control demonstration, report that exposure to an *inanimate* model "attempting" to pull the dumbbell apart rarely results in the observer's reenactment. Consistently with ST, seeing a nonbiological entity does not trigger the kind of virtual tracking associated with mind-reading."
>
> (Goldman 2005:89).

Irrespective of whether we stick to Meltzoff's interpretation or to mine and Goldman's account we all may agree on this: here are demonstrated precursory processes on the path to mental simulation or theory of mind which we find in children from between 3 and 6 years of age. While Meltzoff conceives of this as cognition reading of intentions paving the way to construction of theory of others' minds, which allows for cognitive inferences about the thoughts and

feelings of others, I would rather prefer to see this inner simulation as preparing the way for simulation of the intentions and understanding of others. This may pertain even to sentence completion during verbal conversation by virtue of identifying with others and simulating them in an altercentric manner. But such re-enactment from altercentric perception in face-to-face situation, however, entails perceptual reversal. Simple re-enactment in face-to-face situations, such as arm-raising, or in object-oriented learning situations, such as learning to reciprocate spoon-feeding (Fig. 8.3 (middle)), entails a shift from other-centred participation to self-centred execution of the re-enactment. That is, from Emilie's participant perception of what her feeding caregiver is doing, as if Emilie were a virtual co-author of her mother's feeding, Emilie's altercentric perception of her mother's feeding has to inform and evoke Emilie's own body-centred execution of her re-enactment.

Let us now leave child-adult relations for a while and turn to peers or near-peer relations.

## When a toddler imitates her model: From a 'now moment' to a 'moment of meeting'

Sometimes even an imitation game may turn out to be dramatic, such as in this Kindergarten case of Anita who loves to imitate Tuva who is four months older:

> Anita (20 months) takes after what the slightly older Tuva (two years) is doing. If Tuva climbs in the sofa Anita is there immediately after her. If Tuva lifts her arms clapping, then so does Anita. While Anita often approaches Tuva with smile and inviting gestures, Tuva hardly offers a glance at Anita. Now Tuva is approaching the slide, with Anita following her. She climbs the staircase with Anita behind. However, instead of sliding down on her seat this time Tuva walks down the slide while casting a glance at Anita who now looks desperate. Slowly Anita stands up carefully there at the top of the slide. Her legs are shaking and her knees almost defy being straightened. Courage fails her and she slides down on her behind as she is used to. This time she is unable to take after Tuva who repeats her risky walk down the slide – this time on two legs. Safely down Tuva and Anita look at one another and are smiling. This time Anita will try to imitate, up on two legs on the top of the slide, standing fairly steady. But when she is looking down the slide her facial expression signifies fear. However much she tries her short legs will not move. Her gaze lifts from her shaking legs seeking out Tuva, opening her mouth and stretching her arms towards her heroine who has been watching her with an intense gaze. The next moment Tuva is with Anita reaching as far as she can in order to grasp Anita's hand, carefully guiding her, walking down the whole slide. Safely down the two girls look at one another, laughing. Tuva pats Anita on her head and runs away.
>
> (Observations by Medböe 1994, adapted from Os 1998, transl. SB).

In the above slide episode, the moment when Tuva observes how the shaking Anita stretches her hands towards her, may illustrate what Daniel Stern (2004) terms a critical 'now moment' inviting transcendence and resolution. Here are some of the characteristics:

First, they both immediately grasped what might be about to happen when Anita was standing there with her legs shaking.

Second, Tuva might have experienced some of the fear entertained by Anita.

Third, the moment occurred without any preparation or planning.

Fourth, like a narrative without words this was a shared experience in felt immediacy, expressed by gestures, not by words in any representational sense.

Fifth: This critical now moment was transcended when their hands met, and resolved and confirmed when they joined in laughter at the bottom of the slide. After Tuva had patted Anita on her head and left, Anita stood there and looked at the slide with a pleased smile, perhaps feeling that a qualitative change had occurred in their relationship in that moment of meeting. Here is Stern's definition:

> [...] mini-crisis needing resolution. Such moments are largely unpredictable and remain in the domain of what is implicitly known. They are emergent properties of two minds interacting. They are resolved by "moments of meeting". These involve a moment of mutual other-centered participation in which both partners create and undergo a joint experience. The experience is of short duration: seconds, subjectively a present moment. This resonant experience enlarges the intersubjective field between them which then opens up new possibilities for exploration. A qualitative leap is accomplished. A change has occurred.
>
> (Stern in Bråten (Ed.) 2007:43)

And that may have occurred in the relations between Anita and Tuva, when the critical now-moment full of acknowledged fear was later resolved allowing for a moment of meeting. Here there had been an asymmetry in their relation which came to be played out. While the asymmetry is maintained their relationship has been qualitatively changed by their joint laughter of relief and as acknowledged by Tuva's patting Anita on her head.

## The creative nature of transitional phenomena and self-dialogue in early ontogeny

Above we saw how Anita (20 months of age) expressed her adoration of her model Tuva by attempting to re-enact almost everything Tuva was doing. May there earlier in infancy occur attempts of re-enactments of experiences treasured by the infant?

Donald Winnicott (1986) has made the point that what he terms "transitional phenomena" may be the infant's ways of re-enacting aspects of earlier mother-infant interplay. Regardless of the validity of such an attribution, perhaps the first instance of a truly self-creative act in ontogeny involves what Winnicott (1986) terms a "transitional object". Between 4 and 12 months of age infants constructively close upon some thing or some part of themselves, making it into an almost constant companion which is frequently returned to and cuddled. Parents and care-persons notice how most infants engage in close and intimate contact with a thumb, a pacifier, a piece of blanket, a woollen cloth, or some other medium (as identified by the adult). For example, when in need of comfort, or preparing for sleep, this inanimate companion is called for and cuddled by the infant, sometimes while sucking on a thumb or stroking the hair, or in combination with some other mannerism that involves the body. When Winnicott designates such prevailing phenomena as "transitional phenomena", the term signifies a transition from the primary stage that involves dyadic union with the actual other to stages in which the infant will come to draw distinctions between self and others. In terms of Object Relations Theory this means transition from the prior stage of dyadic union with the holding mother to a stage of differentiation in which the mother is separated and distinguished as a separate "object". Some cultural medium is often involved in transitional phenomena, be it a dummy or a doll, or some other transitional object. It is created by the infant as a companion in the space which has been shared with the holding mother and may, according to Winnicott, be seen as a creative sort of circular re-enactment of the mutual interplay with the mother, now re-created with a transitional object imbued with life. That may be considered the first co-creative acts whereby the infant uses some medium, provided by the culture and endowed with life, I would say, by the infant's virtual other, to re-enact dyadic closure in the infant's companion space. In more developed form, it permits the construction with some medium of an actualized and animated companion, created in distinction from the actual companions with whom the child otherwise engages.

If this is a plausible interpretation, then transitional phenomena may be seen as the first qualitative leap into modes of re-creation and co-constructing its world by various media as they become available to the child, permitting it to taste, grasp, embrace, point, move, scribble and talk. Such media may be seen as means of communication and co-construction in a double sense. First, they permit transcendence of the immediate modes of communication with the child's actual others, enlarging the child's companion space, as it were, with a repertoire of mediate modes of communication. Second, the child's modes of conversing with itself, of co-constructing with its virtual other their world and others in it, become enlarged and enriched. This seems consistent with Stern's (1985:116) identifying an evoked

companion in the child, based on generalized experiences of interacting with actual companions, and operating in the absence of actual companions:

> "The infant engages with real external partners some of the time and with evoked companions almost all the time. Development requires a constant, usually silent, dialogue between the two."
>
> (Stern 1985:118)

This may be related also to observations of older infants' meaningful acts of care accorded a doll, imbuing it with a life of its own, to children's adoption of some fantasy friend or invisible companion, and, later in life, to other kinds of co-creative activity, involving some medium in the self-creative dialogue with one's virtual other. Examples are the way the smoker may use his pipe, the painter may engage with her canvas, the dancers with their ballet shoes, the scientists with their models, and indeed, the way in which one is sometimes muttering in one's own language. Involving some cultural medium, such occurrences may be seen as instances of self-creative dialogue in the same companion space that is otherwise filled by actual others for intimate dialogue. In the following chapter will be turned to children's conversational, problem-solving and pretend-play engagements with peers and with adults as actual others, as well as examples of their resorting to dialogue with an evoked companion or a virtual other, as well as with invisible playmates or imaginary companions.

CHAPTER 9

# On children in conversation and in self-dialogue

The previous intersubjective layers with the primary entailing protoconversation and the secondary entailing object-oriented learning by mirroring prepare the way for and support the qualitative jump to the first order tertiary intersubjective understanding layer. This is marked by the evolving sense of a verbal self at around 18 months (Stern 2000) and the unfolding of interpersonal conversations mediated by symbols and concepts, beginning to be operative by virtue of predication such as 'ball wet' (Akhtar & Tomasello 1998) and developing with the capability of perspective-taking in conceptual and re-presentational mediacy. Two-year olds manifest intersubjective understanding and reflectiveness in collaborative and joint pretence mediated by self-other representations: 'I a Mommy. Dinner ready'. Conversations with care-persons, such as Emily with her father at her bedside (Nelson 1989) may sometimes be followed up by self-conversations – with the child's virtual or evoked companion (Bråten 1988; Stern 1985) – or what Vygotsky (1986) terms 'inner speech' which he demonstrated was evoked in school children when problem-processing was required. And then, there is the prevailing phenomena of children engaging with their imaginary companions sometimes even demanding that their parents pay attention to the child's invisible friend. In all these kinds of conversations – dialogues or pretend plays with peers or care-persons as actual companions, inner dialogues with the child's virtual other or evoked companions, and even engagements with imaginary companions – language serves as an efficient mediator, even though supported by the primary and secondary layers of bodily and object-oriented intersubjectivity.

## Language learning as an inherently intersubjective phenomenon

As we saw in Chapter 1 (Figure 1.1) Piaget had trouble with deferred imitation exhibited by the 16-month-old girl whom he had observed. He wondered if some sort of representative or pre-representative element may have been at

play here. In terms of other-centred participation this explanation may now be offered: Watching the boy, the girl unwittingly engage in a virtual participation in the boy's movements as if she were a virtual co-author of his trying get out operating from his centre. Her sharing the vitality affects contours of his stamping and screaming, as if she had been doing the screaming, pushing and stamping with him, leaves her with an e-motional memory (or what Fogel (2004) terms a 'participatory memory'), inviting her circular re-enactment on the next day. This is enabled by her altercentric participation in the boy's effort on the preceding day, the very reverse of egocentricity posited by Piaget (1959) as a point of departure for child development of thought and language. The contrast between the implications of his paradigm and of the intersubjective matrix is indicated in Table 9.1.

Piaget (1959:39) makes a point about differentiating "between thought which is socialized but capable of secrecy, and infantile thought which is ego-centric but incapable of secrecy." His attribution of such non-communicable thought, then, which he finds manifested by children's speech between 3 and 7 years of age when they are unfolding what he termed 'the pre-operational stage', may explain how he came to adopt Baldwin's and Janet's suggestion that early imitation entailed "a sort of confusion between one's own action and that of others" (p. 41). This complete lack of recognition of any intersubjectivity at play early in infancy may explain why Piaget conceived of language socialization the way he did, even though Piaget and Inhelder (1969), latter acknowledge that a kind of 'Copernican revolution' occurs by the first 18 months – with a partly decentration of the egocentric point of departure towards a decentred object-relational anchorage becoming operative in the pre-operational stage.

This is partly consistent with what is emphasized later by Akhtar and Tomasello (1998) about the fundamental change occurring during the second year of life with respect to how infants relate to and understand others. While sceptical of Bråten's and Trevarthen's attribution of an innate (virtual other) foundation of primary intersubjectivity being operative from birth, Tomasello (1999) emphasizes a cognitive revolution occurring around nine months of age when infants come to recognize others as agents with intentions, opening for cultural learning in which imitation becomes a path towards identification with and simulation of others. This 'revolution' is consistent with our definition of the secondary intersubjective step becoming operative around nine months of age and supporting the higher-order steps of tertiary intersubjectivity with the unfolding of verbal conversation, beginning around 18 months of age and, later, between 3 and 5 years, entailing even simulation of the conversation partners' mind (Bråten & Trevarthen 2007).

As emphasized by Rommetveit (1974, 1998), language and language learning has gradually come to be acknowledged as inherently intersubjective phenomena,

**Table 9.1.** The contrary implications of the Piagetian paradigm on the path from egocentric throught to egocentric speech and of the intersubjective matrix, as specified by Bråten, Stern and Trevarthen

| | **According to Piaget's paradigm** on the path from egocentric thought to egocentric speech (Piaget 1926/959, 1962; Piaget & Inhelder 1969) | **According to the intersubjective matrix** (Bråten 1998ab, 2002, 2007; Bråten & Trevarthen 2007; Stern 2000/2003, 2004, 2007; Trevarthen 1979, 1998) |
|---|---|---|
| point of departures for child development | Primary and secondary circular reaction and non-communicative egocentric thought | Primary intersubjectivity, proto-conversation and learning by altercentric participation |
| definition of circular reaction | Circular re-enactment entailing a kind of self-imitation | Circular re-enactment evoking circuits that involve the other – actual or virtual |
| occurrence of decentration | in child development (human ontogeny) | in hominin infant evolution (hominin phylogeny) |
| relations between stages or layers | In the metaphor of a 'ladder' – each lower stage is left and discarded as the child moves on to higher stages | In the metaphor of a 'staircase' – each lower layer or step continues throughout life, supportive of higher-order layers or steps |
| accounting for early imitation and deferred imitation by the toddler (cf. Fig. 1.1 in Chapter 1). | Considering early imitation to entail confusion of own and others' action Piaget (1946/1962:63, 69) had problems explaining how the nearly 17 month old girl could take after her visitor who had stamped and tried to get out of the play-pen the day before. Piaget wonders if pre-representational element could be at play here | In terms of other-centred participation: watching the boy's screaming and trying to get out, the girl unwittingly participates in the boy's movements and his accompanying emotion as if she were his virtual co-author, leaving her with an e-motional memory inviting circular re-enactment on the next day (Bråten 1998a:110) |
| development stages identified by Piaget compared to the inter-subjective steps identified in recent research | from reflexes and circular reaction in the first months to incomplete practical intelligence, differentiation of schemata, and combinations resulting in a-ha experience with representations used in imitation. Children in the pre-operational stage between 3 and 7 years manifest egocentric thought, even though Piaget and Inhelder write about a 'Copernican' revolution occurring around 18 months | (I) from body-oriented and mutually attuned proto-conversations in the first months; (II) object-oriented joint attention and participatory learning from around nine months, to (III) unfolding of conversational abilities towards the end of the second year supported by the primary and secondary layers and – from 3 to 6 years – mind-reading and meta-understanding of others' (mis)understanding by virtue of participant simulation of mind |
| nature of so-called 'ego-centric' speech | Viewed as self-centred talk, disappearing as the child reaches school age (Vygotsky disagreed – finding problem-centred loud talk in school children) | Viewed as overt manifestation of internal dialogue with the child's 'virtual other' (Bråten 1988) or 'evoked companion' (Stern 1985/2000) reflecting problem-processing in Vygotsky's sense |

not just in the sense that intersubjectivity facilitates language learning, but rather in the sense that language is inherently intersubjective. This is also stressed by Akhtar and Tomasello:

> "The more we think about processes of linguistic communication, the less we like saying such things as intersubjectivity 'facilitates' or 'plays a role' in early language. Instead, we believe it is more accurate to say simply that language is an inherently intersubjective phenomenon through and through […]
>
> It may be true that from birth human infants can engage in affectively meaningful interaction with others (Trevarthen, this volume), and it is possible that they possess a 'virtual other' as a part of their neonatal psychological equipment (Bråten 1993; this volume). Nevertheless, a fundamental change in how infants relate to and understand others takes place during their second year of life."
>
> (Akhtar & Tomasello 1998:334–335).

There is no doubt about such a qualitative jump from secondary to tertiary intersubjectivity. This is demonstrated by their chapter on intersubjectivity in early language learning and use. In their studies of word learning they show how children as young as 18 months are able to make use of a variety of pragmatic cues to establish understanding with adults and, in this way, learn new words from them. Akhtar and Tomasello also point to the ways in which young children use language reciprocally and predicatively, including their understanding of causes of misunderstanding and their affording repair. Soon after their first birthday toddlers use language with a reciprocal understanding of its communicative significance for others: after having defined a topic for joint attention they predicate particular aspects of a situation when manipulating the attention of others, and they comment on what is new in a particular situation. While 2-year-olds are more than likely to repeat their original utterance when queried by their mother, they are more likely to re-formulate when queried by a stranger. They soon show a remarkable ability to determine causes of breakdown of understanding and to efficiently repair by reformulating their previously misunderstood utterance (Akhtar & Tomasello 1998:332; 334). All of this would have been impossible if the children were to adhere to the kind of egocentric thought attributed by Piaget.

The ability to detect occurrence of misunderstanding in the other, and even resort to a re-formulation of the utterance originally uttered and misunderstood, almost attests to tertiary intersubjectivity of the second order, i.e., mentalization or simulation of the conversation partner's mind. As the very reverse of perception of facing subjects from an ego-centric perspective, other-centred participation entails the empathic capacity to identify with the other in a virtual participant manner that evokes co-enactment or shared experience as if being in the other's bodily centre. This has bearings inter alia upon the issues of language acquisition and early language usage.

## Different language landscapes afford different temporal and reality patterns

Language offers more or less gross or detail-levelled patterns which the child may apply to its world and the ambient cultural landscape. The psycholinguist Dan Slobin (2004, 2006) uses the term 'granulation'. While, for example, the Hanunóo-language of the Philippines allows for 92 different terms for various variants of rice, the single term "ris" for rice suffices for the Norwegian speaking child when asking about what is being boiled. On the other hand, in winter time, the Norwegian child will acquire usage of four or more terms for snow, for new snow, wet snow, icy snow and sticky snow, while such a variety of terms would not be needed in the Philippines. While the Norwegian child acquires one term for what is in the sand pit, children in the Kalahari desert could hardly cope unless they learn to use a variety of specialized terms for sand forms and sand states. And when it comes to colours: For a child in Liberia learning to talk Bassa, this language invites a bifurcation of the colour spectrum in terms of 'hui' combining what we term "purple", "blue" and "green", and 'zíza' which covers those colours we could discern as being yellow, orange, and red (Brown 1965:316–317).

Different languages open different windows to aspects of children's phenomenological life. Two language distinctions that vary with English and German and are pertinent for the topics of the present book, are these: When we would like to draw attention to the distinction between (1) the immediate, momentary sense of lived experience and (2) accumulated experience, we have to rely in English on the term 'experience', while German offers the term '*Erlebnis*' for (1) and another term '*Erfahrung*' for (2). Related terms for this distinction are offered by Danish, Norwegian, and Swedish languages. On the other hand, while not allowed for in these languages, English allows for the distinction between interpersonal 'communion' and interpersonal 'communication'. While the former occurs in presentational immediacy, the latter entails the re-presentational mediacy of symbols and interpretations.

But then, just like Nordic languages, both German and English allow for a telling ambiguity most pertinent to key topics in the present book: when we say "moved" in English (or "*bewegt*" in German), such as in this utterance: "She was moved by his telling expression and – moved towards him" the double sense of "move" is illustrated. This double sense is partly reflected in the term "emotion" which literary means "out-of-motion" (cf. the usage in the present book of the term "e-motional memory" which reflects this double meaning).

### When time is being indicated

And then, there is the beautiful term 'present' in English, with the two-fold meaning of being present in terms of location and being present in terms of time; here and

now. This invites striking titles of pertinent books, such as *Philosophy of the Present*, by G.H. Mead (1934) and *The Present Moment in Psychotherapy and Everyday Life* by Daniel N. Stern (2004).

With respect to marking of time and memory traces, Barth (1980) recounts from the baktamans in the inner of New Guinea how when walking in the bush with the natives, they could tell him about the 'dating' of important events, such as a successful hunt or an enemy attack, not in terms of the time in which they occurred, but by virtue of the places at which they occurred, pointing those places out to him, such as a particular bush or the edge of the rain forest.

Whorf compared the Hopi-Indian language with West-European languages. Where we would have used versions of the verb 'to run' to indicate a person in the process of running, or having run, or being about to run, the Hopi-language invites the testimony of a spectator about the occurrence of running – as a state of affairs: "WARI", as reflecting the memory of someone who has run away: "ERA WARI", or as expression of the expectation about running: "WARIKNI" (Whorf 1956:213; Fig. 11).

## From Anna Freud's report on rescued orphans' foreign language acquisition

As recounted in Chapter 6, Anna Freud has documented how six orphans, rescued from Nazi concentration camps, behaved in relation to one another and the world they met when brought to the UK. When the orphans arrived at Bulldogs Bank in England, the youngest was three years old and the oldest 3 years and 10 months. They spoke German with some added Czechoslovakian terms which they had acquired during their transport, while the English language was completely foreign to them. The Bulldogs Bank staff spoke English but added some German terms when addressing the children. Upon arrival the orphans completely rejected the staff there. They held onto one another, while kicking and striking anyone else approaching them. After they had been there for seven weeks the staff stopped using any additional German terms. In the beginning they were mostly neglected by the orphans treating the staff as non-existent except when they needed something or went into attack by biting, striking or kicking.

But after a while, when some normal contact emerged with the staff the orphans began acquiring elements of this new language, albeit, in the case of Paul, after having repeated some words in English, he exclaimed:

> "*Is nicht motor car, is Auto, blöde Tante! Nicht good morning Paul, guten Morgen Paul*!"

In a transition period the orphans began after a while to use word-combinations from both languages, such as "*Auto-car*", "*doggy-Hund*", "*dolly-Puppe*" and "*Löffel-spoon*" (Anna Freud 1951:220–221).

Paul, who initially had protested as shown above against the staff's addressing them with English words, turned out to be the first to use English in their contact with the village people. When in December the orphans passed through the village, a woman came out of one of the houses there and gave them flowers. Paul then said:

> "*Flowers*." (and after a pause) "*Lovely flowers*!" (And then) "*Many lovely flowers, tank you*!" And the woman bent down and kissed him
>
> (Anna Freud 1951:220).

The children differed in the progress of acquiring bits of English, and in this respect the girls were behind the boys. In their fifth week could be heard the first adjectives and verbs in English, while the children stuck to the German negation *nicht*, and to the personal pronoun *meine* for more than twelve months. From February 1946 they all spoke English, both when addressing one another and when speaking to the staff. Before that language differences had actually been a source of conflict between the children. Here are two examples:

December 1945 (during a meal).

| | |
|---|---|
| Leah: | "*Brot*." |
| Ruth: | "*Is bread*." |
| Leah: | "*Brot*." |
| Ruth (half crying): | "*Nis Brot, is bread*." |
| Ruth (crying): | "*Is bread*." |

(Anna Freud 1951:221).

January 1946 (during a meal).

| | |
|---|---|
| Paul: | "*Look, ich big Teller, siehst Du*?" |
| John: | "*Nis Teller, is plate*." |
| Paul: | "*Oh nein*." |
| Paul (shouting): | "*Oh nein*." |

(Anna Freud 1951:221–222).

Such instances of quarrelling did not all affect the mutual concern, understanding and care-giving which they bestowed upon one another. Actually, one instance of language adaptation occurred in a way which also illustrated this: One of the orphans arrived at Bulldogs Bank later than the others, due to an infection that had to be taken care of, and upon her arrival the five others immediacy reverted to their original German language and so continued until she as a late arrival could catch up.

## Children in conversation with adults and with "themselves"

Long before that two-year-olds are already capable of engaging in verbal conversation with others – and with themselves. The latter Piaget termed 'egocentric speech'

because apparently the child addresses no one else but herself. If we analyze the kinds of conversations that two- and three-year olds carry on with themselves, they sometimes sound as if they are addressing a companion – not an actual other, but a virtual other or an evoked companion (Bråten 1988, 2000; Stern 1985/2000).

Below it will first be illustrated how children's conversations with adults and with themselves sometimes appear to adhere to the same dialogical format, or to entail sequences of questions and replies in the same manner. This suggests that the terms 'egocentric speech' or 'monologue' are not quite apt because sometimes self-dialogues appear to almost adhere to the same mode as dialogues with actual others.

## Narratives from the Crib: Emily in conversation with her father and then with herself

Early in the 1980's Katherine Nelson (1989) makes video recordings of Emily when she is around two-years-old. After Emily has been tucked into bed by one of the parents and engaged in conversation, usually with her father, Emily begins to talk by herself. Here are some episodes reported by Nelson (1989:66–67; 2000).

When Emily (28 months) is being told by her father that they will be going to the ocean their conversation continues in this way:

Emily: *....we can sit in the ocean?!*
Father: *Yeah, we can sit in the ocean [...] if it's a warm day in the...*
Emily: *And I can splash?!*
Father: *and you can splash, you bet!*
Emily: *and I can [...] kicking*
Father: *Yes, you can*

And after her father has left the room Emily continues by herself:

- *we're gonna …*
- *at the ocean.*
- *Ocean is a little far away.*
- *baw baw buh [.....]*
- *far away... think it's ....*
- *couple blocks... away*
- *Maybe it's down, downtown,*
- *and across the ocean,*
- *and down the river.*

(Nelson 1989:66–67; 2000)

What is occurring here? When Emily continues by herself this does not quite fit what Vygotskij called "inner speech" which he specified to be incomplete and

abridged. As pointed out by Nelson, when Emily talks to herself she is sometimes more explicit than in the conversation with her father. But then, "we seem to be left without a theoretical limb to hang our studies on," Nelson (1989:19) declares, and then asks:

> Is there an implicit, noninterpretative, nonthreathening "other", a "play" or imaginary other in these monologues?
>
> (Nelson 1989:vii)

Today, we may answer in the confirmative, either in terms of what Daniel Stern (1985/2000) would specify as Emily's *evoked companion*, or in terms of what I would call Emily's *virtual other* (Bråten 1988, 2000) which makes her self-dialogue partly conforming to the format of the dialogues with her father as her actual other. Compare these two sequences, extracted from Nelson (2000; 1989:66–67) – to the left the dialogue with her father, to the right her dialogue with what we may term her virtual other or evoked companion:

| **Emily** (E) **in dialogue with her father** (F): | **Emily in self-dialogue**: |
|---|---|
| E.: ....we can sit in the ocean?! | Um, I can be in the red car, but, |
| F.: Yeah, we can sit in the ocean [...] | see, I be in the green car. |
| if it's a warm day in the... | But you know who's going to be in |
| E.: And I can splash?! | the green car... |
| F.: and you can splash, you bet! | both children... |
| E.: and I can [...] kicking | I'm going to be in the green car |
| F.: Yes, you can | in my car seat |
| (Nelson 2000) | he's gonna be… |
| | and nobody's gonna be, |
| | just…you know, |
| | (Nelson 1989:67) |

The dialogue sequence to the left contains questions posed by Emily and replied in the confirmative by the father as her actual other. Both dialogues – the one to the right with her actual other and the one to the right with her virtual other – are equally explicit. The self-dialogue is not shortened as one might have expected according to Vygotsky on inner speech. To the right questions and replies are exchanged between Emily and her virtual or evoked companion.

As pointed out by Bruner (1990:91, 94), when approaching 33 months of age, Emily turns to narrative accounts, organizing her experience of human interactions in lifelike, story-like way. As pointed out by Stern (1989:319): Recognizing her subjective perspective about who she is and how she is in relation with actual others, which she does in the domain of narrative, in the creation of her narrative self, Emily is thereby crossing the gulf between an unreconstructable past and a past that permits reconstructions in terms of narratives.

## Confronted with a puzzle: A two-and-a-half-year old girl with her mother attending

Both Piaget and Vygotsky had noticed how preschoolers often talk loudly to themselves. Since their speech was clearly not addressed to somebody else, Piaget naturally termed this 'egocentric speech' and assumed that it would disappear at school age. Vygotsky disagreed simply because he had a different view of the nature of so-called 'egocentric speech': he considered it to be a manifest expression of an inner self-regulating dialogue, a sort of conversational thought process which would continue as inner thought, but could be expected to manifest itself loudly when problem processing was required. This he demonstrated with pupils of school age, for example, when assigned a task such as drawing or painting, while lacking pen or pencil. Yet, he retained the term coined by Piaget.

The designation 'egocentric and inner speech' is also used by James Wertsch (1991:88) when giving the below example. This is the case of a two-and-a-half-year American girl engaging with her mother in episodes concerning a puzzle. The task was to insert pieces from a pieces pile into a copy puzzle so that it would become identical to a model puzzle. Thus, the correct location of a piece in the copy puzzle could be determined only by consulting the model puzzle, a truck with cargo. In the beginning the mother echoes the child's question, and then comes up with an advice:

Child: *Oh* (glances at the model puzzle; looks at the pieces pile). *Oh, now where's this one go?* (picks up a black piece from the pieces pile; looks at copy puzzle; looks at the pieces pile)
Mother: *Where does it go on this other one?*
Child: (picks up the black piece from the pieces file; looks at the copy puzzle; looks at the pieces pile)
Mother: *Look at the other truck and then you can tell.*

In a later episode the child comes up with a reply to a question posed by her and her mother:

Child: (glances at the pieces pile; looks at the copy puzzle; picks up the orange piece from the pieces file) *Now where do you think the orange goes?*
Mother: *Where does it go on the other truck?*
Child: (looks at the model puzzle)
Child: *Right there.* (points to the orange piece in the model puzzle) *The orange goes right there.*

And, then, in a third episode only the girl is active in the questioning and replying:

Child: (looks at the pieces pile; picks up the yellow piece from the pile; looks at the copy puzzle) *Now how..... Now where....Now....*(looks at the model puzzle)

Child: *You.....you.... the yellow one on that side goes....One yellow one's right next there.* (points to the yellow piece in the model puzzle; looks at the yellow piece she is holding in her hand)
Mother: *Okay.* (Adapted from Wertsch 1991:87–88)

While in the initial episodes the mother is helping and leading on, in the third episode the child begins to operate on own premises, posing questions more to herself as well as affording the replies. This episode invites the following comment:

> "In this [last] episode the mother did not ask the question to guide the child's gaze to the model puzzle (intermental plane). Instead, it now appears that the child's egocentric and inner speech (intramental plane) guided the process. In Bakhtin's terminology, the child's speech has taken the properties of hidden dialogicity" (Wertsch 1991:88).

True, rather than seeing this as "egocentric" implying that no one else is involved in the process, Bakhtin would have pointed to the implicit dialogue. According to him there is always someone else involved in a speech situation. The other may be someone in one's present or a special group or a collectivity, a superior or inferior, a family member or a stranger or – as emphasized by Wertsch (1991:53) with reference to Bakhtin (1986:95): 'an indefinite, non-concrete other'.

Here is another example of an episode involving a puzzle with which a five year old is occupied, while mumbling:

> *"Where's the red piece? I need the red one. Now a blue one. No, it doesn't fit. Try it here"* (Berk 1989:255)

## Private speech or dialogue with one's virtual or evoked companion

The essential, demonstrated also by Emily's self-dialogue extracts as reported by Nelson (1989, 2000), is that the form of the dialogical is maintained irrespective of whether it proceeds in conversation with an actual other or with an un-specified non-concrete other, which we also could name 'evoked companion' (Stern 1985/2000) or 'virtual other' (Bråten 1988, 1998). Preschoolers engage in so-called "egocentric speech" or "private speech". They pose questions to themselves and others and come up with their own forms of replies and with impressive narratives in visual and verbal forms, making sense of their world and of others in it. Infants' expressed verbal categorization, and with it a sense of a verbal self and others, may begin around the 15th or 16th month (Stern 1985/2000). In protoconversations with adults even one-year old infants start

narrative-like expressions in protolanguage, and which may be complimented and complemented by actual others in a kind of co-operative discourse that involves such patterns as question-answer; request-refusal; request-compliance, etc. (Trevarthen 1992). The initial asymmetry of the verbal capacity in the dyad is transformed into a near-symmetrical mode of dialoguing in which both engage in a symbolic play. The striking characteristic of the symbolic play is not only that various objects or persons may be distinguished by members of the dyad, but that absent objects or persons may be evoked in narrative-like proceedings. With the emergence of symbolic play, evoking absent objects and events at the beginning of the third year, there is a jump around 36 months in the child's life when narrative selves and others come into play. And then immersion in narratives and conversations opens for participant perception of the other partner's understanding and misunderstanding (tertiary intersubjectivity of second order, to be turned to in Chapter 10).

Above, we have seen how so-called transitional phenomena may be considered the first co-creative acts whereby the infant uses some medium, provided by the culture and endowed with life by the infant's virtual other, to re-enact dyadic closure by virtue of the primary self-other organization of the mind. In more developed form, it now recreates itself in the child when disengaged or disengaging from the actual other, involving the construction of some medium as an actualized and animated other in the child's companion space. This may be related also to observations of older infants' meaningful acts of care accorded a doll, imbuing it with a life of its own, to children's adoption of some fantasy friend or invisible companion, and, later in life, to other kinds of co-creative activity, involving some medium in the self-creative dialogue with one's virtual other. In developed form, the same kind of mechanisms may apply to the kind of "scaffolding" that are in operation when the infant internalizes linguistic aspects of a conversation with the adult other, continuing the conversation and recreating fragments with the child's virtual other. Katherine Nelson has recorded examples, as we have seen above that invite such an account (cf. also Stern (1985:172–173) and Bruner (1990:92–93) who emphasize the transition to narrative structures).

### Self-dialogical narratives

Sometimes, a storytelling or picture book, which previously has been jointly explored with some adult in a guiding position, may serve as a medium for the child's self-dialogue. For example, through the open door I observed how the boy Johann (29 months), brings to bed a picture book. Each page pictures a person or character, split in six pieces, so that each of the pieces may be turned over, revealing a part of another character, pictured on the next page:

Johann is sitting in his bed, while his older brother is sleeping in a bed above him. He turns the separate pieces over as he carries on this dialogue with himself:

*"Is that daddy?*
*No, that's grandpa!*
*Is that daddy?* (as he turns a page)
*No, that's not daddy."*

He repeats this sequence several times, and then finally asks himself:

> *"Where's Kine?"* (Kine is his older sister.) He climbs out of his bed, goes into the kitchen, and grabs a bottle, exclaiming "*Kine*!" and then proceeds to find her.

In this sequence, the boy Johann is in his third year, engaged in self-dialoguing, making distinctions and comparison between pictures and symbolized absent others, that otherwise play an active part as significant others in his world. After a while his self-dialogue with his virtual other evokes a shift and plan of action for re-engaging with one of these significant others as an actual other. Aborting his self-dialogue he goes about to find and bring into his present one of them, his older sister, associating the bottle with her.

## On "egocentric speech" and problem-processing self-dialogue

It is here proposed that overt cases of people talking to themselves and of children conversing with invisible playmates may be seen as outward manifestations of processes that go on almost all the time in the absence of conversations with actual others. That is, when the child's or adult's mind is not engaged in conversation with some actual other, the mind in a wakeful state is engaged in conversation with what is here termed a virtual other, or with some re-presented other, an evoked companion as Daniel Stern terms it, activated in the companion space of the virtual other. As he points out, "in fact, because of memory, we are rarely alone, even (perhaps especially) during the first half-year of life" (Stern 1985:118). We are nearly always engaged in internal or external dialogue with some companion.

Construction and narration, in the present perspective, are co-constructive activities involving some medium and communication with the child's companions, virtual or actual. When involved in communicative co-construction with its virtual other, it may appear to an observer as self-centred and non-communicative. But the next moment, or later in the process, as we saw above in the case of Johann, the child may open himself to the actual other and let her or him in as a companion in the narrational co-constructing activity.

This view implies that the normal child frequently should be expected to be active in covert or overt dialogue with his virtual other, in other words, talking to herself or himself in a way that even may appear as non-sense to the observer. The implied self-creative dialogue of the child may manifest itself in the way that corresponds

to the phenomenon that Piaget calls "egocentric speech". He considers it a primitive and infantile language function that disappears with the child's coming of age and beginning school (Piaget 1960:9–15, 17, 21). Vygotsky objected to Piaget's view. He considered that so-called egocentric speech continued as an internal mode of thought in school children, and even to be externally manifested in problematic situations. In view of Vygotsky's emphasis on the priority of inter-psychic processes over intra-psychic ones it is only natural that he should object to Piaget's expectation of the disappearance of the so-called "egocentric speech". Vygotsky (1978:27; 1986:30) points to demonstrations of how the relative amount of children's egocentric speech increases as the difficulty of the child's task increases:

> "In order to determine what causes egocentric talk, what circumstances provoke it, we organized the children's activities in much the same way as Piaget did, but we added a series of frustrations and difficulties. For instance, when a child was getting ready to draw, he would suddenly find that there was no paper, or no pencil of the colour he needed. In other words, by obstructing his free activity we made him face problems.
>
> We found that in these difficult situations the coefficient of egocentric speech almost doubled, in comparison with Piaget's normal figures for the same age and also in comparison with our figure for children not facing these problems."
>
> (Vygotsky 1986:30)

In terms of the child's virtual other I would say that it entails that the inner dialogue with the virtual other becomes intensified and even manifests itself overtly in relation to the difficulty of the problem situation. The very act of drawing, for example, may thus be seen as an activity in which the internal dialogue recreates itself in an exteriorized form in which expressive media are comprised by the self-creative dialogic networks realizing the conversation with the child's virtual companion. When obstructions are introduced from the outside, for example through removing or hiding means of expression such as pencil or paper, the self-creative dialogue with the child's virtual companion continues and makes itself felt through other available means of expression.

This entails, then, that so-called ego-centric speech is not an epi-phenomenon, but an expression of an integral part of self-creative dialogic activity. Vygotsky describes an incident that may illustrate this. A child (five-and-a-half year) is in the process of drawing a streetcar when his pencil breaks. He tries to continue with the pencil, but in vain, and mutters: "It's broken!". Taking watercolours instead, he now begins depicting a *broken* streetcar after an accident, continuing to talk to himself from time to about the change in his picture. As Vygotsky's puts it:

> "The child's accidentally provoked egocentric utterance so manifestly affected his activity that it is impossible to mistake it for a mere by-product, an accompaniment not interfering with the melody."
>
> (Vygotsky 1986:31)

The child is engaged in a self-creative dialogic process which continues even when the pencil breaks, but now in loud conversation with his virtual companion, the content of which in turn becomes an integral part of the continued self-creative activity expressing itself in the child's visual or verbal, singing or dancing narratives.

Vygotsky reports that school children tended to act differently than preschool children in a task situation. The older children appeared to evaluate the situation, take a prolonged pause, and then proceed to find a solution. But when asked what he is thinking about, such a child would answer much in line with "the thinking aloud" of a preschooler. However, by now, he has learnt to be silent in class and listen and learn. He will more rarely forget himself and resort to so-called egocentric speech. But according to Vygotsky it does not disappear, as Piaget would have it; it merely "goes underground", turned into inner speech as a mode of thinking. This is in line with the present thesis: the self-creative dialogue will continue to recreate itself in various modes and through various means of expressions. But as the child grows older, and is conscious of others being present, the self-dialogue may continue in silence, unless the child forgets herself.

> Sitting beside me as a stranger on the plane from Bergen to Oslo, five-year-old Silje was travelling by herself. The stewardess handed her a plaything consisting of a coloured landscape of trees, grass, water and sky, and a set of loose marks for plants, animals, birds, etc. Silje immediately got about the task of placing the various marks on to the corresponding places in the landscape surround. While she was working on this task, she was talking loudly to herself. Sometimes she would turn silent, and look in my direction. But soon she would forget about the stranger besides her, and being absorbed in her work, her talking to herself could be heard again. After her task was completed, she fell asleep.

This case of Silje invites two interpretations. First, that her talking to herself was an epiphenomenal activity, not essential to what she was actually doing with the bits and pieces. The second interpretation, in line with the perspective voiced herein, is that Silje's very processing involved her conversing all the time with her virtual companion, irrespective of whether it manifested itself audibly or not.

## Unfamiliar situations evoking creative self-dialogue

What is entailed by taking a "fresh look", shifting, as it were, the perspective that has been nurtured by experience with familiar, but irrelevant previous situations? Concerned with the dialogical workings of the developing mind, entailing dialogue between complementary perspectives, I shall indicate how the other, actual or virtual, may be a source for a creative shift of perspective, and that if no actual other is available as a dialogue companion, then self-dialogue – sometimes overtly manifested – will accompany the active exploration of the situation.

Manifested private speech may be seen as overt expressions of the self-organizing dialogue between perspectives evoked in problematic, unfamiliar situations. I propose that such private speech, whether revealed in preschool or school children, reflects the basic dialogic nature and operations of the human mind, exhibiting the same operational format as dialogue with actual others included in the child's companion space:

> (S) In virtue of its inherent companion space for (proto)dialogue with others, actual or virtual, the developing mind recreates and transforms itself in the same coherent format, whether (i) in dialogue with actual others and (ii) in self-dialogue (with the virtual other).

As specified in Chapter 7, the virtual other, then, denotes a non-specific companion perspective that complements the bodily self-perspective with the operational efficacy (*virtus*) of an actual companion perspective, and which is nurtured by engagement with actual others included in the companion space (in the place of the virtual other).

This permits protodialogue and self-dialogue, involving, respectively, the infant's actual and virtual other, to be accounted for in the same operationally closed format, even in a primitive, pre-linguistic sense. As metaphorically illustrated in Figure 7.3, whether realized in intra- or inter-personal dialogue, an autonomous dyadic system may be specified, defined as a dyadic unity by the bifocal self-other organization that makes ego and alter, virtual or actual, essential participant processes of a dyadic network. Through their reciprocal operations they constitute the boundary that emerges in the companion space in which they inter-operate.

In this way thought, which Plato viewed as "the conversation of the soul with herself" (*Sophist*), may be specified as self-dialogue, which, without any shift of basic mechanisms, conforms to the operationally closed format of (proto)dialogue with actual others, providing the prerequisite nurture for self-dialogical operations in the same format. Piaget's dictum that intelligence organizes its world by organizing itself, still applies, albeit in this dual sense: the child avails itself of the means for doing so in dialogue with the child's companions, actual and virtual. The principle of constructivism may be regarded as relevant if it is considered to pertain to a process of co-construction involving the child's virtual other, for example, in so-called "egocentric speech" identified by Piaget and Vygotsky. Children's "egocentric speech" and communication with invisible companions that are named by the child, while invisible to the adult, can be accounted for in this perspective. In problematic situations that call upon reflection and creative problem-solving, it is implied that the crossing of complementary or competing perspectives are evoked, in the child as well as in the adult, overtly or covertly, conforming to the creative format of the self-dialogical.

## Manifestations of private speech vary with age

The creative self-dialogue will come to be silenced in another, more literal sense, turning inaudible in the presence of others as the child grows older. Even though self-dialoguing may be the operational format of thinking at various age-levels, its overt manifestations will vary with age, state and situation. Children are often rebuked by adults, more rarely by peers, for talking to themselves. As Berk (1994) points out, however, this is an overt manifestation of how they self-direct their overt behaviour in the mastering of new skills. She and her co-workers have studied private speech in preschool and school children in its various modes as manifestations of an essential self-regulative activity. While the typical four-year-old will describe the task at hand and give herself or himself directions out loud, the older child may rather resort to inaudible muttering. For example, Angela mumbles inaudible to herself as she works on a math problem, while Carla, who is younger, doing a page in her math book, says out loud, "Six", and then counting on her fingers, "seven, eight, nine, 10. It's 10. It's 10. The answer is 10." (Berk 1994:80). Berk stresses the self-directive function of private speech, and how it will manifest itself differently according to how puzzling the problem situation appears to the child:

> "Private speech enables [...] children to direct their own behaviour, acquire new skills and otherwise work through situations that are unfamiliar to them. When any child encounters a new task, he or she will state out loud those features of the problem that seem puzzling. As the youngster's competence grows, this private speech turns into inaudible muttering. Finally, when the cognitive operations necessary to succeed at that task are well practiced, the child thinks words silently."
>
> (Berk 1994:79).

Thus, private speech appears to be a genuine self-organizing activity in the operationally closed format of the dialogical, the manifestation of which will vary with the child's age and the unfamiliarity of the problem situation. Berk's last clause about silent word thinking need not always apply. The well-rehearsed practice need not require thinking at all in the sense of creative self-dialoguing, and certainly not reduced to silent wordings or voicing only. Moreover, other modi besides silent verbalization, such as visual imagery and internally enacted and simulated movements and co-actor processes (Bråten 1982; Kaufmann1988), may equally be evoked in the companion space, and sometimes come to find overt expressions in visual and embodied forms. But often the child will re-enact silently the verbal instructions heard from his peer or teacher, with not much creativity involved in the self-dialogue. And even in us adults, when we do mutter to ourselves, faced with some tricky problems, then shorthand words serves as vehicles for our self-dialogue.

We speak of people's tendency to mutter, to mumble or talk "to oneself". For example, a post-doctorate student noticed that while she mostly was welcomed at the luncheon table, on certain days her colleagues tended to avoid her during luncheon time. She wondered about this and outright asked them why. She was then told that the partitioned walls of her office did not reach the ceiling. Hence, on certain days her angry voice, when she was talking to herself, could clearly be heard. Those were the days the others stayed clear of her.

Contemporaries of Adam Smith remember him as a child with a remarkable good nature, a prodigious memory, and his habit of talking to himself, a habit that he never lost in adult life. He was known to his friends to frequently be moving his lips, muttering and talking to himself. This is, in the above terms, thinking in the self-engaging format of dialoguing with his virtual other, and in a manner which even frequently came to overt manifestation. In the old days, before the advent of the mobile phone, when people become conscious of their talking audibly to themselves at some time or other they might embarrassedly be looking around to check if someone has heard them, or they could be arrested by someone nearby present who innocently asks: "What did you say?", or, "Did you say something?". Some people, not merely of old age, carry on such audible talking to themselves openly and without embarrassment. And then, nowadays, with the advent of the mobile phone people are engaged in conversations almost all the time. What is the difference when they are addressing some actual others through the invisible phone, and when they are just talking to themselves? The characteristic difference is that in the former case they are usually gesticulating with facial expressions and sometimes even with their arms – even though their actual other cannot see them. When muttering, there are no accompanying facial or manual gestures.

### In relation to other children: Play and pretend play

Children live in several kinds of different worlds affording a varied set of relations. There is the world in which they engage in interplay with adults – parents, care-persons or teachers. There is the other world where they play with one another without adult interference and frequently engage in pretend play. Peer interaction partly requires other kinds of abilities and sometimes entails initially indirect and careful approach or negotiations not called for in interaction with care persons. Ivar Frönes (1995) has listed some of the ideal type characteristics that may differentiate parent-child relations and child-child relations (Table 9.2). Sometimes, some of these listed characteristics converge rather than differentiate. For example, parent-child relations may sometimes become exceedingly complex, while communication may flow easily between peer playmates. At other times, as

**Table 9.2.** Comparison between parent-child relations and peer relations (adapted from Frönes 1995:173–174)

| **Parent-child relations** | **Child-child relations** |
|---|---|
| May be communicative simple | May be communicative complex |
| Non-ambiguous relation | Ambiguous relation |
| Ascribed relation, defined in advance | Achieved and attained relationship |
| Unequal status and social position | More equal status og social position |
| Unequal life situation and circumstances | More equal life situation and circumstances |
| Unequal developmental competence | More or less equal development competence |
| Experienced inequality | Experienced equality |
| Domain for adaptation and instruction | Domain for comparison and discussion |
| Nature of interplay partly defined in advance | Nature of interplay partly to be negotiated |
| Cultural reproduction and learning | Cultural production and creative pretend |

in children's pretend play, or in triadic mother-father-child engagement, interaction may appear to flow easily at the surface, while there may be undercurrents of a more complex nature.

### When children listen to fairy tales

Sometime, children's imagination flows much more freely in mutual engagement. But then, adults may afford narrative worlds; fictional absorption in narratives told by adults invites imagination and identification with the protagonist in an alter-centric mode (Rall & Harris 2000; Harris 2000):

> "In their early role play, young children situate themselves in an imagined world and process events from that point of view of pretend protagonist. Similarly, when they start to listen to narratives, children mentally locate themselves within the narrative world and process events from the point of view of the narrative protagonist. This same altercentric mode is found among adult readers and regulates the ease with which they take in narrative information."
>
> (Harris 2000:53).

On the basis of experimental story recall studies, including their own studies at Oxford of 3- and 4-year-old children's recall of 'Cinderella' and 'Little Red Riding Hood', Jaime Rall and Paul Harris make this suggestion. Finding that recall is more accurate for verbs, such as 'come' and 'bring', 'go' and 'take', if used *spatially consistent* with the point-of-view of the main protagonist, they state:

> "[it] would be plausible to conclude that listeners engage in what we might call 'altercentric participation' (Bråten, 1998). This would allow us to make sense of

> the fact that listeners not only encode movements and location in relation to the protagonist, they also anticipate the emotional implications of impending events "
> (Rall & Harris 2000:207).

In conjunction with his other studies of fictional absorption in children, Harris (1998, 2000) opens a window here for exploring further whether even the simulation of a situated *imagined* other may evoke feelings of virtually moving with the movements of such a re-presented other.

## Pretend play

And then, there is pretend play, which Piaget considered a retreat from reality, but which may rather be seen to be ways of simulating role playing in various imagined situations so as to open windows to later understanding of the perspectives of actual others in various real-life situations. Two studies of 3- to 5 years olds including coding of their joint pretend play (by Astington & Jenkins 1995; Schwebel et al. 1999) point in such a direction. Children who engaged in more joint play, including role play, performed better on the theory of mind tasks (false belief tasks), even when the potential contributions of age and verbal ability were controlled for, while no such connections were found for solitary pretence play (Harris 2000:42–43).

Having observed two-to-three year olds of both genders for ten days, Möklebust (1987) found the boys to be engaged in pretend play like building or running a train, while the girls in this case engaged in pretend preparation of dinner or – when playing with cars allowing for the cars to communicate with each other. Here are some instances. First the two boys, Emil and Öyvind:

> Emil: I SHALL MAKE A LORRY! Having found a mattress with brown cover he put a green wooden box in front of it. Drags the lorry with the box in front halfway across the threshold into the next room.
>
> Öyvind climbs a chair […] sitting on his knees back ways on the seat. I AM AN ENGINE DRIVER, he declares and shakes the back of the chair.
>
> (Möklebust 1987:37).

But the boys can also co-operate, pursuing the train pretend play:

> [Three of them] collect all the small chairs in the room, placing them pell-mell after each other in a long row. BUILD TRAIN, one of them exclaims. Another boy places himself in the front, making running noises: AE, AEH, while the third one sits behind and joins in the shouting.
>
> (Möklebust 1987:37).

And the girl Julie, who has engaged in pretend play with her children, with her dolls on both her knees, calling one of them HI, BIG BROTHER and another HI,

LITTLE BROTHER, or saying, SIT WITH ME, LITTLE FRIEND, also enjoys playing with cars, but not quite the way the boys do:

> Julie is standing in front of the shelves with toys; at her level is a toy farm house, on the shelf beneath a box with cars, and at the floor a wooden toy house. While humming, she removes some of the cars, one by one, from the box to the farm house, and from the cowshed through the door of the house on the floor, nearby a small chair:
> Holding one car in each hand, she is driving between the wooden house and the chair, with one car asking the other [...] ARE YOU GOING TO THE KINDERTARDEN? WE HAVE TO HURRY. And as she hums the cars continue their chatter
>
> (Möklebust 1987:38; translated SB).

Also in the report on the two girls, Guri and Lina, engaged in pretend play, the social and the relational are clearly expressed:

> Guri: I DADDY.
> Lina: NO, I AM DADDY THE WHOLE DAY [...]
> Guri: THEN I AM MOMMY.
> Some boys appear, and Lina asks: "WOULD YOU LIKE TINNER? I COOK FOOD.
> [Sometimes later after having turned the knot on the oven and moved some casseroles and pans]: EVERYONE TOMING, Lina exclaims and begins to lay out the table with frying pans, sun glasses, plastic plates and logo board. OH NO, OH NO, NOW THE FOOD ARRIVES [..] Crying out: DINNER FOR EVERYONE
>
> (Møklebust 1987:37; translated SB).

## Two four year old friends during pretend play

Here is an example of pretend play in the North-American culture between two four year old boys, E. and N.:

> E.: *Hold on there everyone! I am the skeleton! I'm the skeleton! Oh! Hee. Hugh, ha, ha! You're hiding.*
> N.: *Hey, in the top drawer, there's the, there's the feet*! (imitating the sounds of feet)
> E.: *I'm the skeleton!! Whoa! A skeleton, everyone! A skeleton!*
> N.: *I'm your friend, the dinosaur.*
> E.: *Oh, hi Dinosaur. You know, no one likes me.*
> N.: *But I like you. I'm your friend.*
> E.: *But none of my friends like me. They don't like my new suit. They don't like my skeleton suit. It's really just me. They think I'm a dumb-dumb.*
> N.: *I know what. He is a good skeleton.*
> E.: (cries) *I am not a dumb-dumb!*
> N.: *I'm not calling a dumb-dumb. I'm calling you a friendly skeleton.*
>
> (Adapted from Parker & Gottman 1989:95)

Not all pretend play runs as smoothly without quarrel – in particular when three are involved entailing the risk of one being defined as or feeling to be an outsider. Here is an example of negotiation on pretend ending in separation:

> Greta and her girl-friend, Katharina, play with their dolls. After a while, the big brother Nils arrives and proposes that they play hide and seek. Katharina is willing, but not Greta. [...She] proposes that Nils joins them in playing with dolls and, afterwards, they can play hide and seek [which would require the three of them. Reluctantly Nils agrees] Patiently he gives the child a bath, drinks coffee from a pretend plastic cup and scolds his 'oldest daughter', Greta [...] After half an hour he feels to fulfilled his part of the bargain and expects the girls to comply with his wish [...]. Greta refuses and declares herself not to be interested, and that she would rather go to the playground with Katharina. [...] Strong reaction by the other two: they accuse her of being a liar and a no-good friend before they push her away and run. Greta is left standing crying alone.
>
> (Kloep & Hendry 2003:107–108; translated by SB)

## Children's imaginary companions or invisible playmates

Many young children engage in communication with companions which are invisible to others, but which are addressed by the child. The child's conversation with imaginary playmates may be seen as coming about through a creative act involving the child's virtual other. Parents paying attention to the children's activity when left by themselves will sometimes realize that a child, who may be two years old or older, with voice and bodily gestures carries on long conversations with someone or something that is invisible to the parent. Unlike dolls or teddy bears or other bodily realized and named playmates visible to the adult, the child's invisible companion can only be inferred from the child's own gestures, and sometimes, from what the child tells about this specific companion. The child may let the parents or care person in on this communication with this invisible companion or playmate, and even tell them its name. The adult may even be invited to participate in the communication with the invisible playmate, pretending to pay attention and show consideration. The parent may also attribute such pretended play-acting to the child, that is, assuming that to the child the invisible companion is not "really there", the child only pretends and play-acts *as if* the invisible companion really exists. Be that as it may, the child will usually demand that its invisible companion be taken seriously. The invisible companion may take a part in funny incidents shared by the child, but the invisible companion, like the child, should not be made fun of. The child's invisible companion are brought along on all serious undertakings. It should be given food, room should be made

for it in the wagon, it should be brought along on trips, etc. The below case story of an invisible companion to a boy, named Tor, told by his mother, illustrates this aspect:

> Tor was three and a half year when the family moved from Oslo to Akureyri, a village in the northern part of Iceland. When we had lived there for some weeks Tor began talking about his friend "Little-Tor"...after a while he told us that Little-Tor had his own job in a large white house at the harbour. One day he showed us the building: "There Little-Tor has his office with his name on the door." We later learnt that this was not the first time he had pointed out the working place of Little-Tor. Before that he had been there with his grandparents and shown it to them.
>
> All through the winter we were invited to follow the development at his working place. The narratives usually started with "At the job of Little-Tor..." We were also kept oriented about Little-Tor's opinions about our daily life.
>
> After the winter at Akureyri the family was to return to Oslo.... via Reykjavik for about two weeks stay there. On the road to the airport at Akureyri Tor suddenly began to cry. He told us that we had forgotten to bring along Little-Tor.....After a while we worked out a solution asking the driver to bring with her Little-Tor when she was to return to Reykjavik in a few days. Tor instructed her carefully about how to find Little-Tor and emphasized the name on his office door.....
>
> Nowadays Tor rarely speaks about Little-Tor. One day I asked him how was it with Little-Tor, should we not go and fetch him? Pointing to his head, Tor smiled and said: "Didn't you know. Little-Tor is only me!"
>
> That was the last time I heard about Little-Tor.

By that time Tor was five, approaching six years old. This story illustrates several important aspect of the prevailing phenomenon of children's invisible companion. First, the invisible companion initially appears to exist to the child in time and space, and takes a part in the child's activities. When Little-Tor was left behind, Tor acutely felt the loss of the companionship of Little-Tor (and perhaps also the felt communion of earlier childhood) and took steps to re-create the relationship. When approaching school age it becomes increasingly difficult to maintain overtly the companionship with someone without any bodily realization. That which is acceptable to the young child need not be felt acceptable for one approaching school age. Gradually, the existence of Little-Tor as independent of Tor is denied. But there is an elegant twist to this: Little-Tor's existence is not explicitly denied. Tor informs his mother, probably assuming that his mother realizes that his named companion is actually himself, or a smaller version of himself.

## Are children with invisible playmates less social than other children?

If Piaget's notion and attribution of egocentricity had been tenable, then one should expect that children with imaginary companions or invisible playmates

would be engaged in a pure egocentric activity which makes them less sociable than children without such playmates. While inconclusive, some current research in progress suggests that the reverse is the case. Children with invisible playmates appear to be more social in their interplay with other children than children without imaginary companions, and even appear to be better reading feelings. In a study in progress, children with invisible companions were found to be better than other children in reading emotional expressions on pictures to which they were exposed (Giménes-Dasi & Pons 2006). Four-year-olds who engaged more in role-play, as indexed by their invention of an imaginary character, be it an invisible companion that they played with or a character that they impersonated, were found by Taylor and Carlson (1997) to perform better on false belief tasks concerning their capacity to understand others' misunderstanding. Reviewing four related studies, Paul Harris draws this tentative conclusion:

> "we have persuasive evidence that involvement in role play, whether in the context of joint play with other children or pursued in more solitary fashion through the creation of an imaginary character, is a correlate, and indeed an advance predictor, of later success on belief tasks."
>
> (Harris 2000:45).

Related to Stern's (1985) 'evoked companion', the child's virtual other may be seen to pertain to the phenomenon of children's invisible companions. This topic is examined by Papastathopoulos and Kugiumutzakis (2007) through their reported studies of five-year old preschool girls. Sixteen preschool girls were interviewed and observed in dyadic play interactions, at the nursery schools. The girls are reported to describe their imaginary companions as persons, humans with bodily and psychological characteristics. They attribute to them primarily the functional roles of playmate and interlocutor and secondarily the role of a companion in everyday activities. During the dyadic play interactions, the girls with imaginary companions used significantly more of their speech to communicate than the girls without imaginary companions. They also engaged significantly more often in pretend play and in negotiations about it. During their play with dolls, girls with imaginary companions used them significantly more often as active agents and attributed to them psychological and relational characteristics. The authors consider imaginary companions to emerge naturally because of the inherently dialogical structure of mind and the intersubjective nature of human development. Their findings may leave substance to the assumption – contrary to what has been surmised from Piaget's line of enquiry and psychoanalytic thinking – that a child who overtly engages with imaginary companions may turn out to be more socially sensitive and competent also in relation to actual companions.

## Visual and verbal narratives: Cosmology of a five-year-old

Above instances have been offered of children's creative self-dialogues, which interchange with dialogues with actual others. Children pose questions to themselves and others and come up – if the adults or peers let them – with their own forms of replies, making sense of their world and of others in it. Their self-dialoguing is a creative activity, sometimes resulting in impressive narratives in verbal or visual forms. This is not only the product of cultural learning in the sense of co-constructing replies and stories told by others. Self-creative dialogue in a seminal sense is involved. The snapshots of the preschooler's narratives to be shown in the following, developed in self-dialogue as well as in conversations with others, adults and peers, will illustrate that.

When the boy, Henning (named Peter in what follows) is four years old he starts to produce a number of scribbles which he and his father collect in a folder for "important things". The scribbles appear to picture human beings, animals, trees and things, linked together by arrows. His drawings combine scribbles, naturalistic styled forms, and various forms of box diagrams and arrows. The latter means of expression he has probably picked up from observing his father's working with flow charts for computer programming (This was in 1970 when flowcharts were still used in preparation for programme writing). He may have come to understand that when the adults try to picture "important things" they resort to the use of arrows. During his fifth year Peter enjoys telling also other children what he has found out. Sometimes in the Kindergarten he may be seen strolling around with a little girl or a boy behind him, gesticulating and appearing to explain something or other to the other child. Sometimes he may even be seen strolling around by himself, his gesticulating revealing his conversation with himself.

One day, a month before Peter will be six years of age, his father places him on his lap and ask Peter to tell him about his drawings. Close to 40 in number, they are contained in his folder of "important things". Peter is the teacher, his father the pupil. Showing patience with his father's ignorance and misunderstandings, Peter tells him about the world and things in it in terms of cords and containers of air, water, earth and fire. Two examples of his explanatory drawings are shown in Fig. 9.1.

As Peter explains to his father what he has brought forth, it turns out that they are expressions of a child's metaphysics. He has made his own observations, for example of the changing faces of the moon, or of how matches flare up when struck against the side of the matchbox. He also draws upon stories he has heard, for example about the genesis and about evolution, about the growing of trees, about people and animals. But as to his questions and replies about how and why with respect to the things in his universe Peter has come up with his own account. Here

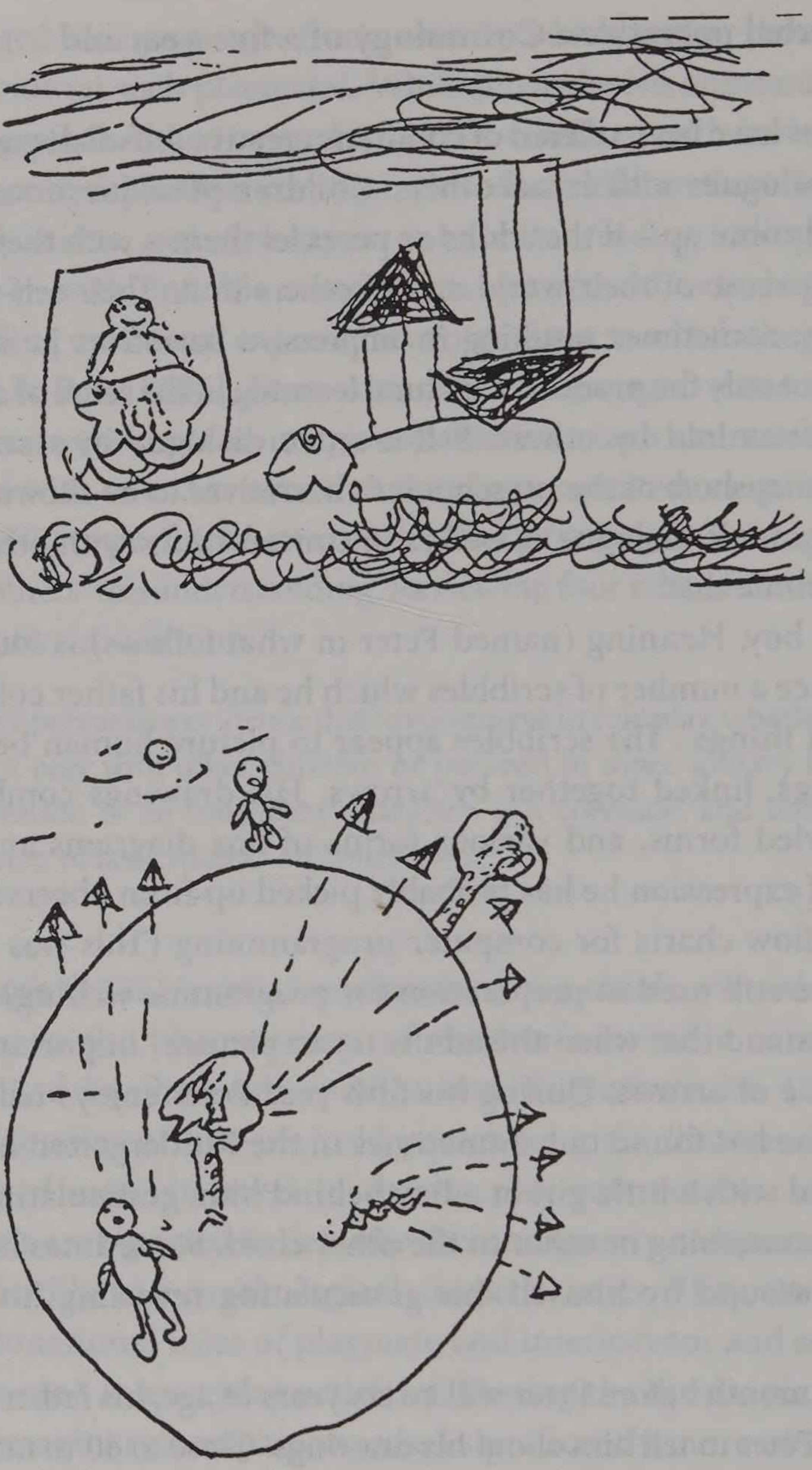


**Figure 9.1.** The drawings of Peter (5 years old) illustrating his own account of genesis and evolution (cf. his lecture to his father when he is nearly 6 years old, as recorded and translated in the below text).

are some of Peter's own statements (taken out of context and translated as nearly as possible to his grammatically informal statements):

> *"This shows.....*
> *".. why one always thinks that which one sees.."*
> *".. why the body grows..."*
> *".. how wounds heal themselves..."*
> *".. when the heart beats....."*

*".. why the heart does not beat when one is dead.."*
*".. why one has closed one's eyes when one is dead.."*
*".. why one is cold when waking up in the morning.."*
*".. why clocks tick.."*

With reference to his drawing (Fig. 9.1 (top)) Peter accounts for genesis and evolution in this "lecturing" conversation with his father:

*Child:* *Here I just show that – emm – that, do you think that it was in that water that provided us, but – or do you think that it is God who created water?*
Adult: Hmm, yes, both (interrupted by the boy)
*Child:* *I believe it was – yes, that I believe, too. I believe it was it (the water?) that made people and God who made the other things.*
Adult: I see.
*Child:* *That animal I believe, yes, became a man.*
Adult: Yes, that's why you've have drawn it like that, yes
*Child:* *Ummm*
Adult: and one arrow come from God and the other from the animal?
*Child:* *No!*
Adult: Ah, no.
*Child:* *It just shows either is that animal that is made or either is it God.*
Adult: Yes, well, I see, mmm.

Later they turn to the second illustration in Fig. 9 (bottom):

*Child:* *Here is how God managed to create things.*
Adult: Yes. Aha. Let's put a "k" on this one, then.
*Child:* *But you – shall I tell you something? You know, I believe there are many things down in the earth.*
Adult: Yes.
*Child:* *and each time God said that now shall there be a tree – then the tree came up from the earth.*
Adult: Yes.
*Child:* *I believe there were many things inside the earth – earth – came up each time God said so.*

In many of his accounts Peter employs the container principle which he has used in some of the above illustrations. The earth contains fire and trees which come out on the surface upon some particular perturbation or command. A match, struck against a match-box, flares up because the surface is broken letting out the fire contained inside the match-head. He considers the human body a container of air. For example, when he poses himself the question why a man turns smaller when he becomes old (he has observed how old people appear reduced in size), Peter explains this in terms of air gradually leaking out of the old man's body. When one is being shot by a gun, then all the air leaks out. In his own (translated)

words: *"Each time one is shot, there will be a hole in the brain and air will not enter the heart, but leaks out of this pipe."*

It is apparent from the above conversations that Peter enjoys telling his father what he has found out. He combines bits and pieces of information he has picked up from various sources. But he makes his own observations, also, and the questions he poses and the accounts he comes up with are documentation of a self-creative activity on his own premises. That is, the questions and replies as to the *why* and *how* of things he have heard about or experienced himself, emerge from his dialoguing with himself and his explaining them to others.

## At school and in the classroom: When the creative self-dialogue is silenced

The case of Peter illustrates how a preschooler may shift between self-dialoguing, posing questions to himself and offering tentative replies, and then turn to actual others in his life-world, peers as well as parents. His case need not be considered a unique one. Children's talk and scribbles reveal a richness of insight and creativity to those who pay caring and respectful attention to them without posing questions about what the scribble "represents" or resembles, and without offering smug replies about how things "really are". Any preschool child may be seen as engaged in a quest for making sense out of his universe, co-constructed in conversations with his virtual other and with available actual others. But the kinds of questions, the means of expressing them, and the availability of conversational partners will make a difference. If they have ready-made answers and impose too many prescriptions for how children should "rightly" express themselves, they may come to silence the child's creative dialoguing on his or her own premises.

As has been indicated above, the internal dialoguing in the child has a self-creative aspect, even when it employs "objects", and later, linguistic and other means in its dialogic mode of operation, such as the infant's doll or the preschool child's means for scribbling and talking to himself. As may be seen from the artful scribbles reproduced by Howard Gardner (1980) and others, and from the case of Peter, such expressions of the preschool child's activities indicate that if circumstances permit, the preschool child may sometimes be highly creative, posing questions, devising replies and expressions in his own terms.

When entering school this internal dialogue may come to be temporarily silenced. There appear to be a qualitative change from preschool to school age: Children's artful scribbles mostly disappear, as does most overt manifestations of private speech unless the situation is problematic. The school children come to take part in an institution which is to function as the source of the "right" answers to the "right" questions. The nature of the institution contributes to establish

a 'model monopoly' maintained by 'model-strong' teachers, who feel an obligation in relation to the correctly defined curriculum.

For example, the continuation of the story of Peter's case is this: When approaching the year for beginning at school, he went, six years old, with his father to the school and brought the folder with the important things in it. But since day one at school he never again produced another scribble expressing his cosmology. His folder of important things was laid aside, never to be retrieved. Instead, he learnt at school to listen to his teachers and pay attention to their ready-made questions and replies about how things "really" are. This may invite a temporary collapse of the child's self-creative activity involving dialoguing with the child's virtual companion. Entering the school, the child may come to understand that there is no need to ask oneself questions; the teachers have all the answers, even the recipes for the way in which questions should be posed. When a school child submits in this way to the model power of the teachers, such a model monopoly (Bråten 1973c, 1989) may come to reduce the question horizon of the child and temporarily silence the creative self-dialogue. This may apply not only to the school child submitting to the model power of the teacher or the text book author. The history of science offers many cases, for example in geometry and mathematical logic, of how the creative dialogue between rival perspectives has been silenced in the sage on the verge of a discovery, but aborted by his submitting to a model monopoly long since established (Bråten 1986; 1989). And, indeed, we saw in Chapter 1 the model monopolies created by the views on infants by Freud and Piaget that came to prevail throughout much of the previous century.

## Hidden dimensions of classroom learning?

But what about learning by altercentric participation; may altercentric participation sometimes pertain to occurrences in the classroom? Usually we applaud the fluent teacher who eloquently addresses his class. But it could very well be the hesitant speaker, searching for words, who may evoke attention and altercentric participation in the pupils, inviting them to become silent co-authors of the lecture in progress. If the teacher succeeds in engaging some of the pupils in such a manner of silently co-articulating what the teacher is about to articulate, that would attest to their developing command of the subject matter of the lecture. And then, during a physical or object-oriented class room demonstration, even if the pupils are not being physically hand-guided, by virtue of participant perception of what the demonstrator does, the pupils may still be left with a participating memory of having been virtual co-authors of the afforded demonstration.

Here is a pertinent episode. One morning in the biology class one of the pupils is allowed to hold a guinea pig, lifting it out of its box, cuddling it and talking

snugly. The other pupils gather around her, forming their hands as if they were holding and cuddling the guinea pig and addressing it – virtually participating in what the girl in their centre was actually doing with her precious animal. This is one of the many episodes reported by Håstein (2000:4; 2004) who has carried out a series of classroom observations in elementary school in Southern Norway, looking for manifestations of altercentric participation. Sometimes he observes what is going on between pupils pair-wise or in a group, sometimes he observes the interaction between teacher and pupils. Here is an episode:

> Sitting in a circle around the teacher who is addressing them on the subject matter the pupils exhibit a variety of bodily postures. When the teacher changes his sitting posture from slightly asymmetric to becoming more symmetric as he sits on his hands, four or five pupils adjust their own bodily posture, turning more symmetric and straight, and apparently with increased concentration
>
> (Håstein 2000:5).

Håstein has also noticed that sometimes the apparently isolated pupil, sitting by herself or by himself away from the group of others, may manifest by bodily posture and expressions that she or he is virtually participating in what the others are doing.

Mechanisms contributing to pupils being included in or excluded are often at play in the class room. In a pilot project conducted by Karsten Hundeide, chair of International Child Development Programme (ICDP), school teachers were encouraged to become conscious of pertinent roles and modes of behaviour, and to reflect upon acquiring a new perspective on the pupil. The emotional climate is not just dependent upon the teacher but upon the "mutual negotiations between teacher and pupils", as he puts it. Not everyone is in command of the "code" that applies to the intersubjective space of the class room entailing feelings of insecurity on the part of the outsider. Simple means of nodding and smiling, informing the newcomer of what the topic is about and inviting her or his comment, can make a difference. The teacher may be seen to have a special responsibility for inviting object-oriented attention sharing, i.e., participation in what Trevarthen and Hubley denote "secondary intersubjectivity" (Hundeide 2003:70, 74), and which in turn supports narrative and conversational processes such as illustrated above.

## Problem-processing when denied access to the actual other: The hat-rack experiment

Adam Smith distinguishes the "spectator" in himself from the agency part of himself. Charles Sanders Peirce writes about "the critical self" that participates in

his thinking. George Herbert Mead declares that thinking is a conversation between the "I" and the "me". These are different terms for the same phenomenon: thinking as self-dialogue, entailing a denial of a monadic or monological conceptions of the mind.

Thinking as a self-dialogical process (with the virtual other) may be expected to be evoked in the kind of situations to which Raaheim's (1974, 1984) has applied his principle of the limits of intelligence. In conjunction with previous definitions this permits the following expectations:

(T1) Problematic contexts, defying definition in terms of familiar situations, will evoke in the exploring problem-solver self-dialogical crossing of complementary perspectives.

(T2) The more unfamiliar or difficult the problem context appears, the more likely it is that the internal self-dialogue (with the problem-solver's virtual other) will find overt expressions, or that actual others will be appealed to, in the quest for an adequate "fresh" perspective. (Bråten 1995).

The latter would be consistent with Vygotsky's report on how problematic task situations evoke "egocentric speech" even in school children, and with Berk's (1994) related studies of how children resort to "private speech" in self-directing their exploration of situations that are unfamiliar to them.

Raaheim (1974) reports from his and Kaufmann's study of students subjected to a hat-rack assembly task. Each subject is handed some bars and clams with the task to construct a hat-rack on the basis of the material at hand, a most unfamiliar task that has to be managed in 30 minutes. Each attempt to join the rods with a clam is registered as a trial, whether in error or not. Four out of 100 succeeded immediately, while about half did not succeed. When correlating the number of trials with the outcomes, it turned out that successful subjects exhibited a higher frequency of errors than the unsuccessful ones. Filmed records of two different subjects engaged in this hat-rack task show two different characteristic patterns of problem-solving attempts. Raaheim invites his students to guess which leads to success, and which to failure. The film shows the experimenter to be present in the room, sitting at a table, but with still-face and unavailable for communication with the subject after the start signal has been given. When engaged in the attempt to accomplish the task, the two subjects, let us call them S1 and S2, position themselves differently and proceed differently: S1 positions himself face-to-face with the experimenter and immediately starts to try out various combinations, with frequent small pauses during which he is looking at the experimenter. S2 turns and keep his back to the experimenter and proceeds to try out various combinations with a higher frequency than the other. Who is the successful one? The correct reply is S2. Is this merely by virtue of his higher frequency of failed attempts, entailed by his higher activity?

The hat-rack situation was a situation in which communication with the actual other was denied. In that context, the subject with his back to the experimenter and immersed in the task of trying out possible solutions would be expected to succeed, while the other repeatedly looking at and failing to engage the still-faced experimenter in his attempts will hence prevent himself from being engaged in any dialogue between perspectives, neither with the actual other, nor with his virtual other, both which would have been potential sources of a complementary perspective inviting a "fresh look" at the situation.

The successful one, S2, turns and keeps his back to the experimenter, pauses perhaps a little longer before beginning his attempts, and then proceeds to try out various combinations. He is clearly immersed in the task, engaged as it were, in a private conversation with himself, that is, with his virtual other, while trying out various combination. If we accept his virtual other to supply a competing perspective, complementary to his bodily self, then he will have continuous access to another perspective in his self-dialogical exploration. His active trial-and-error exploration may be expected to be accompanied by his talking to himself in this manner: "Perhaps I should..." "No, better try this..", "What will happen if I go this way?", "What did you do now?", "May be this goes the other way round", "No, why don't I begin at the top?", etc. Whether inaudible or not, this is the kind of self-dialogue which is here attributed to the problem-solver without recipe for an automated or well-rehearsed solution.

## 'Perpetuum mobile' connections in the current network society

Never before in human history on the road, on the pavement, in the tramcar, in the train, in the bus, on the path in the wood or in the mountains, or by the water front, has this been observed: solitary people sitting or walking by themselves, while gesticulating and talking loudly into the air, while touching with a finger or two a little gadget held in the hand, if it is not hidden in the pocket. As pointed out by Levinson (2004:63), "the cell phone has left us no place to be alone, whether car or park or mountaintop."

In his work on '*Origins of the modern mind*' Donald (1991) distinguishes, as we saw in Chapter 3, four stages in cultural evolution – from the first episodic (primate) culture, through the second mimetic (Homo Erectus) culture, the third oral mythic culture (in Archaic Humans), and finally the modern theoretic and linguistic carving culture – evolving from picture carving and non-alphabetic systems to the invention of the phonological alphabet, inviting meta-linguistic skills and windows to current days language, science and information technology. The question is: Does the advent of information and communicational technology,

beginning with Bell's telephone more than one hundred years ago, warrant the label of a qualitatively new step? Following the invention of the home phone that enabled speech communication across vast distances, and the computer which enabled access to huge data files and – when connected – exchange of written messages – what we may hear and see today deserves perhaps to be designated as a partially novel step in our cultural evolution. The key term is the 'network society' or 'the electronic cottage' predicted in the 1980's and 1990's by Bråten (1981; 1983), Castells (1996), and Toffler (1981). Some of the critical steps for the emerging network society have been these events, described by Mayo and Newcomb (2008:103–125) with reference to key persons in the oral history of the Internet:

1958 Arpanet, the Advanced Research Projects Agency was set up by the U.S. Military
1960 Packet switching, one of the Internet's building blocks, was conceived at Rand Co.
1969 The interface message processor (I.M.P.) was connected to the first host
1973 Transmission control protocol (TCP) for interconnecting networks was designed
1983 The Internet embraced by university researchers and other adopters
1991 The World Wide Web was introduced in the physics laboratories CERN
1994 Earth-Link, an Internet service provider, was introduced
1998 The Internet search engine Google was introduced
2000 In this first decade library and knowledge services emerge (Wickipedia, Knol, etc.)
2008 iPhone is introduced for mobile game playing and the following year Apple employs a nine-year-old 'wonder boy' as iPhone programmer.

When comparing the adoption of mobile telephony by teenagers in 1997 and 2001, Ling (2004) reports that in 1997 significantly more boys than girls had mobiles, while almost no 13-year-olds owned such a device. In contrast, already by 2001 the adoption rate had changed dramatically: approximately 90 % of the teenagers interviewed in a representative national sample had a mobile telephone and, furthermore, there was a larger number of girls than boys who had mobiles (Ling 2004:84).

In an inquiry, reported by Endestad et al. (2004) concerning the use of new media technology among Norwegian school children between 7 and 12 years of age in the years 2002–2004, the difference between boys and girls were especially noticeable. The girls made up the majority of the largest group, 40 % of the children, reporting that they made little use of the new media technologies. 25 % of the children were reported to have an entertainment focus, while 23 % were reported to have a utility focus, gathering information through the Internet, doing their school work on the computer, and using chatrooms and e-mail communication. While the youngest children were not so concerned with chatting, e-mail and mobile phones, there was a change at the fifth grade and above (from 10 or 11 years of age) with

many school children beginning to employ Internet communication and mobile phones. Still, this report from the project "The Digital Childhood", pointed out that the most notable result was the finding that the children did not employ the new media to any significant extent, even when accessible to them at home (Endestad et al. 2004:68).

By now, 5 years later, one may expect that the situation is somewhat changed brought to bear by the fact that these new media afford a novel historical transition that transcends the modes of information and communication that characterized the traditional network communities and the societal hierarchical organizations (cf. Table 9.3, reflecting a prediction of the net-society made nearly three decades ago).

**Table 9.3.** 1981-prediction of the net-society as transcending and fusing characteristics of the communal (*Gemeinschaft*) form of connectivity and the more formally organized (*Gesellschaft*) connectivity (a distinction proposed by Tönnies 1887) with a new form of network connectivity expected to come about by virtue of the emerging information and communication technological media (Bråten 1981c:290; translated from Norwegian)

| **Communal society,** distinguished by the G-form | **Organizational society,** distinguished by the H-form | **Net society,** distinguished by an I-form |
|---|---|---|
| affective collective orientation and face-to-face communication based on natural everyday language and a common definition of reality with low tolerance of deviating views of reality; | cognitive means-end orientation and impersonal exchange of information, based on expert language and models (adjusted to the object domain) with room for a certain variety within the means-end object frame; | fusion of subject-subject and object-oriented communication and information exchange, affording a variety of models, data and language games – including a pseudo-natural language within a "computer-logical" frame; |
| informal "tight" structures of person-to-person contact with 'programs' for exchange of rewards and punishments, goods and evils, embedded in the daily interaction patterns; | formal specialist roles in hierarchical organization structures with centralization of planning and control, regulating the role performance of well-defined narrow tasks; | informal and formal horizontal networks across tight family structures and loose work life structures, and with a certain degree of (usurped) autonomy; |
| whole persons in contact with one another with many-sided close connections, in common space and rhythms of time cycles; coinciding domains of material exchange of goods and communication of signals | specialized role performance with narrow and impersonal contact, punctuated and distributed in differentiated space and standardized in time, separate channels for exchange of goods and signals | broad interpersonal contact across personal life and work life, in varied fragments of time at the same place; face-to-face contact is supplemented by remote screen contact with role performers |

The sociologist Tönnies (1887) had distinguished two ideal types of societal and interactional organizations. One type is based on a natural and essential form of companionship; the other on an arbitrary, negotiated form of co-operation in order to achieve some ends. The first type, defined by nature and essence, he termed "*Gemeinschaft*". The second type, affording conditions for exchange between distinguished and formal actors, he termed "*Gesellschaft*". Introducing the term 'net-society', predicted an emerging third form, expected to transcend and confuse the characteristics of the previous two other forms.

It was pointed out that the list in the Table 9.3 was gross and lacking in nuance, but that it might serve an attempt to indicate how certain *G* and *H* traits might come to be modified and combined in a possible emerging *I* form (the right column). It was also pointed out that the types of solidarity that Durkheim distinguished as 'mechanical' and 'organic' may be superseded by a form of cohesion in the emerging net society which one superficially might be denoted 'electronic solidarity'. Thus,

> "I predict a transition to the network society [...] In twenty years – year 2001 – we shall have an empirical ground for rejecting these simple speculations, unless some catastrophic event has occurred in the meantime that cancel such conjectures."
>
> (Bråten 1981c:290–291, 295).

Now, nearly three decades later, we see the rapid expanse of the net society inviting perhaps 'a network science' as suggested by *Nature* editors in the February issue 2007. There is featured an article by Duncan Watts (2007:489) on "A twenty first century science". Two studies are referred to, one them of comprising anonymous e-mail logs by 40 000 users in university locations; the other involving an experimental study of down-loading of unknown songs by 14 000 web users. And, then, before the historical US presidential election in 2008, more than one million voters visited the site my.barackobama.com.

CHAPTER 10

# When conversation partners become virtual co-authors of what the other is saying

When 3 to 6 year old children show themselves able to understand others' understanding or misunderstanding, is this due to their having formed a theory of others' minds, or does it come about by virtue of their simulating what the other is thinking or intending? Irrespective of the reply, the pertinent term is Theory of Mind (T-o-M), entailing the ability to infer from a theory of mind (the theory version of T-o-M, such as advanced by Leslie & German (1995)), or to imagine or simulate the mental states of others (the simulation version of T-o-M, such as advanced by Goldman (1993) and Gordon (1995)). In its various versions, some of which employ computational metaphors, the focus is on social-cognitive or empathic abilities to infer from theory or to imagine or simulate others' minds and emotions.

One of the early manifestations is the attribution of false beliefs. Such second-order intersubjective abilities probably begin to emerge with the discovery of deceit and upon discerning deception in others. This marks a qualitative jump in conversational competence. In this chapter we return to verbal conversation with a focus on how the partners may read one another's mind, supplementing or completing what actually is being uttered. Examples will be offered in the form of fragments of conversations between Simone de Beauvoir and Jean Paul Sartre in which they complete one another's aborted or incomplete utterances. Such feats of reading the conversation partner's mind, which are shown also to apply to conversational partners less intimate than Sartre and de Beauvoir, mark the peak of conversational competence reached at the 2nd order layer of tertiary intersubjectivity, distinguished by Bråten (1998:327–328) and Bråten and Trevarthen (1994/2000; 2007:21–34).

## On theory-of-mind concepts: Theory version or simulation version?

The T-o-M concept came independently into prominence when applied to young children's understanding, and to the comparative domains of autism and primate behaviour (Baron-Cohen et al. (Eds) 1993; Leslie 1988; Premack & Woodruff 1978).

This has evoked extensive debates, reflected *inter alia* by the distinction of fundamental issues by Whiten and Perner (1991) in terms of "mind-reading". Harris (1991), for example, argues that children's mind-reading should be seen in analogue with the biographer's imagination rather than with the cognitive scientist's psychological theory. According to Harris (1989, 1991) the child can understand emotions in others by mental simulation of their feeling states, and can understand pretend actions without needing a 'theory of mind'. Harris and Gross (1988) explain the ability of 6-year-olds to distinguish between feeling states and emotional expressions in terms of the same kind of recursive processes that is involved in deception.

According to the *theory* version children develop and employ a folk-psychological theory which they use for inferences, prediction and explanation of other people's minds (Gopnik & Welmann 1992). Proponents differ with regard to learning and maturation. Leslie (1988:41), for example, speaks of the innate basis of "theory of mind", while Gopnik and Meltzoff (1993) point to infant imitation as a 'theory-of-mind' tutorial. Advocating the theory version, Alan Leslie and Tim German (1995:122) consider that the capacity to acquire a "theory of mind" is domain-specific and innate. They find the simulation version at worst implausible, and at best, just another theory version of the theory of mind, coined in simulation terms. And Gopnik (1993), who addresses the issue of how difficult it is to assess our own mental state, discards the possibility that we may understand others by virtue of simulating our own state. But then, when we assert the simulation version, to be turned to below, this is not what we mean. As Gordon (1995) puts it: Simulation [occurs] without introspection or inference from me to you. We rather speak of other-oriented simulation or imagination in the altercentric mode (cf. Goldman 1992, 2005; Bråten 1998a; Harris 2000:53).

According to the mental *simulation* version (Gordon 1986; Goldman1989; Harris 1991; Heal 1986) children imagine or simulate other's thoughts or emotions by putting themselves, as it were, in the shoes of the other. In the social-semantic domain of speech acts, similar ideas have been proposed by Grice (1975) who anticipated the theory version with his account of how we grasp the speaker's intention, and by me who anticipated the simulation version with my cybernetic model of mental 'co-actor simulation' during conversation (Bråten (1973ab, 1974), drawing upon my background of computer simulations of human communication.

## A conversation model of coding regulation through simulation of co-actor processes

As pointed out in Chapter 2, my simulation of mind model from the early 1970's drew upon many influences: First, it was influenced by G. H. Mead's (1934) point of

how we anticipate the other's response by virtue of perspective-taking, and partly by Liberman's (1957) motor theory of speech perception and Rommetveit's (1972) emphasis on the complementarities of our speech acts. Second, it drew upon my own computer simulations and laboratory studies of perturbed dialogues in which interlocutors falsely believe to share the same definition of the task situation. How did they proceed upon realizing that there was a breakdown of understanding? In today's theory-of-mind terms, Tomasello's (1999:308) would reply that "we more or less simulate other persons' behaviour and psychological functioning on analogy to our own". This is the self-oriented conception of simulating the other. The alternative other-oriented way in line with my mental co-actor simulation model entails our simulating the other by putting ourselves in the other's shoes.

The premises for this model are that upon breakdown of intersubjective understanding the actor will resort to simulation of the other's coding processes. It may be predictory simulation of the listener's comprehension process, or postdictory simulation of the speaker's production process. This implies that there has to be close links between perceptual and motoric processes in the act of speech and in the act of listening: During listening, implicit production of that which was said by the other would be evoked in the listener; while during speaking, implicit processing of that which would be heard by the other would be evoked in the speaker (cf. Figure 2.3 in Chapter 2 and Figure 10.1 in the present chapter).

The core features of this simulation of mind conversational model were presented at the 7th International Congress on Cybernetics in Namur 1973 in this way:

> "According to this frame man's symbolic activity cannot be understood or described as long as he is conceived [of] as a monad locked in a cell. The significant acts are made possible by ego's capacity for alter-oriented regulation of own acts by his assuming the role or the attitude of the other [...]
>
> Mead's notion of anticipatory response may be adopted and extended as part of a theory for encoding and decoding regulation, containing the postulate put forward by Braten [1973] to the effect that the actor regulates his coding activity through simulation of reverse coactor's coding processes, i.e., through covert experimentation with his coactor model [...].
>
> ... the actor regulates his encoding through covert predictory simulation of coactor's decoding, and regulates his decoding activity through covert postdictory simulation of coactor's encoding."
>
> (Bråten in the Namur proceedings 1974:328).

The year before, in a thesis in social semantics, I had posed this question: What kind of coding regulation is evoked in the normal adult during conversation – in particular when suspecting misunderstanding or being misunderstood by the other? Upon experienced breakdown of intersubjective understanding, I posited,

the actor will resort to alter-oriented simulations of the co-actor's perspective and processing; coding can be regulated on the basis of simulating the reverse coding processes in the coactor. Egos' encoding of what is (to be) said is regulated by predictory simulation of Alter's decoding. Ego's decoding of what has been heard is regulated by postdictory simulation of Alter's encoding. With the empirical situation-oriented semantics developed by Arne Naess (1953, 1961) as a point of departure, and consistent with Rommetveit's (1972:178–79) emphasis on the speaker's anticipation of decoding and the listener's reconstruction of the encoded message, the above was advanced as the main core of my social semantics thesis (Bråten 1973a).

## A conversation model of internal coding regulation by simulation of processing in the partner

Here follows a translated extract from one of the chapters ("Elements in a socio-semantic theory") in my Norwegian thesis on sign processing and meaning: towards a social semantic systems perspective:

> *Coding regulation through internal feedback circuits.* – Some of the conditions for establishing practical understanding in language interplay may be highlighted by a model of coding as [integrated] regulative circuits. It concerns the questions about the kind of mechanisms that enable an actor, first, to *be understood*, and second, to *understand* a co-actor during language interplay.
>
> G.H. Mead's concept of anticipation of the co-actor's response can be used in an explanatory reply to the first question: The actor regulates his utterance by calling up in himself the co-actor's response to the utterance he is in the process of making. To the extent that the co-actor's role is adequately taken, such regulative adjustment increases the likelihood that the actor will be understood. In his frame, Rommetveit (1968:65) points to encoding and decoding being complementary processes, and that encoding entails anticipatory decoding.
>
> This explanatory principle is retained in the first of the two following propositions about coding mechanisms:
>
> (H1) During execution of a sender program, the successive encoding of activated content into sign complex is regulated by internal feedback from implicit successive decoding of the sign complex ... (informed by the deviation between the activated content and the output of the implicit decoding).
>
> (H2) During execution of a receiver program, the successive decoding of a given sign complex into activated content is regulated by internal feedback from implicit successive encoding of the content ... (informed by the deviation between the given sign complex and the output of the implicit encoding)....

> The first statement (H1) expresses the assumption that satisfactory successive encoding depends on simulated decoding. Only if the sign complex being produced is also implicitly being processed can the sender program be adequately executed. The second statement (H2) expresses a similar assumption regarding the recipient program; it can be completed if and only if form is given to the content output of the sign processing. Adequate decoding presupposes simulated encoding...
>
> In the execution of a sender program, the goal state may be considered satisfied when the actor's expectation of being understood exceeds a certain threshold, such that he may answer 'Yes' to the following question: Would I in the other's shoes have understood what I am now in the process of saying? Upon satisfaction, the regulation by simulated decoding according to H1 discontinues. Neither this test, nor the regulative [internal] feedback, is implied to be conscious.
>
> In the execution of a receiver program, the goal state may be considered satisfied when the actor's evaluation of his understanding the co-actor exceeds a certain threshold, checked for by the following implicit test: Would I in the other's shoes have expressed in the way he did it what I have now understood him to say? As long as the reply is 'No' to such a question, the simulative regulation of his decoding according to H2 continues until his subjective evaluation exceeds the threshold value.
>
> The two propositions H1 and H2 may be reduced to the following postulate:
>
> (P1) By virtue of implicit simulation of the co-actor's [reverse] coding processes, the actor regulates his own coding processes from criteria that serve his attunement to the co-actor with respect to understanding and being understood.
>
> It should be noted that P1 concerns *internal* feedback and regulation from subjective expectations and evaluations. An actor may successfully execute symbol programmes if and only if he has resources for implicit encoding and decoding. These resources as employed differently in sender programmes and receiver programmes. The fact that *external* feedback serves to regulate the programme execution is beyond the domain of P1, H1 and H2.
>
> *Analogical to sensory-motor circuits.* – [...] Understanding of the circular coherency of regulation within the sensory-motor and the motor-sensory systems is basic to the understanding of the principle expressed by H1 and H2. Sensory-motor processes are local to the same global system, entailing that motor programmes cannot be adequately executed without involving sensory operations, and that sensory programmes execution requires motor operations as programme parts (cf. Gibson 1966:320).
>
> In conjunction, H1 and H2 express the postulate that the coding system [...] entails circularity analogue to the circularity of the sensory-motor system [...]
>
> The sensory-motor circularity may be given a psychophysiological functional explanation. Statements about circular coding processes permit a social psychological

> functional explanation. By virtue of functioning as a simulated recipient of the utterance which the actor is making *qua* sender, he may adjust the encoding to the co-actor system (a person, a group, a population) being the target of the utterance. By virtue of functioning as a simulated sender of the utterance which the actor processes *qua* recipient, he may adjust his decoding to the co-actor system producing the utterance.
>
> In the same manner in which a simulated *pre*diction of the recipient's decoding serve to regulate the sender's encoding, a simulated *post*diction of the sender's encoding serves to complete the recipient's decoding process....
>
> (Bråten 1973a:71–72, 75–80, translated by SB).

This would imply that it would be difficult to find pure cases of aphasia, and some refutable implications were discussed in light of reports on encoding and decoding impairments in aphasia. I also explored this conversation model through computer and empirical experimentation with paired students in a perturbed task communication situation (employing Blakar's (1973) map design). Facing one another, they are each given maps believed to be identical, except for a route marked on one of the maps. The task was to communicate that route to the other. Since the maps actually are different, communication was bound to break down. This study was presented at the next Namur conference on cybernetics (Bråten 1977).

Today, I would regard these proposed alter-oriented mechanisms, even though they operate at the second-order layer of tertiary intersubjectivity, to be backed up by the primary preverbal capacity for what I have termed altercentric participation, and to invite description, albeit at a higher-order verbal level, in almost the same terms used to specify the phenomena examined in my chapter on "Infant learning by altercentric participation – the reverse of egocentric observation in autism" (Bråten (Ed.) 1998:105–124): Unlike echolalia in autism, and which I attribute to be a result of egocentric observation of the speaker from the outside, as it were, the typical listener may be seen to be virtually co-authoring the speaker's talking as soon as the listener realizes the end-point towards which the utterance is headed. The speaker may be seen to be virtually co-enacting the listener's processing of the utterance and thus may come to arrest and modify herself in the midst of the utterance before any feedback is afforded by the listener to correct for the misunderstanding which the speaker by her altercentric participation feels to be building up in the listener.

## Manifest implication of simulation of the partner's mind: Sentence completion

Nearly three decades after building the above conversation model did I realize that sentence completion on the part of the listener from predicting where the talker is

heading would afford evidence of the listener's simulating or reading the conversation partner's mind. Here is a conversational episode which I expect would be familiar to most of the readers:

> You are listening to a conversational partner in the process of making a verbal utterance who then appears to hesitate or to be at loss for the right words, before the utterance is completed, and without hesitation you supply the words, completing the utterance of the speaker, who just goes on, repeating the completing, or silently nodding or confirming your adequate completion of the half-made utterance.

Sometimes, of course, the speaker may react differently, refusing to accept your completion of the sentence. Then, a misunderstanding is entailed, but which in turn may come to activate mind-reading. When you more or less unwittingly complete covertly or overtly what you experience that the other is about to say, you do so by virtue of altercentric simulation of the other's speech production. Even though the other is the initial author of the incomplete sentence, your virtual co-author participation in what has already been said enables you to overtly join in virtual co-authorship. Sometimes you are able to afford such a completion by virtue of simulating the conversation partner's mind; sometimes it suffices to be immersed in the narrative that is in the process of being unfolded, and in any case the jointly established conversational context matters.

## How two conversation partners complete one another: de Beauvoir and Sartre

Above I have attempted to indicate how altercentric participation may be operative in speech perception by the learner and in discourse by the conversational participants, virtually taking part in one another's production and processing.

In verbal conversation the listener may sometimes be heard to complete the sentence while in the process of being uttered by the speaker. Here are some snapshots, then, from the conversations with Sartre recorded by de Beauvoir (1981/1985) in Rome and Paris, which illustrate sentence completion. Below follow extracts from the English translation 1985 with some of the original 1981 expressions in French in italics in square brackets:

> De Beauvoir asks Sartre about what gave him the idea of writing a book about Jean Genet and about how Genet reacted to the book. In a very odd fashion, Sartre replies. While in the beginning he did not take much notice of it, but then one night Genet got up and went to the fireplace with the intention of burning the book….

SARTRE: I believe he did throw some pages in it and then plucked them out. It disgusted him because he felt that he was as I had described him, and although he was not disgusted with himself, yet…

DE BEAUVOIR: Yet he was disgusted that a book should be written about him. It was like a funerary monument. [*Mais il était dégoûté qu'on écrive un livre sur lui; c'était comme un monument funéraire.* [p. 389]]

SARTRE: He did not argue about the ideas. He thought that on the whole the things I said about him were true…(p. 273)

Later they talk about the way in which Sartre relates to other people, about Sartre being unable to be at ease with other people (p. 289).

DE BEAUVOIR: Once again I say it's odd, this contrast between your stiffness and a welcoming attitude, a kindness, a warmth, as soon as.....[*une gentillesse, une chaleur dès que...*]

SARTRE: As soon as anyone turns to me to ask for something, it vanishes [*Dès qu'on s'adresse à moi pour me demander quelque chose, ca disparaît.*]

DE BEAUVOIR: Yes, because at that moment you are acknowledged. [*Qui, parce qu'à ce moment-là vous êtes reconnu* [p. 412]].....

In another conversation episode (on pages 325–28) they talk about Sartre's neglecting his body and of his being aware of his "ugliness", and of his lively way of walking which became a nervous tic when he was fifty or fifty-five. And Sartre comments:

SARTRE: I was rather overwrought for ten years or so. It's over now.

DE BEAUVOIR: It came from an excess of Corydrane, I think. [Sartre echoes: I think].You used to take quantities of stimulants... and what's more they brought on a crisis.

SARTRE: But do you see, my trusting in Corydrane was to some extent the pursuit of the imaginary. While I was working, after taking ten Corydrane that morning, my state was one of complete bodily surrender. I perceived myself through the motion of my pen, my forming images and ideas. I was the same active being as Pardaillan, neglecting... [*j'étais cet être actif qu'était Pardaillan, négligeant...*]

DE BEAUVOIR: ...the real body, which was in the act of destroying itself (p. 328) [*Le corps réel qui était en train de se ruiner* [p. 465]] and against which you have always had an almost aggressive attitude. ....

(extracts from de Beauvoir: 1981/1986).

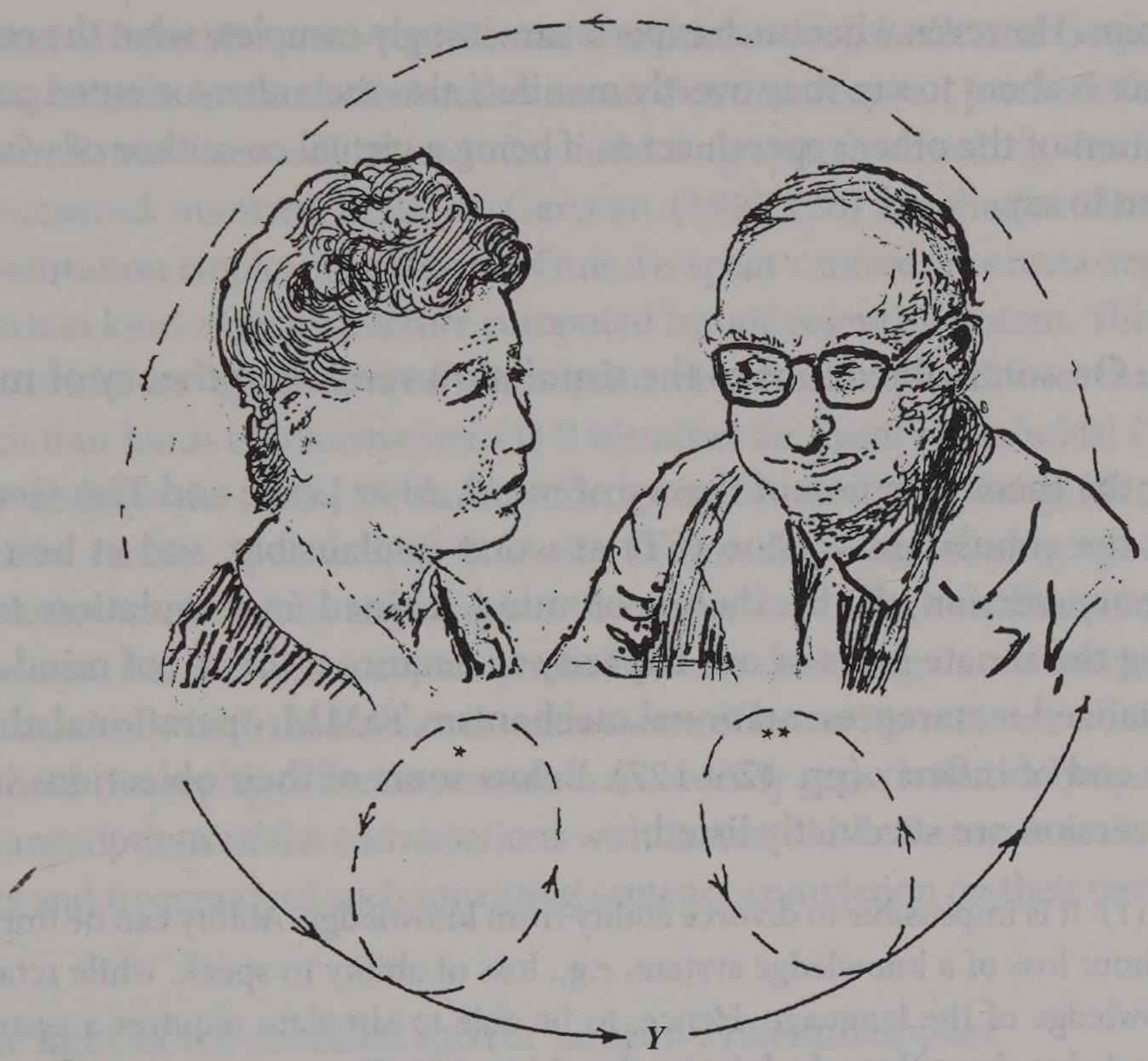



**Figure 10.1.** Simone de Beauvoir in conversation with Jean-Paul Sartre. They sometimes complete one another's statements, as exemplified by the recorded conversations in de Beauvoir (1981/1986). When one is in the process of uttering something, the other sometimes completes the sentence – which invites being accounted for in line with the sociosemantic simulation of mind model (Bråten 1974) and in terms of the operating characteristic of other-centred simulation (Bråten 1998a, 2002):

* While she is about to say something it may occur that de Beauvoir engages in anticipatory simulation of how Sartre may come to process and understand her utterance *Y*,

** While Sartre listens to what de Beauvoir is in the process of uttering, he may sometimes complete what she was about to say by virtue of his participatory simulation and co-articulation of her utterance *Y* as if he were a co-author. In this way the two of them also change place when she completes what he is about to utter.

Readers may object that Sartre and de Beauvoir knew one another so well from a life long partnership, having grown accustomed to what the other was thinking and saying that such sentence completion would come as no surprise. No simulation of mind is needed; it would suffice to say that they are immersed in the current narrative which both of them know well (cf. Gallagher & Hutto 2008). That may be true. However, it is not difficult to find other conversational cases of sentence completion, in which the participants do not know one another that well. For example, Bråten & Rosness (2001) have reported several such occurrences of sentence completion in two laboratory groups assessing safety measures on ships (cf. also Rosness 2004). Of course, their lacking knowledge of one another is compensated for by their being immersed in the given narrative context and being in command of the expert terms for safety

aspects of ships. However, when such experts unwittingly complete what the conversation partner is about to say, they overtly manifest also their alter-oriented participant perception of the other's speech act as if being a virtual co-author of what the other is about to say.

## Discussion: On some objections to the simulation version of theory of mind

Advocating the theory version of theory of mind, Alan Leslie and Tim German (1995) find the simulation version (ST) at worst implausible, and at best, just another theory version of the theory of mind, coined in simulation terms. Emphasizing the innate basis of our capacity to acquire a theory of mind, they label a specialized metarepresentational mechanism ToMM, operational already towards the end of infancy (pp. 126–127). Below some of their objections to the simulation version are succinctly listed:

> -ST(1). It is impossible to divorce ability from knowledge. Ability can be impaired without loss of a knowledge system, e.g., loss of ability to speak, while retaining knowledge of the language. Hence, to be able to simulate requires a system of knowledge about that which is simulated (pp. 124–5).
>
> -ST(2). Representations of propositional attitudes are required; i.e., agent-centred description of a situation in terms of meta-representations, e.g., *mother* PRETENDS (of) the banana (that) "*it is a phone*". Opacity is reflected in pretend play, and a translation machinery (an innate ToMM-module) is required to translate a literal, transparent description into representation of a particular attitude (e.g., PRETENDS) that agents can take to (the truth of) information, and interpret behaviour accordingly (p. 126)
>
> -ST(3). According to ST "the only way you can understand someone else is to "pretend" yourself "into their shoes" (p. 129). But as Leslie (1994) points out, this is a problem when it is not clear whether the other is pretending or not pretending. Theoretical inferences are required, and even if simulation may replace inferences, control processes are required to organize them and to interpret the results.
>
> (Leslie & German 1995:129–130).

The above objections to the simulation version of theory of mind rest on the assumption underlying the theory version of theory of mind, namely that reflective knowledge about others is required to drive understanding of other minds. Indeed, even the defining characteristic of "imputing or attributing mental states" implies this mode of relating to oneself and to others in a calculative and reflective manner from the stance of a scrutinizing observer. There is, however, another mode of relating to others in felt and presentational immediacy which is non-reflective, not mediated by theoretical or conceptual representations or meta-representations. Deliberate or conscious interpretation is a matter of theory, while unwitting simulation is not.

The kind of reflective meta-representative module which Leslie and German attribute to the conscious human mind makes sense. But that does not preclude the operation of a much more immediate and non-reflecting system affording simulation in an other-centred manner. Leslie & German (1995:126) emphasize that the meta-representation employed in theory of mind is agent-centred: The meta-representation is a certain kind of data structure computed by our cognitive system. This data structure provides an "agent-centred" description of a situation. It achieves this by making explicit four kinds of information: (1) It identifies an Agent [who holds] (2) an identified attitude [to the truth] (3) an identified propositions [describing] (4) an identified aspect of reality. Specified in this way, the mechanisms at play upon sentence-completion could not be anything but theoretical and reflective. That may sometimes be the case. But such an account cannot hold for unwitting occurrences of sentence-completion of which the listener is made aware of her or his sentence-completion only if exposed to a replay of the conversation record. My guess is that only upon looking at the transcriptions of the conversations with Sartre, did de Beauvoir realize the occurrences and frequency of such unwitting sentence completion on their part.

## In the light of the revealed mirror neuron systems support

And then, there is the matching resonance attesting to an understanding of what the other is about to do by virtue of embodied simulation which is completely devoid of propositional description. As we saw in Chapter 2, Rizzolatti and Arbib (1998:188–194) quote a recent status report on speech research by Liberman (1993) where he *inter alia* makes the point that the processes of production and perception must somehow be linked in the sender and receiver of communication. With this as a preface the authors spell out the relevance of the mirror neurons discovery. Examining experimental results suggesting that a mirror system may be operative in human ontogeny and phylogeny, they suggest that mirror neurons support may have marked the beginning of intentional communication:

> "The actor will recognize an intention in the observer, and the observer will notice that its involuntary response affects the behaviour of the actor. The development of the capacity of the observer to control his or her mirror system is crucial in order to emit (voluntarily) a signal. When this occurs, a primitive dialogue between observer and actor is established."
>
> (Rizzolatti & Arbib 1998:191)

With reference to Donald's (1991) assumption about mimesis as precursor to language, they speculate on the sequence of events that might have led from gestural communication to speech. It is likely, they state, that the human capacity to communicate beyond that of other primates depended on the progressive evolution of the mirror system.

In their article on "Mirror neurons and the simulation theory of mind-reading", Gallese and Goldman (1998) explore *inter alia* the possibility that a mirror neurons system underlies the process of 'mind-reading', or serve as precursors to such a process. In so doing, they distinguish the TT and ST versions of the Theory-of-Mind approach in these terms: While TT, the theory version, depicts mind-reading as a thoroughly 'detached' theoretical activity, ST, the simulation version, depicts mind-reading as incorporating an attempt to replicate, mimic, or impersonate the mental life of the target agent. While the TT draws upon a theoretical reasoning system to predict what another will decide to do, inferred from processing in terms of this knowledge system the pertinent beliefs, desires and decision principles attributed to the other (the target), there is in the simulation scenario a distinctive matching or 'correspondence' between the mental activity of the simulator and the target. With respect to simulation, a significant portion of the mind-reading episodes involves the process of mimicking the mental activity of the target agent, while the TT does not entail any such mimicking as a part of the mind-reading process. This contrast, they point out,

> "presents a potential basis for empirically discriminating between ST and TT . If there is evidence of mental mimicry in the mind-reading process, that would comport nicely with ST and would not be predicted by TT."
>
> (Gallese & Goldman 1998:497).

And one might add in the same vein: if no case could be made for any matching or similarity between the states or processes occurring, respectively, in the "mind-reader" and in the target subjected to mind-reading, then that would suffice to disconfirm ST and support TT. Given the TT assumption that mind-reading is theory-driven, i.e., rests on a theoretical knowledge system applied in the explanation or prediction of the target's behaviour, the mental states and information processes of derivations in the mind-reader would necessarily have to be radically different from the processes occurring in the target. In contrast, as Gallese and Goldman (1998:497) declare, the ST implies that "there is a distinctive matching or 'correspondence' between the mental activity of the simulator and the target." They also point out that mental simulation can be used not just to predict mental states, for example, by providing a predictive reply to the mind-reader's question 'how would I in the target's shoes react to what I am now doing?', but also for 'retrodicting' or postdicting, moving backwards from the observed action in the target: "What goal did the target have that led him to perform the act he just did?" They consider this to be in support of ST, while admitting that a "proponent of TT might say that TT also has ways of accounting for retrodictive attribution of mental states". In defense of TT, they point out, it would be possible to consider prediction and postdiction also as processes derived from TT, just as scientific theories allow for

prediction and explanation of phenomena without affording to match the predicted or postdicted phenomenon in the sense required by ST (cf. Gallese & Goldman 1998:497–498). But again, the difference between TT and ST has to do with the degree of conscious or reflective mind-reading at play, as in TT, versus the immediate participant perception pertaining to ST.

Such an immediate sense is consistent with the coding simulation mechanisms specified in the above conversation model of how interlocutors monitor their own production and understanding of utterances by predicting and postdicting the coding processes in the dialogue partner (cf. also Chapter 2 (Fig. 2.3)). While producing an utterance, the producer may monitor his production by mental prediction of the decoding process in the other, as if he were asking: "Would I in the listener's shoes understand what I am about to say in the way in which I intend it?". Analogously, the listener may check his own understanding of what he hears by postdicting the speaker's encoding process, as if the listener were asking: "Would I in the speaker's shoes have chosen the formulation I heard if I were to express the meaning I have taken him to express?" (cf. Bråten 1973a:77; 1974). If such questions were actually asked by the speaker or the listener, then that would be consistent with the TT version, implying conscious reflection. If the speaker or the listener, on the other hand, behave and simulate *as if* they could have afforded replies to such questions if they had been asked, that would have been more consistent with the ST version. To the extent that the listener is able to become a virtual co-author of the speaker's production by virtual participation in what the speaker is saying, such as also implied by Liberman's (1993) motor theory of speech perception, immediate or automatic 'replies' could have been yielded to such postdictive or 'retrodictive' questioning.

Thus, Gallese and Goldman find the discovery of mirror neurons (MNs) to support the ST version, and not the TT version, of the theory of mind assumptions. Their conjecture is that the mirror neurons found in the macaque monkey brain do not constitute a full-scale realization, but only a primitive version, or possibly a precursor in phylogeny, of the simulation heuristic that might underlie mind-reading. The kind of matching that is entailed between processes or states in the target and the observer, is consistent with the ST version, but not the TT version:

> +ST(1) "The point is that MN activity is not mere theoretical inference. It creates in the observer a state that matches that of the target. This is how it resembles the simulation heuristic. Nothing about TT leads us to expect this kind of matching [...]
>
> +ST(2) A further link between mirror neuron activity and simulation can be inferred from the fact that, as the TMS [magnetic stimulation study] experiment by Fadiga et al. [1995] demonstrates, the human equivalent matching system facilitates in the observer that same muscle groups as those utilized by the target.

> This supports the idea that even when one is observing the action of another, one undergoes a neural event that is qualitatively the same as an event that triggers actual movements in the observed agent. It is as if the tracking process in the observer is not taken entirely off-line [...]
>
> +ST(3) If TT were correct, and an observer represents a target's behaviour in a purely theoretical fashion, it would not be predicted that the same muscle group would be facilitated in the observer as in the target. But if ST were correct, and a mind-reader represents an actor's behaviour by recreating in himself the plans or movement intentions of the actor, then it is reasonable to predict that the same muscular activation [when not entirely inhibited] will occur in the mind-reader. As matching muscular activation is actually observed in the observer, this lends support to ST as opposed to TT."
>
> (Gallese & Goldman 1998:498).

Such matching muscular mouth-movements are also revealed by some of the feeding infants previously referred to (cf. Figure 2.1), manifested by the way in which they unwittingly open their mouths while reciprocating the caregiver's spoon-feeding, i.e., opening their mouth as the one who is fed opens his or her mouth. With the likely support of an adapted mirror neuron system there is a developmental path from such bodily pre- and re-enactment of movements to pre- and re-enacting simulation of mind later in ontogeny.

## Is simulation of mind self-oriented or other-oriented?

While the controversy between proponents of the theory version and the simulation version of mind reading may be enlightened by the discovery of mirror neurons, there is another issue that remains to be returned to and clarified. This concerns whether we draw upon self-insight or upon insight in the other when we resort to simulation of the other's mind. This issue was raised by Rommetveit (1974) when referring to my simulation of mind conversation model of mental co-actor simulation during verbal conversation (as illustrated in Figure 2.3):

> "And what is implied by a capacity to adopt the perspective of 'the generalized other' as opposed to a generalized capacity to adopt the perspectives of different 'others' may be further explored in a computer simulation of human communication (see Braten 1973). Anticipatory decoding may thus in a simulation programme be defined as involving simulation of self in the other's situation, i.e., the speaker may ponder: what would I take for granted if I were 'in his shoes'? He will in that case act on assumed similarity: his speech is monitored on the premises of the listener, provided that the latter is similar to himself. The generalized other is thus, in a way, a projection of self.

> But anticipatory decoding may also be conceived of as a simulation of the other in the sense that the listener's temporary social reality is inferred on the basis of the speaker's knowledge of what the listener thinks and feels in other situations [...]. It may hence make sense to conceive of simulation of self versus simulation of other in terms of individual differences, as characteristics of [self-oriented] 'autistic' as opposed to 'other-oriented' communication."
>
> (Rommetveit 1974:59).

These questions with reference to my thesis in Rommetveit's book *On Message Structure*, which deserved his intended title 'On the architecture of intersubjectivity', actually anticipated recent and current debates on theory of mind in two ways. First, it concerns the issue whether mind-reading is based on simulation of the other or on the speaker's knowledge or (folk) theory about the other's thinking, i.e., the theory version versus the simulation version. Second, it raises the issue of whether the listener simulates the other in terms of self, i.e., self-oriented simulation, or simulates the other by putting oneself in the shoes of the other, i.e., other-centred simulation. The latter is what I had in mind when formulating my simulation of mind during conversation model. And, then, recently, Gallese and Goldman (1998) point to the way in which the speaker's attempts to reach an anticipatory or predictory reply to her question "how would I in the target's shoes react to what I am now doing?", and how could an act be post-dicted:

> "for "retrodicting" or postdicting, moving backwards from the observed action in the target: "What goal did the target have that led him to perform the act as he just did?"
>
> (Gallese & Goldman 1998:497).

This is completely in accordance with the listener's postdictory simulation of what the speaker was about to say, as specified in the above model (Bråten 1973ab, 1974, 2002) and consistent with Liberman's (1957, 1993) motor theory of speech perception. Today I see such postdictory simulation as entailing altercentric participation in the speaker's utterance process inviting the listener to become a virtual co-author of the utterance in the process to be made.

That which has been highlighted as a decisive characteristic in autism – the lacking ability to read other minds – irrespective of whether we see this as impaired theory-of-mind construction ability, or impaired simulation of mind capability – is an ability which typical children only show from three years of age or later. Some of those advancing the theory-of-mind version uses the fact that typical children have difficulties in interpreting their own mental states as a counter-argument against the simulation version, assuming that this version presupposes drawing upon the simulation of own state to infer about the mental states of others (cf. Gopnik 1993). But that need not be pertinent; those who

advance the simulation version of theory of mind need not, as we have seen, assume inferences from own state (cf. Bråten 1973a, 1974; Goldman 1993, 2005; Gordon 1995). Yet, we would all agree that mind-reading, irrespective of the underlying mechanisms, is impaired in subjects with autism.

## On the nature of the path from bodily imitation to participation in another's mental life

And the typical ontogentic path to this 2nd order tertiary intersubjective ability is likely to be from bodily simulation of other's movements to mental simulation of the other's intention. In an *Impuls* interview with Gallese and myself we were asked whether there is such a path, then, in child development, from bodily to mental simulation, and whether that would be a self-centred path or an other-centred path by way of virtual other participation (Bråten & Gallese 2004:99). I pointed out that in the conclusion to the proceedings of the first Theory Forum symposium ten years earlier we had still been far from understanding the qualitative jump from infant intersubjectivity (at layers I and II) to children's second-order understanding of others' thought and emotion (at layer III). In that volume Meltzoff and Moore (1998) had suggested that there may be a tutorial path from experience of bodily resemblance to discovering familiarity of minds. We asked there and then if neonatal imitation of bodily movements is a precursor of mental simulation of others' intended movements, and whether that in turn afforded an ontogenetic path to simulation of other minds. Now we are in a better position to confirm that there is such a path by way of learning by imitation and – as some of us would say – entailing other-centred participation in the sense of being a virtual co-author of what the model is doing.

In Chapter 5 of his book on *The Present Moment in Psychotherapy and Everyday Life*, Stern (2004) reviews the evidence, including neuroscientific evidence, for the intersubjective matrix in early ontogeny. Experiencing the other *as if* we are executing the same action, feeling the same emotion, making the same vocalization, or being touched as the other is being touched, in line with the *as if* mechanisms described by Damasio (1999) and Gallese (2001), such 'participation' in another's mental life entails a sense of shared feelings and understanding (Stern 2004:79):

> "The essential point is that when people move synchronously or in temporal coordination, they are participating in an aspect of the other's experience. They are partially living from the other's center."
>
> (Stern 2004:81).

The intersubjective capacity enabling such early feats has according to Stern been captured in a synthesizing manner by my conception of alter-centric participation,

which he considers to be the basic intersubjective capacity that makes imitation, empathy, sympathy, emotional contagion, and identification possible." (Stern 2004:241–242). And, what is more, as we have seen above and in the previous chapters, when engaged in such other-centred participation in your companion you may sometimes reveal by your muscle movements or accompanying utterances how you virtually partake in what the other is doing or saying, manifested for example by lifting one's leg when watching a high jumper, when opening one's own mouth when putting a morsel into another's mouth, or when completing the conversational partner's sentence.

## On now-moments and other-centred moments of meeting in clinical conversations

In collaboration with the Boston Change Process Study Group, Stern has searched for and uncovered the characteristics of certain intersubjective events that entail changes in the therapeutic process. They are termed 'moments of meeting' in which some previous critical 'now moment' is resolved. He invokes the Greek term *kairos* to characterize the almost "moment of truth" nature of such significant micro-events that sometimes entail qualitative leaps in the relationship. As distinct from *chromos* entailing the running arrow of time, kairos entails a small window of becoming or of opportunity – a time in between in which something special happens or may happen which entails a qualitative change.

Stern (2004:245) defines the key concept of 'the present moment' as the span of time in which psychological processes group together very small units of perception into the smallest global unit (a gestalt) that entails an experiential sense or existential meaning in the context of a relationship. Objectively, present moments last from 1 to 10 seconds with an average around 3 or 4 seconds. Subjectively, they are what we experience as an uninterrupted *now*. The present moment is structured as a micro-lived story with a minimal plot and a line of dramatic tension made up of vitality affects, emerging as the moment unfolds, as (inter)subjective experiences entailing analogical shifts in temporally contoured changes in feelings. Here is an example of a face-to-face present moment giving rise to a qualitative change in feeling intensity: After having been listening, the listener says: "I do not think you are quite frank with me", or even "I don't think you are telling the truth," followed by silence (p. 36). As those present moments unfold, there are split-second micro-shifts in the intensity or quality of feelings in the sensitive speaker, perhaps even an explosive contour.

> The current contents of mind contained in a present moment may sometimes slide unnoticed or sometimes, as novel or problematic, unpredictably jump into

> awareness as a first-person experience, a holistic happening felt as a whole, not something that allows to be regarded from a third-person perspective. Having short duration, of roughly several seconds, present moments occur "in the time slot of immediate presentness", entailing a dynamic of time-shapes, involving some sense of self and inviting the experiencing self to take a stance
>
> (Stern 2004:32, 34, 38–39).

> The key notion is that in psychotherapy certain moments emerge that call into question the current status of the working relationship between therapist and client, (for good or ill). These moments, called "now moments", are a sort of "moment of truth" or of *Kairos*. They create a mini-crisis needing resolution [...] They are resolved by "moments of meeting". These involve a moment of mutual other-centered participation in which both partners create and undergo a joint experience. The experience is of short during: seconds, subjectively a present moment. This resonant experience enlarges the intersubjective field between them which then opens up new possibilities for exploration. A qualitative leap is accomplished. A change has occurred.
>
> (Stern 2007:43)

As Stern points out, such present moments may last from one to ten seconds; subjectively, they are what the participants experience in an uninterrupted now.

And here is a clue for looking for indications of such moments of meeting during the talks and conversation with the client. Sometimes, when the therapist hesitates or aborts a statement or a question, the client may come to complete that statement or question as if she as a listener had been in the process of uttering it as a co-author, virtually participating in the utterance as if being in the speaker's centre. Needless to say, if such a mode of other-centred participation is manifested by a patient who suffers depression, and thereby has an impaired ability for empathic identification with others, such an instance of other-centred participation may entail a break-through for an otherwise depressed and passive client. Examples have been found by Kari Vik (2004) in her study and clinical guidance of mothers with symptoms of postnatal depression, and various degrees of impaired (proto) conversation ability, when afforded video-related counselling in line with the Marte Meo method during joint viewing of playback of video records of their interaction with their infants. A severely conversation-impaired mother who initially could hardly speak or converse, barely whispering to herself and holding her baby as an object at a distance managed with such therapeutic guidance to transcend her self-centred state. In Chapter 7 we noted how Lynne Murray (1991) had found many mothers with post-natal depression to be self-centred, concerned with their own state rather than with their infant. Invited to visit her at the Winnicott research centre in Cambridge, she showed me pertinent video recordings, and I noticed how some of the depressed mothers when giving milk from bottles tended to hold

their infant away from their body, at their knee-cap as if the baby were an object to be handled, and not held in the sense of Winnicott. One of the mothers afforded video guidance by Kari Vik, exhibited this distant manner of holding her baby. But her holding behaviour changed after her guidance sessions. When afforded counselling and encouragement by way of jointly watching with the therapist video replays of her interaction with the infant she manifested how she came to transcend her self-centred state by sometimes completing the therapist's unfinished statement, as a sign of altercentric participation:

Therapist: "And then you are saying 'perhaps he is hungry'."
Mother A: (Nodding)
Therapist: "and you are not quite… it does not look like *you are quite*…"
Mother A: "*certain*"
Therapist: "certain." (Vik & Bråten (2009) in *Infant Mental Health Journal 30* (3):8)

She who initially, before the video replay guidance, could hardly speak or converse, merely shaking or nodding her head, now suddenly comes up with completing the half-spoken utterance of the therapist in the second video guidance session. Now, she is not just listening to what the therapist is saying, but even participates in what the therapist is about to say as if she were a virtual co-author, thereby breaking out of her self-centred state, and which in turn came to be reflected in her holding behaviour towards her child. This may be taken to be a moment of meeting in the sense of Stern, entailing a qualitative change and affording a resolution of the critical now moment in her first encounter with the therapist, when the mother admitted that she felt that her son did not know her.

## Note: On some issues of time in observation and computer simulation of conversation

Conversational participants reflect upon what they have been saying and are saying to each other. When such self-other referential loops are elicited in the laboratory through the use of video playback, how does time enter into the picture, and how may it be represented in computer simulations of conversations? To the observer of participants in conversation – be it protoconversation between infants and adults, or conversations between children peers or adults – time references enter into the observer's characterization in a way that may differ from temporal aspects as experienced by the participants.

First, any kind of conversation involves turn-taking, for example, between questions and replies, uttered in response to past questions, and perhaps, in the anticipation of future questions to come, while each turn may only last a couple of seconds.

Second, in order to engage in a mutual co-operative undertaking, the participants somehow have to be contemporaries, in other words, to co-exist in each other's present. While entertaining complementary perspectives or frames, they somehow appear to share a present "here and now" (Rommetveit 1974).

Third, intimates in dialogue will sometimes exhibit inter-bodily coordination and attunement with the matching of small movements that require slow-motion video-replay or frame-by-frame analysis in order to be captured by the observer. For example, when analyzed frame by frame, or on a continuous scale, Trevarthen (1979) finds infant-adult dyads in proto-conversation to exhibit a finely tuned dialogic dance, involving turn-taking to the split second, without any collision of noise or gestures.

Such description in observer's time applies to the pattern exhibited by the dyad. But were we to apply the descriptions in an account of how each of the participants *qua* physically disconnected monadic individuals could contribute to or generate such patterns difficulties may arise. We could envisage or even try to simulate the dialogue participants as two observers of one another, each with a time clock on hand or in the body, who externally timed their reciprocal gestures in an effort to achieve mutual coordination. But the immediacy of their reciprocal gestures of mutually completing one another would escape such an attempt. In a ping-pong match, for example, if one of the players were to consciously monitor his adjustments during the game, he would be in trouble. Conscious adjustment may require more than a second to come into play, and perhaps another second to take effect (cf. Deeke et al. 1976; Libet et al. 1979). In the actual game co-ordinations occur to a split of a second between different parts of the body of the player as he adjusts to the movements of the other, without having time to think about it or plan it.

When two teenagers or adults engage in an intimate conversation the co-movements they may manifest in synchrony usually occur unwittingly. Unless they are arguing, with the talker leaning forward and the listener leaning backwards in a sceptical posture, they may come to exhibit matching movements and postures that indicate inter-bodily attunement. When the other echoes one's bodily posture and movements feelings of warmth and attunement may arise. When there is mutual attunement or strong rapport even tiny movements, the stretching of the lips, the raising of a finger or a hand, may come to be matched by the other in a way that indicates interpersonal bodily attunement. Desmond Morris (1968:85) terms this "postural echo": "As the speaker jerks his body with the emphasis he makes on different words, so the listener makes tiny, matching movements of some part of the body."

Similar features sometimes emerge from analyzes of video-tape recordings of infant-adult protoconversation, and of adult friends in intimate conversation. A fine mutual bodily attunement is revealed. They show themselves to enter into similar bodily postures and gestures, sometimes in perfect co-ordination, as if they were of one body, not two. Like the proprioceptively felt own body movements, the other's movements are alteroceptively felt in an equal mode of felt immediacy (Bråten 1988; Trevarthen 1986). For example, the snapshots of an 11–days-old baby at the nursing table in interplay with her mother (Fig. 1.2 in Chapter 1), indicate mirroring and mutual attunement, as reflected by the gestures and bodily postures of mother and child. There is reciprocal co-ordination of body movements.

But, then, what kind of qualitative time is involved in a primordial dialogue during which the participants feel to be in communion with each other and exhibit postular echo and inter-coordination of gestures? In what sense can they be said to share an immediate present? When they in rare moments exhibit perfect coordination and show by their bodily postures to be in attunement, in what way can they be said to share a "here-and-now"? When patterns of inter-bodily coordination and what Morris terms postular echo are exhibited, can they be taken as indications of "interpersonal communion", as Stern (1985:148) terms it? If there are such indications, how can they be accounted for in temporal terms of the present and of present moments that supplement or complement the observer's description in terms of the arrow of time? In formal models of such domains we cannot avoid problems and paradoxes of temporality (returned to in the epilogue). We tend to seek for resolution and resolve them in an 'either-or'

manner: either we allow for running time, or we exclude it from the domain in terms of a time-less logic. When doing computer simulations, is there a third alternative that may take into account the intersubjective present shared by the simulated participants, and as distinct from the unarrestable arrow of time to which we have to adhere as outside observers of the corresponding empirical event? A tentative reply is suggested in these notes.

## The third person and the present in affect attunement

For dialogue participants, even in the artificial surroundings of a laboratory, differences may occur with respect to including or excluding the third person. For example, when observing (through one-way screen or through the camera eye) adults engaged in a dialogue, I have noticed how one of them may be seen to focus his attention solely on the other, while the other includes the camera in his attention space, being aware also of the observer "out there". In such incidents, we might say that while the other and the observer are in the present of one of the participants, the observer is excluded from the other's present and belongs to his past.

Similar incidents apply to events of proto-dialoguing between an adult or elder sibling and a baby in home environments. Being aware of my camera recording the adult or elder sibling attends to the baby, while the baby is solely focused on the other dialoguing participant. While the baby and I are in the present of the adult and the sibling, only they are in the baby's present, while I may belong to the baby's future – until some camera noises or other things bring me and the camera into the baby's present. The baby suddenly stops his engagement in the proto-dialogue and turns with apparent interest to the camera or camera-man. It may be elicited by a "false" note in the actual other, indicating that they may be momentarily out of attunement, or by noises made by the camera-man, or for some other reason. The parent or elder sibling will follow the baby's gaze and may even comment on it: "Ah, isn't grandpa funny?", or "You're more interested in grandpa and his camera (than in me)!?" The proto-dialoguing has stopped. But the others may continue to be in the baby's present. The baby may be attending the camera-man with his actual adult or elder other. That is, the actual other shares in the changed focus of attention. The baby turns with his actual other, who follows and accompanies his turning.

During what Daniel Stern (1985) describes as interpersonal communion or affect attunement between adult and infant, the baby may be engaged in some play, for example focusing on the doll, while the mother accompanies the baby's doings with comments. Only when a false note creeps in, or she turns her mind elsewhere will the baby turn to gaze at her, becoming an observer who reacts to the absence and dissolution of the affect attunement. While there is a shared intersubjective present in affect attunement, it may be acknowledged only when it is broken.

## On self-reference and simulated time being arrested for dialogical loops to be completed

Spencer-Brown suggests that time is being generated through the possibility of a form re-entering itself – without disappearance of the boundary. Seeking to extend the calculus of indication in a self-referential direction in a time-less manner, Varela (1979) introduces a symbol (and value) for such a re-entry. Later he points to the peculiar dual nature of self-reference for the observer: either we behold a closing circle as a complete figure or we travel through the circle ceaselessly. Both aspects are explicit in the notion of autopoiesis, for example, in

our picturing the biological cell in this dual perspective: the invariance of its unity and the underlying recursion, the cyclical sequence of processes in time. Time and self-reference cannot be divorced:

> "Therefore we find a peculiar equivalence of self-reference and time, insofar as self-reference cannot be conceived outside time, and time comes in whenever self-reference is allowed."
>
> (Varela 1979:125).

When approaching a biological systems, such as the cell, assumed to be monadic in its invariant unity in an almost Leibnizian sense, perhaps such an unquestioned notion of time may apply. But when it comes to self-reference in a conversational system, the notion of time as smoothly running its unarrestable course may present a problem. Even the monadic case of a singular event of self-referencing invites questions, simply because the point of departure for the self-referential arrow would have been lost in the past before the closure could be achieved (cf. (Fig. 10.n (i)).

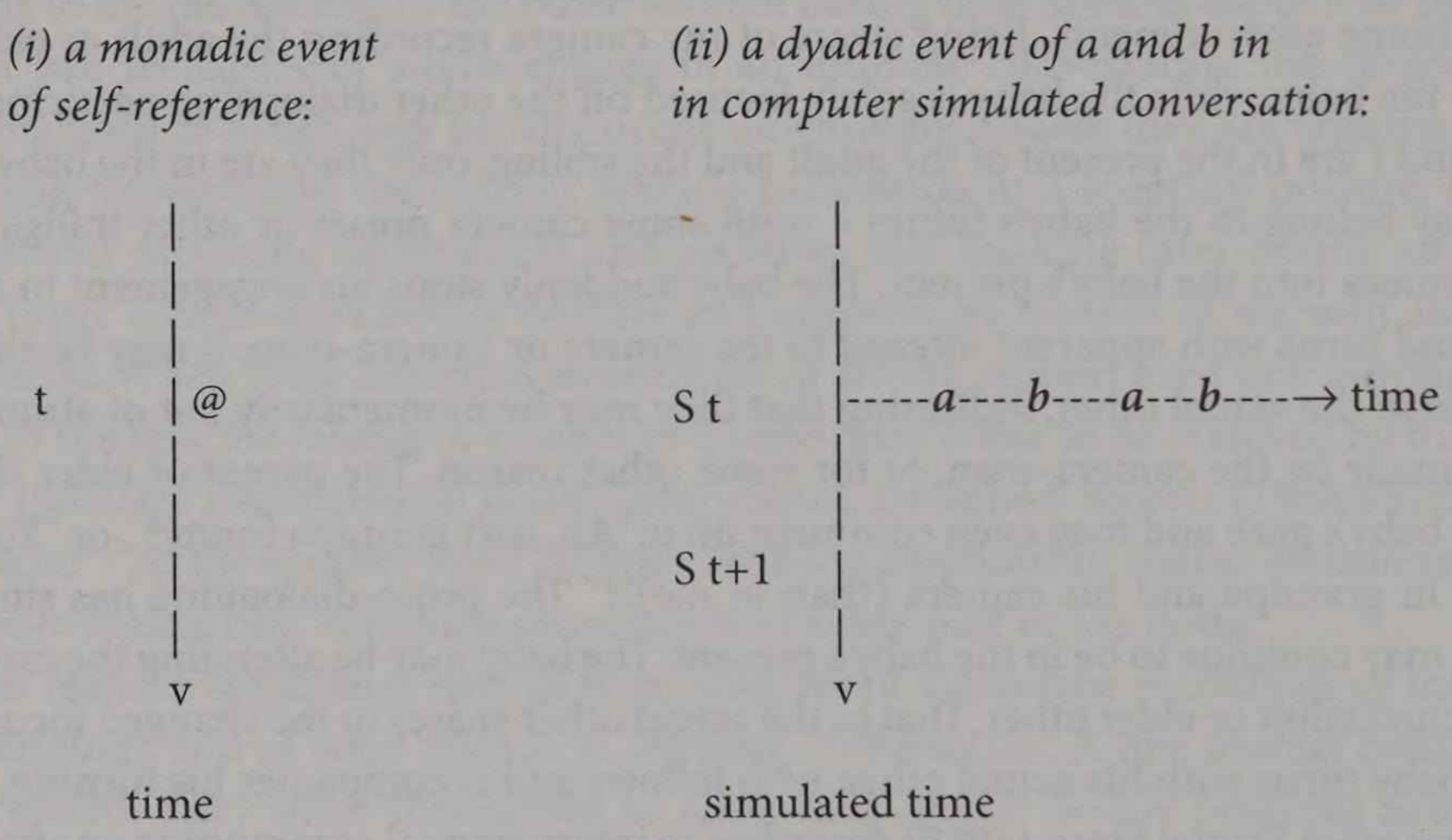



**Figure 10.n** Time as an unarrestable arrow and when arrested in simulated systems time St.

(i) The problem of singular self-reference, given an unarrestable arrow of time: how can a self-referring loop (@) be completed before its point of departure has escaped in the past, becoming a past event?

(ii) Self-other referencing in conversational participants, as implemented in a computer simulation model of conversational dyads, in which processing time and simulation time differ: the simulated time is held until the ***ab***-interaction is completed, such that S t := S t+1 if and only if ***a*** and ***b*** have completed their interaction entailing completion of one another's interaction programs (Bråten 1968, 1971).

If the flow of time cannot be "arrested", how can it allow for a self-referring loop, symbolized by @ in Figure 10.n, to reach back to itself before its point of departure has escaped in the

past and become a past event? We may reply that the actual point of departure for the loop may only be preserved by being re-presented in memory. In that case the idea of self-reference (in the sense of auto-reference) is replaced by the notion of reference to a symbolic self, belonging to a different domain. The issue becomes even more complicated when *two* or more actual occasions share an immediate present, to which they bring their individual past histories to bear, and give rise to concurrent self-other referential loops that are temporarily interweaved. In my computer simulation models of moral-processing conversational dyads in the early 1970's, for which no parallel processing computers were available, I had to distinguish the running clock-time (applying to the computer execution) from the simulated systems time (horizontal arrow in Fig. 10.n (ii)).

## Studies of conversational dyads

As a complement to computer simulation of conversational dyads I have used since 1973 a video playback technique, whereby the video tape recorder and monitor enter into an external circuit. Conversations recorded in the laboratory are being played back to the participants in order to elicit their self-reflective comments, which in turn are being recorded, and which in turn may be played back and reflected upon by the participants. Today, independently, such video play back is extensively and successfully used in the Marte Meo approach to therapy (cf. Aarts 2000; Vik & Bråten 2009). In the 1970's self-reflective video playback, sometimes supplemented by computer simulations, has been applied to

1. conversation in two-person groups processing a moral dilemma (Bråten 1971);
2. perturbed communication in two-person groups either (a) processing a moral dilemma without the participants knowing that labels had been switched, or (b) processing maps in front of one another without knowing that they had been handed different maps which they believed to be identical in line with Blakar's (1973) 'map design' for communicating a route from one map to the other (Bråten 1978);
3. discussion groups (four to ten participants) on the theme "My computer milieu of yesterday, today, and tomorrow" (Bråten 1983).

The moral processing dyads (1) were exposed to various moral dilemmas in relation to which they were asked be a jury, rendering a verdict upon the acts of two actors, A or B, who acted differently. One of these dilemmas concerned *euthanasia*: At two different hospitals, one with physician A and the other with physician B, there was a patient suffering from an incurable fatal disease. At both hospitals the physician in charge was begged by their respective patient to be relieved of the pains forever. B complied, while A did not. Who did right, A or B, both of them or none of them? Here are two translated extracts from the beginning of the dialogue between the students *a* and *b*, indicating instances that approach sentence completion:

*a*: yes...
*b*: ...what to do then? That I am not sure of. It appears terribly difficult to decide at all what judgment we are to make on that
*a*: yes, that makes it so, yes
*b*: and the one who killed him; I would be quite certain that someone would characterize that as direct murder.....[...]
–
–

*b*: and even if a man then says, "I, my personal opinion, now", then, even if a man is estimated by the physicians to be incurable, there are possibilities. And I have heard about several instances where people has been cured through others sitting down and praying to God.
*a*: mm, and is a fact, actually, from which one cannot escape, that people have been cured...
*b*: ...by prayer
*a*: yes, that's right

In the perturbed sequences (2), references to the other mingle with references to self and, finally, sometimes after a long conversationally sequence, realization that something was wrong about the common ground the participants had tacitly assumed to be sharing.

The played back sequences (3) sometimes elicit self-reflection with reference to the group *qua* unit, sometimes with reference to a particular participant. Sometimes modes of self-reflective interaction competed with task-instrumental interaction. Conceptions of oneself, of the others, and of the actual topic ("Do we really have concepts for comprehending the computerized milieu development?") were changed through being steadily confronted with the immediate past of the played-back proceedings.

The video sessions referred to above also illustrate the relativity of perspectives – even with respect to time and consciousness. For example, one participant, A, may at (her) present be engaged in a dialogue with B, and with B only, and not be conscious of or concerned with the experimenter or cameraman, C, who is someone belonging only to A's past, while the other dialogue participant, B may for her part be conscious of C and addressing both A and C (taking the latter's presence in the camera control room into account), although expecting replies only from A. While the two participants are in each other's presence and present, albeit without loss of their individual perspectives, the third person may be included or excluded.

Through playback the discussion groups are themselves given the opportunity of reflecting upon reflection upon (reflected) discussions. A situation is being created by the group itself, whereby its past is made present. The situation is being filled out by a kind of quasi-interaction with represented past conversations. During such sessions – especially when more than one playback circuit are involved – I have noticed again and again how represented past, actual present, and anticipated future sometimes tend to be intermingled and sometimes entail crossing influences. Participants represented from the past and expected to be reflecting in the future upon the present, are allocated active roles in the discussion. This again invites interpretations in terms of different modes of time.

## Temporal duality

In my inquiry of moral dilemma-processing dyads (Bråten 1977, 1980), time has been subjected to manipulation in two respects: First, the time axis used for generating dialogue (in) consistency profiles, based on content analysis of dialogue records, has been collapsed into a sequence of value-assignment changing events axis. This reflects a changed conception of time – from one of running irrespective of the occurrence or not of events, to one of moving with events (cf. Atkin 1978). Second, in the computer execution of the "Dyad Simulator" developed for postdictory simulations of the dyads, different time clocks are concurrently in operation: "Systems time" is sometimes arrested, while the machine clock real time goes on, so as to allow for the simulation of concurrent processes activated in the two dialogue

partners – at least in the quasi-parallel manner allowed for in *Simula* (which I use as programming language). This was the first object-oriented programming language ever written (developed by Dahl et al. 1968). In the program execution of the Dyad simulator, participants are generated as "objects", each equipped with (inter)action programs and carrying its own updated state variables values, including actual evaluation of the sides of the moral dilemma being discussed. In the simulated communication process, the actor adjusts his own actual state of evaluation and his image of the evaluation (in)consistency state of the dyad, on the basis of his actual state and his image of the evaluations expressed by the other participants, completing and recreating the loop. In this way each of the participants recreates or transforms their own evaluation state, while re-producing and re-evaluating the evaluation state of the dyad which they jointly constitute and recreate.

When I implement such self-reflective dialogical loops in models of human cognition and interaction processes, I am able to arrest the simulated "systems time". As illustrated by the horizontal time axis in Figure 10.n (ii), each of the participants has "time" to complete their self-reflective dialogical loops, involving self-other references before simulated time moves on (albeit the real clock has been running "real time"). In order to re-construct the kind of concurrence required in interaction, time t is arrested until each of the participants have completed their circuits, and only then does time become t+1.

But this is an artificial world, which I may manipulate from the outside in virtue of the way in which a Simula program is written (cf. Dahl, Myrhaug & Nygaard 1968; Bråten, Nygaard, Klitzing & Norlén 1968). The writing of such programs, and following the way in which the main program sequence control allows for the operation of dual time, has made me ponder the possibility that a similar – but existential – arresting of time may be involved in a dialogical self-reflective system when it is enclosing upon itself. Thereby the system is prevented from escaping into the past prior to completion of the self-enfolding circle. True self-enclosure somehow presupposes that the point of departure is not changed before it turns into a point of return (cf. Fig. 10.n (i)); otherwise no tight platform for change on the basis of self-enclosure may be possible.

As pointed out above, during self-reflective video playback sessions, the participants' represented past, actual present, and anticipated future sometimes appear to be intermingled and mutually influential. Participants carry on as if temporality is sufficiently extended so as to allow for a dialogue that transcends narrowly defined here-and-now.

CHAPTER 11

# When the intersubjective mirror has been biologically broken

## The autistic spectrum

What happens when the foundational capacity for mutual interplay, empathy and intersubjective understanding is biologically prevented from unfolding due to genetic disorder or impairment prior to or during the process of birth? In Chapters 7 and 8 we saw how typical infants soon after birth are capable of engaging with care-persons in mutual protoconversation and affect attunement, and how even 11-month-olds who reciprocate their caregivers' feeding reveal by their accompanying mouth movements their empathic identification with the other's intake of the afforded food. Such mutual affective engagement and empathic identification are usually beyond the capacity of persons who suffer from impairments diagnosed as falling within the autistic spectrum. While autism has been difficult to ascertain before two or three years of age, the earliest indications of such impairments may sometimes be manifested around 9 months of age with gaze avoidance, ignoring or avoiding bodily touch, inability to follow gaze and engage in joint attention, and lacking response to auditory call (which can be mistaken for deafness). About half of children with autism acquire language albeit their speech tends to be one-way addresses rather than as a part of mutual conversation. Some such high-functioning show unusual talents, for example as exhibited by Temple Grandin, the designer whose account of her life with autism will be drawn upon in this chapter. Another example is Kim Peek who could instantly count matches scattered on the floor, as illustrated by the "Rain Man" movie. Common to high-functioning and low-functioning individuals with autism is their inability to engage in pretend play and to appreciate and participate in the feelings and intentions of other individuals of the kind described in the previous chapters.

## On the introduction and (mis)use of the label 'autism'

In 1911 the psychiatrist Eugen Bleuler introduced the term *'autistic'* for being solely closed upon oneself and which – as we saw in Chapter 1 – came to invite

the misplaced attribution of such a label by Sigmund Freud and Jean Piaget in domains of typical infant and children behaviour.

In the middle of the last century the term began to be adequately used in seminal accounts of the disorder of childhood autism and the high-functioning disorder in the autistic spectrum named the Asperger syndrome. Hans Asperger (1944) described what he termed 'autistic psychopathy' comprising both low-functioning individuals with severe organic impairments, as well as the more highly functioning in the autistic spectrum with rare intelligence of whom we nowadays think of when using the term the 'Asperger syndrome'. Leo Kanner (1943) published his paper on autistic disturbances describing children who appeared unable to engage in affective relations with others. He also introduced the term "refrigerator-effect" in connection with some of the parents whom he had noticed were cold in their feelings and unilateral concerned about career. They appeared to keep their child with autism "in a refrigerator defying defreeze". Later, however, he transcended such a narrow view, as he began to suspect that autism had a neurological and brain pathological basis.

Even so, the myth was upheld not the least because the acknowledged child psychiatrist Bruno Bettelheim attributed as a contributing factor parents' rejection and wish for the child "not to be allowed existence" in his best-selling book on infantile autism, *The Empty Fortress*: "Throughout this book I state my belief that the precipitating factor in infantile autism is the parent's wish that his child should not exist" (Bettelheim 1969:105). And because symptoms of autism at that time were detected only late in toddlerhood or in preschool years, Bettelheim's attribution of parental cause came to enjoy an unfortunate model monopoly among professionals for a long time. For example, in a report on the Autism programme in Norway Svein Solbakken (1997) attests to such a model monopoly, as reflected by the experts' comments afforded the parents of the first 10 who received the autism diagnosis at a time when the 'refrigerator mother' myth had begun to flourish. The mothers of three boys with autism – Arve, Bent, and Fred – were all told about their being responsible:

> Arve's mother was confronted with [the accusation that] "You yourself are responsible for the way in which your boy is as he is", which to her represented the most traumatic situation in her whole life career. In the case of Bent's mother it was indirectly hinted, yet clearly expressed that her ambitions were the cause of the boy's problems [....] Fred's parents were told that their son "suffered from a great sorrow" and for years they were haunted by thoughts about what sorrow they had inflicted on the boy
>
> (Solbakken 1997:303, translated by SB).

Obviously, these parents were victims of a model monopoly on autism voiced by experts who, in turn, had submitted to the model monopoly of those experts who

had had the power of defining autism and attributing its cause to the parents – with "the refrigerator effect" and attributing parental wish of the non-existence of their child. Martinsen og Kvale (1997) point out that it did not make matters easier given the "enduring specialist regime which [...] in many situations have turned out to be [mis]guided by theory and blind to everyday life's values of care-giving."

## On the biological roots and prevalence of autism

Today, behavioural symptoms of autism are assumed to follow from biological and brain organic impairments that may have been caused by perturbations during foetus life or at birth or which may be due to genetic origins. As for prenatal detrimental influences, fetal testosterone in utero has been listed as one of the causes, in addition to unfortunate genes affecting the neural networks that underlie social skills (Baron-Cohen & Wheelwright 2004; cf. also Pinker 2008:148–149). Mikaél Heimann (1998) has specified two alternative paths opening for different windows to the onset of autism: one path deviating from an initial normal development during the first year or so, and another path entailing autistic disorders from the beginning. The first path, then, entails an initially normal development without any initial symptoms of autism (as pointed to by Osterling & Dawson 1994), and which then is biologically arrested by brain pathology leading to autistic behaviour owing to a faulty development of the nervous system due to genetic or perinatal factors. An example is offered by a mother telling about her son's emerging autism:

> "Terry was a beautiful, healthy and happy baby. All this changed when he was about 2-1/2 years old. Rather than progressing, his development began to slide backwards. Within six months Terry lost all the words he had been speaking and no longer made attempts to get attention or interact with others. He began to bite and hit himself and began to use repetitive actions with little meaning."
>
> (Hagstrom 2008:253).

The other path, suggested by Rogers and Pennington (1991), entails that the child with autism is born with a deviant central nervous system resulting in operative impairments already from birth. In this case, lack of neonatal imitative responsiveness and reciprocal interplay might be a possible marker of autism to be diagnosed later. However, as Heimann (1998:102) points out, such lack of neonatal responsiveness should not automatically be considered to be a possible marker for autism. A variety of other circumstances may also invite such initial lack of responsiveness.

Referring to Bettelheim's unreasonable accusation of parents, Temple Grandin (1995) offers an explanation of the misunderstanding underlying the myth of the

refrigerator mother: It is the child with autism, not the parents, which tends be ignoring and rejecting attempts at contact due to the child's biological disturbances:

> "We now know that autism is caused by neurological abnormalities that shut the child off from normal touching and hugging. It is the baby's abnormal nervous system that rejects the mother and causes it to pull away when touched. There is the further possibility that secondary damage to the brain, caused by a defective nervous system, adds to the child's further retreat from normal comforting touch."
>
> (Grandin 1995:85).

And then she adds with reference to Bauman and Kemper (1994) who have autopsied the brains of people with autism that their cerebellum and limbic system were found to have immature neuron development which may cause sensory problems. Today, in light of the mirror neurons discovery and ensuing brain studies (Rizzolatti & Arbib 1998; Rizzolatti et al. 2002, 2006) we can add that people with autism also are likely to have a deficiency with respect to the mirror neuron system (cf. Ramachandran & Oberman 2006).

Recent discoveries of a mirror neurons system in the human brain allowing for instant understanding of others' intentions, entails a capacity that appears to be impaired in autism. Comparison of EEG measures of brain activity during opening and closing of own hand and during watching another's hand opening and closing reveals a difference between ordinary subjects and subjects with autism (cf. Rizzolatti, Fogassi & Gallese 2006; Ramachandran & Oberman 2006). Given the evolutionary aetiology of mirror neurons (Stamenov & Gallese (Eds) 2002; Bråten (Ed.) 2007), such findings of "a broken mirror" in autism indicate biological impairments. Another factor pointing in the direction of organic impairments is the hypersensitivity that characterizes many subjects with autism who find some sensory stimulations exceedingly painful. Such hypersensitivity, avoidance of eye contact and aversion of certain sounds, which may be due to a different kind of connection between such sensory stimuli and amygdala, can hardly be accounted for in terms of an impaired mirror system. This makes the so-called 'salience landscape' theory pertinent which again suggests genetic causes (cf. Ramachandran & Oberman 2006).

## Prevalence of high-functioning and low-functioning and gender differences

Today, some experts estimate that about 5 to 10 out of 10 000 children may have autism, and with respect to gender there are 3 to 4 boys with autism for every one girl with autism (Heimann & Tjus 1997). Some children with autism suffer such severe damage that they emerge to be low-functioning with regard to all the

intersubjective layers specified in the previous chapters, while 1 out of 400 are less inflicted and regarded as high-functioning. According to Susan Pinker (2008:138), autistic spectrum disorders were earlier found to be perhaps only one in 10.000 births, while recently the rate has been re-calculated as one in two hundred. And then, in Silicon Value, the rate of autism diagnosis, including Asperger syndrome, has been found to increase twenty fold in the period 1993–2008. Some children with the Asperger syndrome display quite extraordinary talents. There may be about 200 alive who are savants with autism, exhibiting extraordinary abilities in various domains of precision, such as in musical memory and playback, in calculation, or in accurate drawing for example, of trains or buildings, but characteristically – their drawings are mostly devoid of people. A common characteristic of high-functioning and low-functioning is some degree of indifference to other individuals, consistent with the impaired ability to engage in mutual and reciprocal interaction.

Some children with autism may experience bodily contact as painful, and their ways of reacting to sense impression deviate from typical children who at the age of 5 to 6 years show themselves able to read others' mind. While typical children can understand others' misunderstanding, children with autism fail to do so. That has invited psychologists to regard mind-reading failure (in terms of lack of "*Theory of Mind*") to be the decisive and defining characteristic of autism (Baron-Cohen 1995), while others regard impairments of the underlying capacity for affective engagement in others to underlie such mind-reading failure. Peter Hobson (1998, 2007:270) points out that while this theory of mind ability is important at one level of explanation, accounts in such terms neglects the nature and significance of the children's limitations in autism in pre-conceptual, in bodily anchored emotionally configured relations with other people. He cites studies which illustrate that children with autism are impaired with respect to primary and secondary intersubjectivity, which suggests difficulties in linking with and being moved by the attitude of others, with a limited propensity to identify with others:

> "a relative lack of specifically person-centred feelings is apparent in the profile of their social-emotional relations; and […] even in episodes of person-to-person (dyadic) sharing, there may be an underlying relation between the children's abilities to share experiences and their propensity to assume the stance of the person with whom they are engaged."
>
> (Hobson 2007:271)

A common characteristic of high- and low-functioning persons with autism is the lacking ability to engage in mutual social interaction and to grasp or mirror in a direct manner the intention of others in face-to-face interplay. A high-functioning designer with autism, Temple Grandin, tells for example about how she prepares

for meetings with others by reviewing in detail previous meetings as if she were replacing an internal video player. A university professor recounts how one of her students one day told her about his autism: For example, the other day, he said, as he was walking home some of the other students on the other side of the street waved to him and he waved back. Only when at home and reviewing the episode did he realize that they had wanted him to join them.

While the term 'autism' indicates a more or less self-centred exclusion of others, this does not mean that others are ignored. Others can be paid attention, but in a manner that entails a certain social ignorance and lack of comprehension of others even by high-functioning subjects who have language at their disposal. One tends to attribute to subjects with autism a lack of emotional engagement. But this need not always be the case. It is rather the lack of reciprocity and empathy, the lack of mutual engagement in the social feelings and minds of others. Some high-functioning authors with autism do exhibit communicative abilities, albeit somewhat in a monological manner – not unlike some scientists. Let us now turn to autobiographical rapports offered by Temple Grandin.

**From the autobiographical reports of three women with autism**

Her extraordinary ability to grasp the behavioural and orientation patterns of cattle enabled dr. Grandin to contribute with design for a steering and management arrangement for cattle keeping. She has written a book on her life with autism. Here she relates how she as the first born in the family acted like a wild animal whenever someone attempted to hold her, while she calmed down when allowed to be by herself. Some children with autism feel direct bodily contact as unpleasant and they may, like little Temple, turn hysterical if anyone attempts to hold them. Even a loving touch can by some be experienced as a painful strike, while others may come to appreciate being held even though they do not directly invite such embrace. The closest some low-functioning come to bodily touch is to take some caretaker by the hand in order to direct the caretaker to provide something wished for by the child.. The two-year old Temple preferred to be by herself and showed little interest in others in the family, avoided eye contact and behaved as if she did not hear what the others were saying. Later she invented a way of simulating embrace by designing a sitting closet with soft material in which she could be "held" without being hurt, sort of an enclosed embrace devoid of human touch and yet experienced to be pleasant.

At two years of age Temple could not speak. But unlike about half of those with autism who never acquire language, Grandin acquired language in the path to taking a doctoral degree and creating excellent designs. She discovered

that cattle depend primary on their eye sight for orientation, and utilized this in her design for cattle management and steering.

As a little girl she could be sitting by herself, looking into the empty air, or spinning endlessly on the wheel of her toy-car. This is one of the symptoms of autism within a varied spectrum of perturbed and peculiar behaviour modes, which also includes repetitive traits entailing compulsive repetitions for the sake of repetition. As mentioned by Grandin, such a child may be found sitting and endlessly spinning on a wheel.

Typical children may also enjoy repetition but would tend to introduce variety and fantasy in their play, while turning the play-car and imitating the sound of a car or taking after mother or father as car-driver. Children with autism have difficulties in imitating in a varied manner, and prefer to repeat the same move undisturbed. Deviance from known patterns may cause strong reactions. Gillberg (1988) writes this about the elaborate ritual behaviour which children with autism may exhibit:

> The majority of children with autism require that certain routines be adhered to in a most unlikely manner. One example is the six-year old boy with autism who demanded that his mother every morning should [stage and adhere to exactly the same breakfast preparation procedure..] in order that he would not be screaming for hours and refusing to eat or drink. [...] A four year old girl with autism had violent outbursts of rage if her mother did not always walk with her on the same sidewalk when they were on their way to fetch the mail. This phenomenon is sometimes named "insistence on sameness"..."
>
> (Gillberg 1988:22–23, translated by SB).

## On the chaos caused by sensory problems in autism

Typical children also like repetitions and rituals and love to hear the same story repeated again and again. But at the same time they appreciate variations, which tend to be abhorred by children with autism, insisting on sameness and on no deviation in the patterns repeated. Perhaps this insistence on sameness and the invariant is due to the problems in children with autism with sorting out various sense impressions. Some feel to be overwhelmed by a manifold of chaotic sense impressions. Here is a report from another high-functioning author with autism, Therese Joliffe, quoted by Grandin:

> "Reality to an autistic person is a confusing interacting mass of events, people, places, sounds and sights. There seem to be no clear boundaries, order or meaning to anything. A large part of my life is spent just trying to work out the pattern behind everything. Set routines, times, particular routes and rituals all help to get order into an unbearably chaotic life."
>
> (Joliffe, quoted in Grandin 1995:76).

Another high functioning author with autism, Donna Williams, tells how she found the world to be incomprehensible, having constantly to fight in order get some sort of meaning out her sense of her sense impressions. When abandoning such efforts to grasp any meaning, she would rather let her mind wander into fragmented patterns – a wandering closed in her self which she found secure, even entertaining: "This was the beautiful side of autism. This was the sanctuary of the prison," Donna Williams writes in her book "*Somebody Somewhere*", as quoted by Grandin 1995:77). And for them both, reporting from their lives with autism, they feel themselves to be controlled by autism without letting it define them: "Autism is not me. Autism is just an information processing problem that controls who I am."

Emotions are certainly not absent, but....

Grandin informs us that the closest she comes to feeling joy is the excited pleasure she feels when having solved a design problem. Rapturous joy is beyond her and she is aware that she is missing something when other people swoon over a beautiful sunset. Grandin acknowledges that it is beautiful, but she does not feel it. She can cry during a sad movie or when something really moves her. But she does not understand how people can engage in complex emotions like loving someone one minute and engaging in jealous rage the next minute.

In her book *Nobody Nowhere*, Donna Williams (1992) voices her view on her autism. She regards autism to be the result of some mechanism or other controlling emotions in a deviant manner. Body and mind are left with an impaired ability for adequate expressions:

> "I believe that autism results when some sort of mechanism that controls emotions does not function properly, leaving an otherwise relatively normal body and mind unable to express themselves with the depth they would otherwise be capable of."
>
> (Williams 1992, quoted by Grandin 1995:89).

That does not prevent people with autism from having strong feeling or affective bonds. Grandin points out that people with autism may form strong emotional bonds and reminds us that Hans Asperger rejected the assumption about poverty of emotions in autism. She tells us how her own affective bonds are associated with places, rather than with people:

> "Sometimes I think my emotional life may appear more similar to those of animals, because my feelings are simpler and more overt, and like cattle, I have emotional memories that are place-specific."
>
> (Grandin 1995:92)

While painful emotional memories are not evoked by the sight of a person, a specific *place* may invite memories of emotions as she again approaches that specific place. And then, she has recounted how strongly she reacted to bodily touch. This implies a description of her so-called "salience landscape", which Ramchandran and Oberman (2006:45) define as the map, created by amygdala, that details the emotional significance of things in the individual's environment. They point to

> "the possibility that children with autism have a distorted salience landscape, perhaps because of altered connections between the cortical areas that process sensory input and the amygdala or between the limbic structures and the frontal lobes that regulate the resulting behavior."
>
> (Ramachandran & Oberman 2006:45)

As a result of these abnormal connections, they point out, any trivial event or object or a person's approach could set off an extreme emotional response, like an autonomic storm, in the child, precisely of the kind reported by Temple Grandin. And, then, while a touch for the typical child feels like a soft touch by virtue of mutual reciprocity, it may be felt as a strike when such reciprocity in felt immediacy is lacking. This may contribute to explain why the infant with autism find bodily touch to be painful. As pointed out by Grandin, the baby's abnormal nervous system and handling of sense impression may explain why parents and caregivers are rejected by the child – in clear contrast to the earlier assumption about cold and avoiding parents being the cause of such impairments.

## Impairments in the autistic spectrum compared to the typical intersubjective layers

Let us now return to the staircase model of layers in typical child development (Fig. 3.1 succinctly recapitulated above the line in Figure 11.1), and use those layers as a frame of reference for comparing some of the behavioural characteristics found in the autistic spectrum.

Given that the foundational layers for typical children of primary and secondary intersubjectivity begin to be operative, respectively, from birth (the primary layer I) and from about 9 month of age (the secondary layer II), the problem with comparing children with autism with typical children has earlier been due to difficulties in detecting autism before a child is two or even three years old. Many behaviour traits exhibited by persons within the autistic spectrum concern the primary and secondary layers. For example, the tendency to display indifference, avoid eye contact, difficulties in manual imitation in face-to-face context, and being one-sided in interaction pertain to I-layer impairments. The tendency to

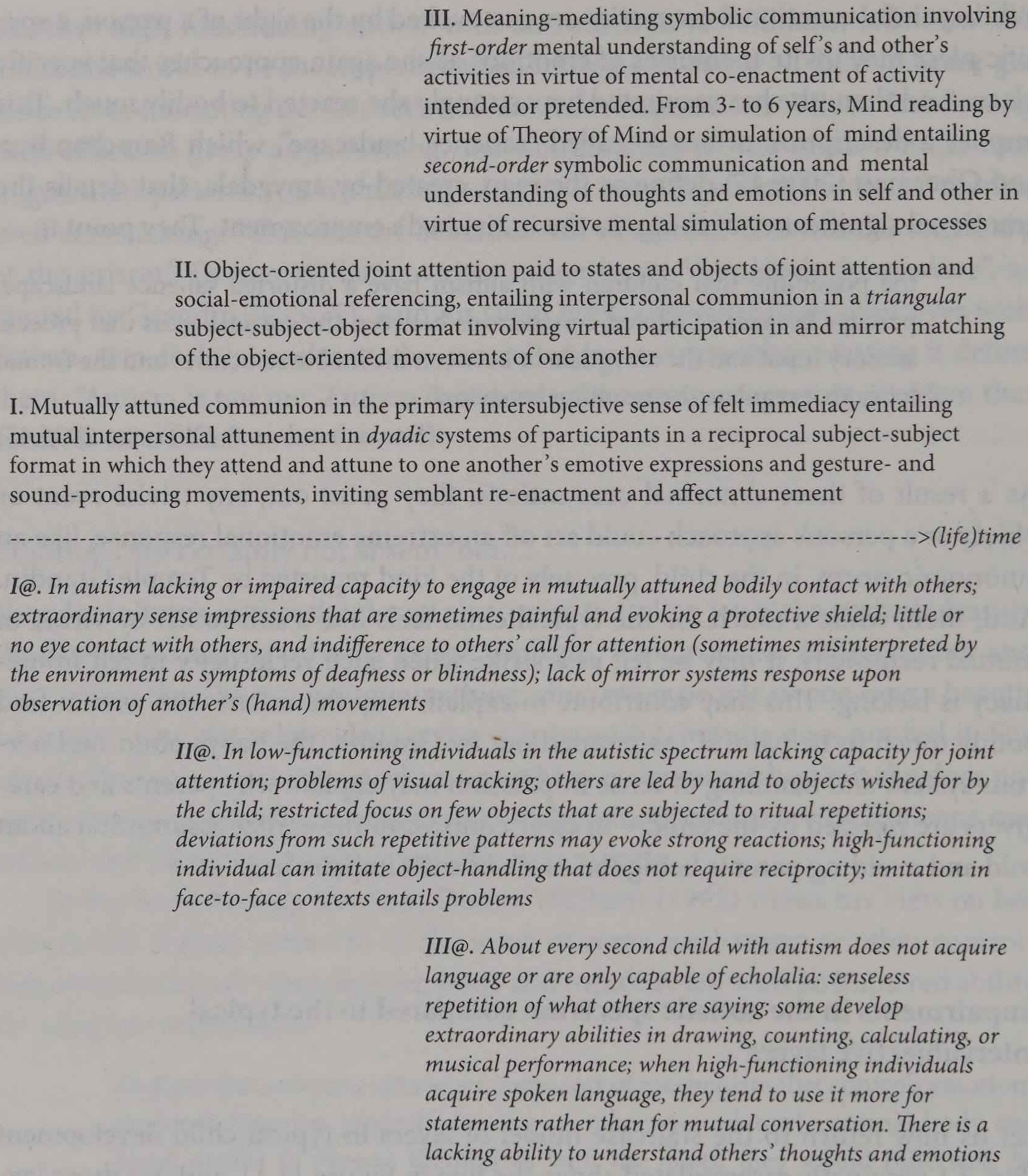



**Figure 11.1.** The intersubjective staircase in typical child development and in the autistic spectrum *(Below the line in italics) I @, II@ , III@*: Impairments in autism (cf. Baron-Cohen 1995; Baron-Cohen & Bolton 1993; Bråten (Ed.) 1998: Gillberg 1988; Siegel 1996; Trevarthen et al. (1998). *(Above the line)* Development in line with the intersubjective matrix and with all the layers fully operational for typical children around four to six years old, including mind-reading (cf. Bråten 1998b; Bråten & Trevarthen 1994/2000, 2007; Stern 1985/2000, 2004).

indicate needs by taking and leading the other's hand, and to repetitively handle and spin objects, and play with toys in isolation, as well as deficits in joint-attention skills, concern the object-oriented II-layer. Joint attention not only entails coordination of attention paid to some object or event, but also involves the conveyance

of affect (cf. Mundy et al. 1993:187). And then, deficit behavioural characteristics pertaining to the higher-order layers are these: No pretend action during playing; if access to language – echoing words or talking incessantly about one topic only, sometimes misusing personal pronouns and, then talking to no one in particular – rather than conversing in mutual symbolic interaction.

While the typical infant is ready from birth to engage in mutual bodily contact, soon demonstrating the primary intersubjective capacity of reciprocal attunement and protoconversation, infants who are later classified as children with autism have a lacking or impaired capacity to engage in mutually attuned bodily contact with others. Many are extraordinarily sensitive to sense impressions which are found to be painful, evoking a protective shield; little or no eye contact with others, and indifference to others' call for attention. Sometimes, such avoidance tendencies are misinterpreted by the environment as symptoms of deafness or blindness.

In his recent article on 'Communicative depth: Soundings from developmental psychopathology', Hobson (2007) addresses the identification deficit in autism and explicates what is implied by claiming that typical infants are identifying with the bodily-expressed attitudes of the person with whom they are engaged, including infants' propensity to be moved by another person's attitude through registering and in part assuming those attitudes in episodes of sharing. Drawing in his account upon Freud's (1921) concepts of identification, Hobson also relates to the above account:

> "within episodes of sharing, there is another-person-centred as well as a self-centred-component to the experience of sharing, and the other-person-centred component comes into existence because of the specifically human propensity to register and assume the attitudes of other from the others' bodily-anchored stance. This picture is closely similar to that drawn by Bråten (1998), who postulates 'a "virtual other" complement to the bodily self that offers a participant (companion) space in which others may be included in felt immediacy (p. 106) and who also posits that individuals with autism may lack the 'resulting socio-emotional nurture of others' perspectives as felt in inside participating' (p. 115)."
>
> (Hobson 2007:270).

This is in line also with Trevarthen, Aitken, Papoudi and Robarts (1998:59–60) who in the second edition of their book on *Children with Autism*, refer to how the efficiency of the processes of human sympathy is explained in terms of how the mind's innate organization with a virtual companion perspective includes actual others in 'companion space', permitting 'co-enactment' of self with other, each in 'alter-centred' agency, and how autism has been posited to involve a failure of this mechanism, resulting in body-to-body mapping errors when "autistic children are asked to reproduce the orientation of gestures that others make in front of them (Bråten 1998; Ohta 1987)." Consistently, they propose that autism is a

condition in which the affected individual is lacking effective motive representations for the 'virtual other' – a lack which is reflected by the impaired self-other mapping when attending actions by other persons (Trevarthen et al. 1998:60). This is in line with what Williams et al. (2004) have found in their empirical review of well-controlled studies of action imitation disorder in the autistic spectrum, implying a deficit in mapping neural coding for actions between sensory and motor modalities.

## The broken mirror

This pertains to a more general problem in autism of relating to others. Engagement with others in complementary and reciprocal format appears to be impaired. They may echo and follow others – subjects and objects – in line, as it were, when facing the same direction. But as we have seen, what may be beyond the capacity of many in the autistic spectrum is the reciprocal and complementary engagement which typical infants demonstrate in face-to-face interaction, such as the mirroring of the others' movements which Emilie and Thomas demonstrate. And again, that is probably supported by the mirror neuron system discovered in the human brain by Rizzolatti and his co-workers, In all likelihood, that is impaired in autism: the mirror neurons system which enables typical children to instantly grasp others' intentions and even pre-enact or co-enact with accompanying movements what the observed other is about to do. EEG evidence of mirror neuron dysfunction in the autistic spectrum has been found (cf. Oberman et al. 2005; Ramachandran & Oberman 2006).

Having investigated the links between autism and the mirror neuron system, Ramachandran and Oberman (2006) have coined the phrase "Broken Mirrors". A simple, but revealing test is this: When typical children make voluntary muscle movements, such as opening and closing the hand and then watches another do the same, motor neurons fire in the premotor cortex in both cases, but with this difference in the frequency of brain waves which is high before muscle movements, and low during muscle movement and when another is seen doing the movements. When children with autism are submitted to the same measurements there is a difference: children with autism showed no suppression of the mu waves when seeing another (or a video) of hand opening and closing (Ramachandran & Oberman 2006:42). In other words, there is no virtual other participation in what the other is perceived to be doing with the hand. If there had been other-centred participation, then the mu wave (measured by the electroencephalogram (EEG)) would have shown to have been suppressed, as does occur in the control subjects without autism. Thus, the attribution of a broken mirror system as a characteristic

of the autistic spectrum may be warranted, as predicted inter alia by the present author (Bråten 1994; 1998a, 2000; 2002).

While typical infants before their first year's birthday are capable of joint attention and deferred imitation, even learning by participant mirroring from models in face-to-face situations, low-functioning individuals in the autistic spectrum lack capacity for joint attention and for the kind of mirror reversal required for imitation in face-to-face situations. While eye contact with caretakers is avoided, they are sometimes led by hand to objects wished for by the child to be brought and be the focus of ritual repetitions. Deviations from such repetitive patterns may evoke strong reactions. High-functioning individual can imitate object-handling that does not require reciprocity; while imitation in face-to-face contexts entails problems.

When the instructor is sitting beside a subject with autism, however, facing the same direction and beginning to imitate the other's gestures, that may come to be noticed and perhaps the model's arm movements will be imitated. But if they are facing one another, then the subject with autism may be unable to perform an adequate re-enactment of what the other is doing, simply because of failure in the mirror reversal required. Successful face-to-face imitation presupposes a reversal of the model's movements as felt by the imitator. In a pre-conference talk on imitation in Paris, 1.June 1994, I posed this question, which to my knowledge at that time had never been asked: What underlies *the perceptual inversion* entailed by re-enactment of the model's enactment experienced in a face-to-face situation? I offered a tentative reply in these two terms: First, Trevarthen (1986) had distinguished *alteroception* as the motivated perception of others that depends on the specific cerebral response to the other's body movements. Second, I had defined *the virtual other* as a non-specific companion perspective that complements the bodily self perspective with the operational efficiency (*virtus*) of an actual companion perspective (Bråten 1988). Hence, body movements of actual others included in the companion space of the virtual other afford crude alteroception in an appropriating sense, which in face-to-face situations entails perceptual inversion: shift from alter-oriented perception of the model's movements as felt from the centre of the model, to own body-centred execution of the re-enactment. Hence, the model and the learner need not face the same direction or use a mirror, unless the novel movements were very complex, or the child had (autistic) learning problems (Bråten 1994). In a *Behavioral and Brain Science* commentary the year before I suggested that in subjects with autism, internal auto-enclosed cycles are operative without the social-emotional nurture of other's perspectives as felt from the inside (Bråten 1993:515). The same summer that this systems-theoretical prediction about face-to-face imitation problems in autism was voiced in Paris and repeated in Oslo, an empirical review paper on imitation in autism appeared.

Here Isabel Smith and Susan Bryson (1994) point to Ohta's (1987) experimental findings of partial imitation errors in subjects with autism trying to re-enact gestural and bi-manual tasks, and which Smith (1995) replicated, yielding the same result: children with autism, as compared to control children, manifested errors in imitating gestures, including rotation of the hand. Smith and Bryson refer to a suggestion about "the intriguing possibility that these errors represent attempts of the children with autism to reproduce the gesture so that their view of their own hands matches the view of the model" (Smith & Bryson 1994:264). This suggestion was followed up by Barresi and Moore (1996:120). They suspected that the problem in autism is a failure of integrated representation of matched first and third person information (cf. also Whiten & Brown 1998). Here, we have been pointing in the same direction, albeit with somewhat different accounts. While typical children can do what the other is doing, when invited to do so, children with autism who understand the invitation, are expected to have problems in virtue of seeing the other only from an ego-centric position: Observing the model from the outside, the subject is seeing, but not feeling from the inside, what the model is doing. Seeing the resemblance between the inside of the model's hands with the insides of his own, and being incapable of a virtual reversal of the model's movements as felt, the child with autism can only do what is being seen from own position, and will raise hands with their insides inwards.

As for tertiary intersubjectivity, while typical children begin to engage in reciprocal symbolic interaction by 18 months or later, and enjoy pretend play, only about half of persons with autism acquire language and, when they speak, it tends to be unilateral talking incessantly about one topic, rather than engaging in mutual conversation and about a variety of topics. Thus, when speaking, they tend to be monological, rather dialogical. Some exhibit only echolalia, i.e., senseless repetition of what others are saying. And there are other deviations. Often the speaker with autism does not use the personal pronouns, like 'I' and 'You', or, if used, they are sometimes confused. But there are those with autism and without speech that are able to imitate and sing songs with an amazing accuracy; some even reproduce the lyrics correctly as they are singing, even though they are unable to recite the lyrics when divorced from their singing (Gillberg 1988:22).

As for tertiary intersubjectivity of second order, while typical children are capable of mind reading by virtue of Theory of Mind or simulation of mind entailing mental understanding of thoughts and emotions in self and other in virtue of recursive mental simulation of mental processes, children and adults with autism have been found to be lacking in such abilities. Even talented persons with the Asperger syndrome are compelled, as Bruner and Feldman (1993) put it, to rely on rigid algorithms and formularies in order to try to guess at what people have in mind or what they are thinking; they appear stiff and "unnatural" in the social and

emotional life as if they have learnt their lesson about life in the way that mathematics is learned. This point made by Bruner and Feldman also implies, however, a certain similarity with the theory-theory version of mind-reading attributed to typical children, as if they learn or construct a theory of other minds, like psychologists do. That would not be working for typical children's mind reading, some of us would assert, insisting on the simulation version. But again, when typical children exhibit virtual other simulation, as if being a virtual co-author of what another is saying, they do not simulate their own mental state. Hence, even if typical children, like us all, have difficulties in assessing own mental state (cf. Gopnik 1993), this does not prevent us from participant mirroring of other's intentions and intended acts, of which people with autism appear to be incapable.

## Rare cases of children with autism who have quite special talents

Children with autism sometimes earlier than others exhibit quite extraordinary talents, including such domains as computing, music or drawing. For example, as illustrated by the 1988 movie "Rain Man" with Dustin Hoffman playing the savant with autism, Kim Peek, he could memorize the phone number book and instantly count matches scattered on the floor. The identical so-called "Rainman-twins", Flo and Key Lyman, are equally impressive, exhibiting outstanding feats of date-dependent memories, and give you the week days of calendar dates in the past and the future.

Baron-Cohen and Bolton (1993) describe the unusual drawing abilities exhibited by Nadia, a girl with autism and with hardly any language. They reproduce two of Nadia's drawing of horses, based on her having seen a horse in a story book. The first drawing was made when she was 3 1/2 years old, the second when she was 5 years old. Both are lively portrayals, drawn with impressive vividness and a lot of details. And both drawings entail the use of perspectives which ordinary children usually do not achieve until adolescence. In terms of orientation towards other humans there is a telling difference between the two pictures: the horse drawn by 3-year-old Nadia is a riding horse with riding gear, but without any rider, while the 5-year-old Nadia drew a horse with a rider on its back, albeit the rider is portrayed rather stiffly. Baron-Cohen and Bolton (1993:55) reports that around the age of 11, Nadia began to speak, while her obsessional interest in producing drawing declined.

In Norway, a boy with autism who lived near a railway station, came to demonstrate his unusual talent in drawing trains, specified to the least detail, and with a perspective and with strokes that captured the train in movement, rushing towards the platform. He also drew trains from the inside in a striking and most detailed

manner. Common to his drawings of trains from the outside and the inside was the complete absence of any humans, no traveling passengers, nobody waiting at the platform.

Almost the same absence of people, is exhibited by impressive drawings of buildings by another boy with autism, Stephen Wiltshire. In his drawing of the Eifel Tower in perspective in an impressive and detailed manner there is no one in the front, while about 10 people are indicated by simple and gross lines in front of the detailed and beautiful drawing of St. Paul's Cathedral, which he has drawn from visual memory:

> "His drawings are all the more incredible when compared with the real buildings: details such as the style and size of windows of ornate building are recorded faithfully, and this is despite Stephen only having viewed the original building once, for a few brief minutes, and often not beginning his drawing until he has returned to his home or school."
>
> (Baron-Cohen & Bolton 1993:56–57).

Most likely, such unusual savant talents reflect an unusual organization of the brain in autism, as Baron-Cohen and Bolton point out. Those few who show extraordinary talents such as in drawing, in music, in counting, in mathematical calculation or mentally running though a calendar, tend to exhibit a speed and mode of operation which defy the rational and deliberate reflective modes of the experts in these domains. It is as if the unusual brain of these talented people with autism, not geared towards the intersubjective mirroring of and engagement with others, allow for some unrestrained areas to be devoted without competition with other highly demanding pursuits. For example, when the brain was scanned of a person with autism who could immediately link past and future date and year in the calendar to correct weekday, his cerebellum was seen to be particularly active. When asked to explain how he managed such rapid calculations, he replied: "I just walk through the row of numbers."

**When therapy, sign language or new experiences open windows to altered behaviours**

A mother tells about her daughter with autism who was without language until as an adult she began to learn sign language in school, and who had always enjoyed music. She has learned by herself to play and play by notes. At school she had two hours weekly with sign language and one hour for music. She plays several instruments and will bring the right instrument if asked by sign language to fetch it (Solbakken 1997:241).

Various forms of music therapy appear to be particularly successful when afforded children with autism and open windows to emotional communication and social interplay with others (Trevarthen et al. 1998:172–202). What is it about music, then? Music evokes feelings and playing music entails moving and being moved. As pointed out by Kierkegaard about the aesthetic character in *Either-Or*, music, like the Magic Flute, opens for immediacy, moves us and invites us to participate in the movements. As Björkvold (1992) has documented in his book on *The Muse Within*, children's songs across cultures exhibit common elements and composition, indicating the universal human nature of music. Perhaps music therapy is so efficient when offered children with autism because it affords emotional experience and participation in a way that is not hurtful or frightening. Through music shared with others the child is allowed to partake in shared experience of felt immediacy while the others – for the time – are being kept at a safe distance.

While some children with autism for whom attempts to improve their communicative speech abilities fail, their acquiring the use of sign language may not only improve their communicative abilities, but even stimulate improved social contact. Two examples are reported by Martinsen, Nordeng and Tetzchner (1985). After having acquired sign language these children with autism increased their frequency of initiating contact with others and could even participate in brief conversations.

Solbakken (1997:314) reports on Hilda, among the first in Norway who was the diagnosed with autism. When 8 years old she had been wrongly diagnosed as "deaf-mute" and sent to an institution for deaf people. When 34 years of age she returned to a home for deaf people, but did not learn any sign language and had no language at her disposal. Later, however, when offered school education, she was afforded systematic sign language teaching and soon acquired 150 signs.

Heimann and Tjus (1997) have explored whether the joint use of computer could be a means to improve the interplay between parents and their children with autism. In a series of experiments children between 6 and 15 years, diagnosed as having autism with middle order impairments, participated as subjects. Each child was assigned a PC with games and tool programs. Those showing interest were allowed to continue with the computer by themselves for a week or two. Then the parents were brought in, and for a period of 6 to 9 months they were engaged with their children in front of the computer. Its tool programs permitted a portioned screen allowing the child to retrieve his own images on his own half of the screen. As some sort of co-operation usually developed, there were video recordings which allowed for playback of what had occurred in front of the computer screen. The parents reported that they felt their contact with their children had been improved, and furthermore, that this improvement was reflected also in other domains beyond playing with the computer. The children grew curious

and began asking questions. Parents also declared that this kind of contact with their children had brought to the parents' attention interaction aspects of which they previously had been unaware, such as bodily manifestations and variation of prosody.

Returning to the case of Terry, whose autism broke out when he was about 24–30 months old. When he was 15 years of age, he participated in an augmentative communication exercise, in which also another teenager with autism participated, who appeared to be very scared. Terry's mother Donna reports on what happened:

> "[h]e was very scared when his mother first left, and he was escalating with sound and signs of potentially abusive behaviour towards anyone who came near him. So we adults sat down and got quiet […]
> And then a miracle appeared in the form of two autistic boys. Terry, who had been off in his own world until that point, suddenly came out of nowhere and plopped himself down right beside (and slightly on top) of this other guy who was so upset. Terry put his arm around him and patted his head and face […] We all held our breath, wondering how the other teen, who can be prone to violent outburst, would take Terry's physical gestures. And here is the beautiful part […] he seemed a little shocked, but then he appeared to understand and he calmed down and even smiled."
>
> (Hagstrom 2008:259)

As the mother of Terry proudly declared, both these two boys with autism had climbed a giant mountain, one in the giving, and the other in receiving the consolation. In Daniel Stern's (2004) terms of the present moment, theirs was almost a moment of meeting, albeit probably lacking the quality of altercentric participation.

CHAPTER 12

# The intersubjective steps in retrospect and guidance, and prospects for further research

In the first part of this book we have seen how recent infancy research and the two related findings on mirror neurons and participant perception have made a difference compared to previous ideas on children's nature and child development. Furthermore, findings on how efficient infant learners are in their speech perception and face-to-face imitation invited questions about the origins of (pre)speech and efficient learning. Such questions were pursued in the second part by way of a review of some computer simulation models and comparative studies of the differences between infant-adult interaction in humans and modern chimpanzees, giving rise to the hypothesis about the adaptive decentration of the mirror neuron system in hominid infants enabling (m)other-centred learning.

In this third part, concerned with ontogeny, findings about children's steps to speech and mind-reading, as well as perturbations and impairments, were specified in terms of these intersubjective layers:

(I) Primary intersubjectivity, entailing neonatal imitation, protoconversation and early speech perception;
(II) Secondary intersubjectivity, entailing object-oriented joint attention and imitative learning by altercentric participation;
(III.1) Tertiary intersubjectivity of 1st order, with children unfolding verbal conversations and engaging in narratives and self-dialogues with their evoked, virtual or imaginary companions;
(III.2) Tertiary intersubjectivity of 2nd order, entailing meta-understanding of other's (mis)understanding as well as mind-reading which inter alia is manifested during conversation when the listener sometimes completes the partner's sentence.

In this concluding chapter we shall first in retrospect differentiate various modes of participant perception and (p)re-enactment in terms of the above intersubjective layers and then – before turning to some open-ended questions on the intersubjective mirror system and on altruism – indicate their relevance for child care guidance in the contexts of the Marte Meo approach (Aarts 2000) and the International Child

Development Program (Hundeide 2007, 2009). Common to these approaches is their emphasizing in a positive manner the inherent resources and capabilities of the individual care person and child, affording windows to facilitate, encourage and re-activate their inherent capabilities. In this respect, the focus below will be to highlight the inherent capacity in both the child and the caregiver for altercentric participation.

### Distinguishing imitative re-enactment from pre-enacting and co-enacting resonance

When the listener affords sentence completion in relation to the unfinished utterance made by the speaker, or when the feeder opens own mouth while in the process of feeding the patient, this is not imitation in the sense of re-enactment, but rather an anticipating or concurrent move that may be termed pre- or co-enactment.

An act or performance at time t may come to invite resonance or mirroring in the perceiver that differs in time: the perceiver's response may be occurring at t+D after the observed act has occurred (inviting re-enactment), or may be occurring concurrently with the observed act at t (inviting co-enactment) or, may occur during preparation at t-d for the performance at t (inviting anticipatory pre-enactment) in anticipatory resonance with the expected performance.

As illustrated by Bråten (2007:135), and returned to above in Chapters 6 and 8, all three modes may be successively evoked in the infant who is learning to reciprocate spoon-feeding: Firstly, when being subjected to spoon-feeding, the infant may be virtually co-enacting the spoon-feeding as if being a virtual co-author of the feeding. Secondly, when taking after the feeder by reciprocating spoon-feeding, the infant re-enacts the spoon-feeding previously experienced. Thirdly, if the infant opens own mouth as he or she is offering the spoonful to the caregiver's mouth, the infant is partly pre-enacting the caregiver's intake of the afforded food. When the infant demonstrates at time t to have learnt from the caregiver's spoon-feeding at time t–D to spoon-feed another by reciprocating, this re-enactment at time t demonstrates the result of learning by imitation (Fig. 8.2, Chapter 8 this volume). And when the infant boy opens his own mouth at time t, while offering the spoonful to the caregiver who opens the mouth at time t+d to take in the offered food, this is anticipatory pre-enactment on the part of the infant. If it occurs concurrently, i.e., the infant boy opens his mouth at time t+d just at the recipient caregiver opens her mouth, then this is concurrent co-enactment, but in no way imitative re-enactment.

As previously pointed out, learning by imitative re-enactment – whether it be the nine-month-old who imitates the experimenter's pushing a button on the box,

or the 11-month-old who has learnt to spoon-feed – can hardly be accounted for in terms of perspective-taking in a social-cognitive sense. They rather invite explanation in terms of an e-motive and participatory sense of more primitive subjective experience in felt immediacy, evoking temporal feeling flow patterns, what Stern (1985) terms vitality contours, which are shared by the model and the infant learner. The same applies to the one-and-half year old who is capable of "reading of intention", e.g., imagination of unrealized or incomplete efforts inviting simulated completion, such as in Meltzoff's (1995) behavioural re-enactment design in which 18-month-olds successfully realizes a novel target act from watching the experimenter failing to pull a dumbbell apart. And, indeed, when spectators watch a high-jumper take off and raise their own feet in the process, or feel leg muscle activation, or when people in the audience watching the newborn preparing to imitate Kugiumutzakis' wide mouth opening, and open their own mouth before the newborn has managed to come up with wide mouth opening, such spectator events – like Adam Smith's example of spectators' moving with the French line dancer – occurring slightly in advance of or concurrently with the performer's move are manifestations of other-centred pre- or co-enactment, and should not be confused with imitative re-enactment. Now, we are in position to recapitulate these distinctions with respect to the various layers of intersubjectivity described in this part.

## Co-articulation, repetition, and anticipatory simulation at the tertiary intersubjective layer

When the class room teacher emphasises and defines a key term which is silently spoken by the pupils in mirror resonance with the teacher's articulated wording, this is co-articulation if occurring concurrently at time t with the teacher's articulation at t, or else – if they repeat the key term by themselves – this is mere repetition and, hence, re-enactment at time t+D. In the recorded conversations between Sartre and de Beauvoir (1981/1986), of which we got some glimpses in Chapter 10, in the middle of conversational passage about his neglecting his own body, Sartre repeats de Beauvoir's "*Je pense*" (on p. 465 in the French original, while omitted in the English translation).

Much more telling is their sometimes becoming virtual co-authors of what the other is about to say. When the talker is half-way through speaking his utterance, accompanied by the listener's silent co-articulation and then – before the speaker has time to complete his utterance – the listener loudly completes the sentence, this occurs by virtue of predictory mental simulation at time t of the speaker's mind by virtue of being immersed in the narrative world in the process of being unfolded, resulting in sentence completion at t+D. Examples of

such episodes were offered above illustrating how they sometimes completed one another's statements. When de Beauvoir's completes Sartre's incomplete statement she thereby becomes of virtual co-author of what he was about to say this by virtue of her anticipatory simulation at time t of what the rest of his intended utterance would have been at time t+D.

Furthermore, in line with G.H. Mead's (1934) notion of anticipatory response and the above simulation of mind conversation model (Bråten 1974, 2002), when she as a speaker or questioner modifies her utterance at time t–d as a result of her anticipatory simulation of how Sartre will understand the question at time t, this is also predictory simulation, but not pre-enactment, since what is being predicted is not an act but the other's interpretation or understanding.

## Re-enactment vs. co-enactment or pre-enactment at the secondary intersubjective layer

In the case of Meltzoff's dumb-bell experiment (Fig. 8.3), when he *qua* instructor tries, but fails to pull the dumbbell apart at time t–d, and then hands it to the toddler at time t, which thereafter, at time t+d, manages to pull it apart, this is behavioural realization of the attempted act due to the toddlers' being able to simulate the completion of the attempted act at time t–d from his having been a virtual co-author of the instructor's attempt at time t–d. In a strict sense this is not re-enactment, since there was no completed instructor act that could have been imitated. The toddler's simulation of the completed act (Fig. 8.4 (bottom)), however, serves in a way as an internal predictory virtual pre-enactment of the toddler's successful realization at time t+d.

When Ferrari and Gallese (2007:82) invite neuroscience to explore more fully whether the mirror neurons matching system can be further exploited with respect to altercentric participation, I would suggest that detailed-level temporal aspects on a millisecond time scale of pre- and co- and re-enactment and of synchronized and delayed mirror resonance in means-end relations might be fruitfully pursued. For example, concerning the difference in mirror resonance discharge upon eating and placing: when there is stronger mirror neurons discharge upon (i) observing a morsel being grasped at time t and then put in the mouth at t+D than when (ii) the morsel being grasped at t and then dropped in a bucket at t+D (as reported by Fogassi et al. 2005), is there also a time difference between (i) and (ii) with respect to discharge in the two cases. And, given the similar time curves for resonance upon (i) grasping to eat and (ii) grasping to place, does this imply that there usually is a delay in the mirror resonance occurring only at time t+D upon completion of the observed act?

## Pre-enactment, co-enactment and re-enactment at the primary intersubjective layer

When there is wide mouth-opening at time t by some in the audience watching Kugiumutzakis' video record of a newborn preparing at time t to imitate his wide mouth opening shown to the newborn and the audience at time t-d, this is pre-enactment in the audience as if coming to virtual aid of what the newborn is preparing to do. The mouth opening in some of the spectators occurs before the video record shows the neonate coming up with a wide mouth opening at time t+D, which in turn is imitative re-enactment on the part of the newborn, but not on the part of the audience.

But then, when spectators in the sport field watch the high-jumper jump at time t and activate their own leg muscles while watching the jump, this is co-enactment or concurrent movements on their part as if their being a virtual co-author of that jumping. But they are not doing any imitation in the sense of re-enactment because their leg-muscles are activated concurrently with performer's jump, and while they are still sitting on their bench.

In addition to the vitality affects characteristics and associated features of temporal dynamics Stern (2004:32–49) emphasizes, as we have seen, the phenomenological nature of the present moment: It is what it is in awareness now: a moment presently felt and as unfolding during a stretch of awareness during a moment lived in felt immediacy, and not as mediated in a verbal account. Present moments are of short durations, entailing several seconds, but seldom more than 10 seconds. For example, in preverbal mother-infant interplay, infants are exposed to 'motherese' and various forms of human phraseology usually in the range of 3 seconds. The same applies to turn-taking during protoconversation (cf. Chapter 7, this volume); vocalizing turns take about 2 to 3 seconds. So do short phrases of mothers' singing to their babies.

A beautiful example of a mother singing to her blind baby has been reported by Schögler and Trevarthen (2007:286–288), based on a video provided by Gunilla Preisler. Here a five-month-old blind girl who when listening to her mother singing a nursery song 'conducts' the musical rhythms of the song with her left hand. The baby had not been taught to 'conduct' and nobody realized that she was doing the 'conducting' until the film was microanalyzed in terms of milliseconds. Microanalysis of the film compared to the spectrograph of the mother's voice showed that the infant anticipated her mother's vocal gestures by an interval of 300 milliseconds. The baby clearly knew the song and 'dances' and 'conducts' the melody of the song, matching subtleties of rhythm and tone of her mother's voice with waving of the arm, lifts and rotations of the wrist and spreading and pointing of the fingers. A plot of the movements of her left index finger shows,

compared to the pitch plot of her mother's voice, that she is leading the mother by approximately 300 milliseconds, and is synchronising with her mother's voice at other points while being bottle-fed. As Schögler and Trevarthen point out, here is an illustration of the core-sense of time-in-movement enabling a baby to engage with another person by hearing, vocalization and gesturing in one intersubjective timeframe of intentions and emotional experience, inviting consciousness of Self and Other to emerge.

And again, as shown by Daniel Stern (2004:81), "when people move synchronously or in temporal coordination, they are participating in an aspect of the other's experience. They are partially living from the other's centre." This is what has been termed "altercentric participation" throughout this book and will be returned to pertaining to dance and music at the end of this concluding chapter. But first, let us succinctly turn to its relevance for child care guidance and facilitation, as seen in the contexts of the Marte Meo approach and ICDP (International Child Development Program).

## Pertinent for caregiver guidance in the contexts of Marte Meo and ICDP approach

Some of the capabilities at the various layers of intersubjectivity may be temporarily blocked in the caregiver or in the child and, hence, invite to be re-activated and stimulated through therapeutic or facilitating guidance. This can be afforded by the Marte Meo methods of jointly watching with the caregiver video records of caregiver-child interaction, or of child-child interaction, accompanied by encouraging comments and drawing attention to laudible occurrences (cf. Aarts 2000). Such joint video replay watching may also be resorted to in the ICDP approach. But when in a war zone or when care persons or children are involved who are refugees or expelled from an invaded territory, such video records and replay are not always possible. Also the ICDP approach, however, emphasizes identification and sensitizing of promising and positive manifestations in the caregiver or the child, and with development facilitation dialogues as part of the guidance (cf. Hundeide 2003, 2007, 2009). Here follow some key terms for such caregiver guidance, succinctly expressed and differentiated by the various intersubjective layers.

With regard to *primary intersubjectivity*, underlying and supporting also higher-order layers, between the caregiver and child or between the children, their capacity for mutual attunement and attending one another's manual and vocal gestures and emotional expressions may be temporarily blocked, preventing self-with-other resonance and mirroring. The caregiver who is temporarily blocked in such ways, for example due to postnatal depression or harsh victimizing condition,

invites to be encouraged to acknowledge the child as a competent dancing and dialoguing partner, to engage in mutually attuned dialogue. Drawing attention to laudable moves of attunement may sensitize the caregiver to mutual engagement and affect attunement, while following up, imitating and completing the child's contribution confirm the child's identity and sense of self and other in interpersonal communion. The caregiver may be encouraged to appeal to or applaud the child's nurturing or prosocial act towards other children in need (cf. Chapter 6 in part II).

With regard to *secondary intersubjectivity*, interpersonal understanding about jointly attended objects brought into play for shared emotional references may come to be overlooked by the pressed caregiver or disregarded by the stressed child in relation to peers by virtue of partly blocked sensitivity. Here are opportunities for the caregiver to invite object-oriented joint attention and cultural learning in various situational context, and to appeal for help in ways which (s)he deems the child competent to comply and manage, like the 18-month-olds who pull the dumbbell apart after the experimenter had failed to do so (cf. Figures 8.3 and 8.4 in Chapter 8). Here the caregiver should look for and be open to manifestations of other-centred participation by the child in the acts and doings of other children, and be sensitive to the child's prosocial initiatives in reciprocating and affording care, applauding the child upon occurrences of caring attention paid to playmates.

With regard to *tertiary intersubjectivity of the 1rst order*, this is the step at which conversation and symbol-mediated understanding of self and others are unfolding in a reflective and verbal sense, entailing comprehension and use of personal pronouns, like You and I, we and they, in a shared symbolic world of meanings that invites perspective taking and dialogues with self and others – actual companions as well as evoked or imaginary companions. The self-centred careperson turning inwards and muttering to herself or himself invites to be encouraged to participate with the child in the emotional colouring and attribution of words to what child and the caregiver are feeling, openings windows for mutual other-centred moments of meeting. The retreating child may profit from being encouraged to join the others in pretend plays and co-enacted narratives. And if the child is engaging with an invisible playmate or imaginary companion and invites the caregiver to join in shared attention, this is to be welcomed in the knowledge that such imaginative play nurtures the child's social feelings and sensitivity (cf. Chapter 9).

With regard to *2nd order tertiary intersubjectivity* allowing for the unfolding of meta-understanding and mentalization about intention, beliefs and emotion in others, this affords foundations of narratives and understanding in a culturally mediated sense. This opens for a meta-reflective basis for constructed identities of own narrative selves and others as main characters in self-dialogical and shared

narratives. Preschoolers are able to detect misunderstanding and false beliefs in others, and may thus achieve competence also in deceit if so invited by their social environment. Care persons may, however, appeal to their meta-understanding and invite re-definitions of the child and others felt to be excluded from shared communality. The ICDP program recommends pointing out how children may define and draw their own boundaries and be prosocial and care-giving oriented by virtue of their self- and other-understanding, simulated by communion and identity-enlarging narratives. In the Marte Meo approach emphasis is put on how the child can be encouraged to handle criticism and disappointments, be invited to participate in and share others' pleasure, and to cooperate in exercises in which the child learns to appreciate and negotiate with various personalities. Thus the child may achieve understanding of the preferences and understanding of others. Common for these facilitating offers are the focus on dialogical guidance inviting sensitizing of capacities and promoting nurturing developmental tasks (cf. Aarts 2000; Hundeide 2003, 2009).

## Questions inviting further research on perceptual reversal and mind-reading

Throughout this book care has been taken to distinguish questions about the origins of speech and mother-centred infant learning and altruism, raised in Part II, for which computer models and comparative primate studies can afford only tentative replies, from the substantial findings on neonatal imitation and infant learning by participant perception that allow for empirical specification of the various inter-subjective steps to speech and mind-reading in ontogeny. And yet, as repeatedly returned to in this Part III, such substantial findings do not preclude a number of questions inviting further research. By way of conclusion, some such questions, some of them raised in symposium and seminar talks, will here be succinctly repeated or specified, inviting to be explored.

### Questions about perceptual reversal by imitating newborns and the role of cerebellum

The question about perceptual reversal, raised in the context of 'Do as I do'-tests in autism, has not been raised by the pioneers of neonatal imitations studies. The head rotation experiment which Meltzoff and Moore carried out with newborns is pertinent. Here some of the newborns, imitating in clockwise direction, may have done so by virtue of perceptual reversal. That invites the question of whether or not the capacity for perceptual reversal requires some minimal period of sensitizing in

order to become operative. Since these newborns were between 12 and 22 days old, most of them would have had sufficient face-to-face experience to become sensitized in such a respect before that experiment. On the other hand, one-hour-olds neonates, such as studied by Kugiumutzakis (1983/1998) and by Meltzoff & Moore (1983), could not be said to have been sensitized. If one-hour-old newborns were invited to imitate clock-wise head rotation and were motorically able to respond, I would not expect them to do so in a correct clockwise direction, which would have required perceptual reversal. But maybe I shall be proven wrong in this respect; upon my talk on altercentric participation, raising this question about sensitizing at a conference at Crete, organized by Kugiumutzakis in 1998, I got the impression that he was ready to attribute such a capacity to newborns. Checking with him as this is being written, he points out that if parents or grandparents imitate first, they could provide a "sensitizing period". In his naturalistic studies of imitation, occurrences involving perceptual reversal have been shown by infants older than 1 month, while his pilot data on hand imitation may indicate that perceptual reversal "is probably there at birth" (Kugiumutzakis, personal communication 2009). He also refers to this pertinent Piaget-observation of the girl L.:

> "OBS. 5. At 0; 1 (26) L. turned her head spontaneously from side to side. At 0; 1 (27) she watched my face when I quickly moved my head from left to right. She then immediately reproduced this movement three times in succession."
>
> (Piaget 1962:11).

But Piaget does not specify whether the girl moved her head from her right to her left, or from her left to right which entails perceptual reversal. But it is interesting to note that Piaget (1962:73–74) emphasizes that in older children imitation entails a confusion of own and the others' activity:

> "The child often imitates without being aware of it, merely through confusion of his activity or his point of view with those of others."
>
> (Piaget 1962:73).

Piaget sees this to be a manifestation of his definition of infantile ego-centrisim. But if we turn this on its head then "confusion of the other's activity with own activity" entails unwitting altercentric participation in what the other is doing, and inviting circular re-enactment which in face-to-face situations entails a shift from the other-centred frame of reference to the self-centred frame required for execution of the re-enactment.

And then, there is the question of whether cerebellum plays a part in such frame of reference shifts, for example, in face-to-face contexts of 'Do as I do' – situations in which the subject is exposed to arm raising, as illustrated in Figure 4.2. This was first studied by Ohta (1987) finding that subjects with autism had trouble

in this respect, coming up with palms inward. Even though the cerebellum of subjects with autism may deviate from what is typical, and even though the autistic model for "Rainman" has to close his eyes in front of the mirror, that cannot be taken as an argument for cerebellum playing a role in frame-of-reference shifts, since imitation difficulties may be due to the more overall intersubjective impairments in autism (cf. the previous Chapter). I first raised the question about the possible role of the cerebellum at a seminar I was asked by Gallese to give in Parma in the year 2000. Here I referred inter alia to a positron emission tomography study by Grafton, Arbib, Fadiga and Rizzolatti (1996) on localizations of grasp representations in humans, and ventured conjectures about the possible role of reversed body maps (cf. Figure 2.2 (bottom)). But the question was left hanging in the air. Later, when Billard and Arbib presented their simulation model of face-to-face imitation they specified, as was noted, a mechanism for transformation from eccentric frame of reference to egocentric frame of reference, and included cerebellum networks in their model. I predict that future brain studies will reveal that cerebellum plays a role in perceptual reversal in face-to-face situations by virtue of its movement scheduling and somatotopical maps.

## Does the actual other-relation and gender make a difference in modes of mind-reading?

In sessions devoted to theory of mind issues in Chapter 10, references were made to the two likely candidates of mentalization or mind-reading. On the one hand, there are advocates of the theory theory version of theory-of-mind (TT) according to which we draw inferences about the other's mind from our (constructed) theory of mind: On the other hand there are voices advocating the simulation version (ST), according to which we more or less unwittingly imagine or simulate processes in the other's mind. There is no firm basis for rejecting either of these alternatives. In all likelihood most of us are capable of entertaining both modes as complementary ways of understanding others. Dependent upon own state and the degree of intimacy or formal relation with the other, either of these modes may come to be activated and, sometimes, the feelings generated by the simulation mode may come to be supplemented or corrected by the theory inferences. Allocation of neurosocial resources would of course differ; with ST activating altercentric participation and its mirror systems support, while TT would activate resources devoted to more analytical and systematizing procedures (of the kind attributed by rational choice theorists).

Furthermore, we saw that some of the advocates of TT attributed inferences from own state to be required for simulating another mind in line with ST, while advocates of ST rejected such an attribution. In the sense that ST entails altercentric

participation, which involves own state of participant perception of the other's state, albeit as experienced from the other's centre, the state of the perceiver is indeed a part of the picture, albeit not as a source of inferences. As for TT, it could very well be assumed that one's own state of mind, even if hard to grasp analytically, may be a part of the theory platform for theory theory understanding of the other's mind.

But then, assuming that both mind-reading modes are candidates for being activated, dependent upon circumstances, persons and perhaps gender, one may ask: what about possible gender differences – which of the two modes, TT or ST, should be expected to be most prevalent in women and which in men? Bearing in mind that both modes could very well complement each other in both genders I venture this tentative reply: While expecting that ST in general would be found to be most prevalent across genders, I would expect ST to be the dominant mode in most females, and TT to be more prevalent in most males.

## Do our sensory modes in language differ from modalities related to music and dance?

In Chapter 7 it was noted that while rhythms appear spontaneously in children, they do not do so in other primates, and that unique to music, rhythm involves a kind of perception and synchronization of beat that differ from linguistic rhythms. And, then, there is the spontaneous manner in which children are drawn into song and dance, entailing a quite different culture than the written language culture. In his work on *The Muse Within*, Björkvold (1992/2005), illustrates with examples from African oral musical culture, as woven into all activities. The African Bantu use the word 'sikia' for the cross-modal experience of sensing with one's whole being. This holistic perception differs radically from the detached and part perception invited by the culture of writing:

| THE TONE | THE NOTE |
|---|---|
| Humans inside as whole beings | Humans outside as detached readers |
| Sikia, holistic perception | Part perception |

(Adapted from Björkvold 2005:61)

The holistic perception in the Sikia sense, with an emphasis on hearing, and excepting taste, comprises otherwise all the senses. That may capture the composite way in which music may be experienced in this African context, Björkvold points out, not just by way of listening, but by moving with the music, even obeying it. And yes, as he indicates, this resembles the intermodal or supra-modal manner of crossing the various modalities of perception which we find in young infants, probably reflecting an innate general capacity (cf. Meltzoff 1981; Stern 1985/2000:51). This invites phenomenological description in near-poetic terms.

In scientific terms such intermodal characteristics have been specified as cross- or supra-modal forms of representations abstracted from the various sensory modalities. My guess is that an explanation in terms of abstracted representation will not hold. Such inter-modal attunement is likely to be much more deeply bodily embedded, like proprioception and alteroception, inviting specifications in terms of the neurosocial characteristics of inter-modal mirroring and resonance in an intersubjective sense.

And then, as previously pointed out, we may return to the way in which music and dance bind people together into a communal moving collectivity; how listening becomes active and motional and listeners are turned into participants (Sacks 2008; Storr 1992), and how the dancers' movements and rhythms may come to invite in the spectators a matching resonance (cf. Mackrell 1991:244). Unlike the way in which nature defines the landscape in which we walk and admire the view, and language defines the frame of reference within which we talk and acknowledge others – which may be done in a detached manner – music and dancing makes for e-motional attachment, transforming spectators or listeners into virtual co-authors by virtue of participant perception in inter-modal attunement.

It is sometimes easy to discern the dance-like and music-like characteristics of an intimate verbal conversation entertained, say, by a group of teenagers. While they may be unfolding narratives like song and dance sometimes do, and may be engaging with one another in felt immediacy, inviting altercentric participation, like an audience is invited to virtually participate in the dancer's dancing, there is this difference: the verbal conversation will make no sense unless it also allows for coding and processing of symbolic representations. Thus, while the conversational partners and the dance audience have in common to be engaged in primary sense of felt immediacy, the verbal conversation also calls upon the higher-order modes of secondary and tertiary intersubjectivity in representational mediacy, even though it may be supported by intersubjective attunement in presentational immediacy.

## Did the toddlers feel to help Meltzoff in pulling the dumbbell apart?

In a series of ingenious experiments with infants and toddlers, Andrew Meltzoff and his co-researchers have uncovered and highlighted a number of critical achievements ranging from neonatal imitation of facial gestures, through deferred imitation of object manipulation, to toddlers' re-enacting realization of object-manipulating acts which the experimenter failed to complete in spite of his (pretended) attempt. In addition to presentation of the experimental results, plausible theoretical interpretations have been afforded and followed up by pointing out how they make signify sign posts on the children's path towards theory

(or theories) of others' minds. Among the key terms of the afforded interpretations are these: Meltzoff and his research colleagues, Moore and Gopnik, propose as we have seen terms such as 'like-me' recognition and supramodal representation; active intermodal mapping mediated by an internal representation of the adult's act; reading of intention; as well as pointing to paths towards arriving at theories of others' minds. Given the same series of experiments on newborns, 9-month-old and 18-month-olds, an alternative or supplementary set of interpretations may be offered with these key terms: 'like-you' alteroception, altercentric participation entailing mirror reversal in face-to-face situations, simulating completion of the act, as precursory to simulating others' intention and (mis)understanding. On the one side there is a rather cognitivist representational account as earlier voiced by Meltzoff and his co-workers, and with a slightly self-centred twist ("like me" equivalences). As a complementary perspective, a more other-oriented account in terms of intersubjective feelings may now be offered.

Let us now return to the 18-month-olds who realize intended but failed model acts in Meltzoff's behavioural re-enactment experiments. Toddlers in the control group either saw the full completed target act or appropriate controls. Results showed that those who had watched the failed attempts could produce the target act – unlike those exposed to a mechanical device tracing the same movements that the person had followed:

> "The results showed that infants did not attribute a goal or intention to the movements of the inanimate device [...] Infants were no more (or less likely) to pull apart the toy after seeing the failed attempt of the inanimate device than in baseline conditions when they saw nothing.
>
> We think 18-month-olds cast the person's actions within an intersubjective framework that differentiates between the visible behavior and a deeper level of felt experience involving human goals and intentions. When they watch a person's hands slip off the ends of the dumbbell, they immediately see what the adult was trying to do."
>
> (Meltzoff & Brooks 2007: 163).

. . . and perhaps – we may add – with an urge to come to his aid? With reference to this "deeper level of felt experience" may be spelt out an interpretation in terms of altercentric simulation in felt immediacy (cf. Fig. 8.4) and also about a potential wish to afford help evoked by the toddler's participant perception of the adult's effort. The toddler feels to be a virtual co-author of the experimenter's attempt to pull the dumb-bell apart and simulates internally the successful completion of that pulling act, leaving an e-motional memory enabling actual realization of the pulling apart.

And this invites the question: Could it be that some of these toddlers who pulled the dumbbell apart actually felt that they were helping this failing adult

in need? He tried but failed, and the toddler came to his assistance helping him to achieve his ends. Perhaps replication experiments would be required to yield a reply to the above question. One indicator would be whether or not some of the toddlers handed back the dumbbell pieces to the experimenter after they had pulled the dumbbell apart. Handing back the pieces could be seen to signify that they had felt themselves to be in the position to help Meltzoff. In that case, prosociality, if not altruism, would have been at play.

## Concluding questions about early altruism and the roles of socializing agents

In Chapter 6 we saw how early altruism in children could be accounted for in terms of their innate capacity for altercentric participation. This invites at least two questions, deserving to be pursued more comprehensively in another context.

First, how may we invite children to become servants of nature and caretakers of the planet? Given such latent capacity for altruism in young children, could this capacity also be mobilized in contexts when the natural environment invites concern? A colleague of mine recounts from when she was about seven or eight years old and accompanying her relatively stern mother in their neighborhood, how her mother always used to stop at a cypress bush and snatch a tiny piece of one leaf which she sniffed. When asked why she did that her mother offered the leaf to her daughter to sniff while uttering these warning words of care: Only a tiny piece, be careful not to harm the precious cypress! (Victoria I. Einagel, personal communication 2008). Whenever seeing a cypress bush as an adult she hears again her mother's words about taking care of nature.

This relates to a critical question (hinted at in an epilogue to Bråten 2007c: 312): Given children's altercentric roots of care-giving and the way in which socializing agents often invite them to turn egoistic, greedy and exclusive (Eriksen 2004; Whiting & Edwards 1988), how may we counteract such influences and invite them to appreciate nature's ingenuity by becoming its servants and indeed – be caretakers of the planet which is theirs to inherit? In Norway, for example, the children's environmental organization, so called "milieu agents", is running advertisements in the press and on television. Topics are like these: Father or mother took the big car going to work. Upon their return, the little boy states: "I am not angry [at you], but terribly, terribly disappointed!" Or the little girl pulls aside the window curtain as her mother is leaving, asking: "Hi mammy, you're taken the bus, aren't you?" In the advertisements, parents are invited to register their children at www.mijoagentene.no. The milieu agents have the right to confront you, it is stated, because they partake in forming their own future.

Second, given altruistic infants, why is selfish behaviour so prevalent in socialized individuals? In the cross-cultural study by Whiting and Edward (1988) referred to in Chapter 6, children in 3 of the 10 cultures studied were found to show increased tendency of egoistic behaviour with age, probably due to influences at home (Cf. also Edwards (1998) on the company children keep). When influential socializing agents emphasize how the child should look out for own interests and stay away from those who do not deserve to be included in the we-centred community of family and friends, selfish behaviour may be encouraged. While affordance of care-giving invites in the infant circular re-enactment by virtue of learning by other-centred participation, so does neglect and even abuse (cf. Bråten 1998a; Dornes 2002). Furthermore, cultural learning of egoistic dominant modes and epistemocentric socialization modify or even passivate the child's natural tendencies to feel concern for others. Instead the child may be invited to redefine others as objects or strangers to be feared and excluded from a we-centred intersubjective space. Such situational definitions afforded by cultural learning could arrest or abort what might otherwise have been elicited as empathic identification with another in need. With the processes of cultural learning, including language acquisition, the child becomes enculturated into the language culture into which the child has been born, and acquires in the process the specific perspectives and world constructions characterizing that culture. The chances are that the very culture into which the child is born is an epistemocentric monolithic system in which the enculturating members are acknowledged by the child to be the ultimate and true sources of valid replies to questions about the world, invites the child to partake in a world construction implying that there is only one set of valid replies to questions about how the world "really" is and about how others in it really are. This is the defining criteria of what I have termed 'model power' (Bråten 1973c). It entails influence on others by virtue of a powerful reality model which the others attribute to be the source of the only valid replies to questions about a specific domain, and which excludes any alternative perspective or reality definition from the question horizon. First, the children's home arenas, and next the children's (pre) school arenas afford "ideal" contexts for maintaining and re-enforcing an epistemocentric world construction silencing any dialogue (such as touched upon in Chapter 9).

While altercentric mechanisms are at work almost from the outset so that the child does not have to decentre in a Piagetian sense in order to relate intersubjectively to others, powerful socializing agents may come to invite we-centration. If there is any (ego)centricity to be attributed, it should rather be used to characterize what is done by many adult mediators of the specific modern culture into which the infant is born, maintaining an epistemocentric, monolithic culture, i.e., a world view that rules out any alternative or crossing perspective. Cancelling some

of the initial openness and prosocial tendencies that characterize younger children, such cultural socialization may rather entail an invitation to increased epistemological centration and pursuit of selfish interests, advocated by the company children keep. Yet, if we acknowledge the inherent prosociality, even altruism, that young children, even infants, may exhibit such socialization pulling in an egocentric and other-excluding direction may in part be counteracted. Throughout this book many examples of caregiving children have been offered. Just the other day, a colleague of mine told about her 15 month old son who had been fairly late in reciprocating spoon-feeding, as she had seen portrayed in one of my books. However, from between 12 and 13 months of age he began to exhibit another kind of caregiving: he enjoys brushing her teeth, illustrating also another important point: When affording care infants enjoy their act of affording care.

# Glossary*

***Affect attunement***: affective accompaniment in tune with the other's activity, such as voiced by mothers when watching the infant child playing. Daniel Stern, who introduced this concept, asked mothers in an experiment to overplay or underplay their accompaniment (which some of them found difficult). When the mother made herself get out of tune, the child would stop playing and turn to look at the mother.

***Allocentric map***: term used by John O'Keefe to distinguish place-oriented memory in animals such as rats (involving hippocampus), determined by where they had been in the landscape, and independent of the direction of their gaze, i.e., transcending the view-orientation linked to the egocentric body coordinates of the animal.

***Altercentric participation***: term introduced by Stein Bråten to characterize the other-centred perception and mirroring of movements which he and Eibl-Eibesfeldt have identified in human infants who feed their caregivers and unwittingly open their mouth as the recipients open their mouth to take in the afforded food – just like adult feeders often unwittingly do. More generally, such virtual participation in what the other is doing was noticed by Adam Smith who recounted how spectators of a French line dancer moved in sympathy with the dancer's movements.

***Alteroception***: term introduced by Colwyn Trevarthen for infants' direct perception of others' body orientation and movements, analogous to our proprioceptive capacity for perceiving own body orientation and movements.

***Baldwin effect***: mechanisms of learning by imitation supplement the process of natural selection of which they are a genetic product. As proposed by James Mark Baldwin, such mechanisms reflect back on genetic evolution and speed it up by producing an even more favourable population distribution.

***Companion space***: term used by Bråten, Kugiumutzakis, and others to denote the phenomenological intersubjective space of mutual awareness between two

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*See also pertinent definitions in the glossaries in Trevarthen et al.: *Children with Autism* (2nd edition) (Jessica Kingsley 1998:313–330), in Stern: *The Present Moment in Psychotherapy and Everyday Life* (Norton 2004:241–247), and in Damasio: *Looking for Spinoza: Joy, Sorrow and the Feeling Brain* (Heinemann 2003:333–336).

participants, in which the bodily self perspective is complemented by a companion perspective – actual or virtual –, enabling transformation in the same operationally closed format in these two cycles:

i. engagement with actual others who fill the companion space;
ii. self-engagement (with one's virtual other) re-enacting the format of (i).

***Emotional memory***: term used by Joseph LeDoux for emotional processing and "storing" in brain systems and pathways bypassing the neocortex, based *inter alia* on his studies of fear conditioning in rats. Maintained by subcortical circuits, emotional memories may be indelible.

***E-motional memory***: composite term (combining the folk sense of being '*moved by*' and the root sense '*out-of-motion*') proposed by Stein Bråten for the procedural memory of having co-enacted – virtually or actually – the goal-directed movements of others, evoking in the learner shared vitality affect contours and inviting circular re-enactment in similar situations.

***Felt immediacy***: the mode of directly perceiving own or others' body movements and orientation in presentational immediacy, as in proprioception and alteroception, differing from perception in re-presentational mediacy that is mediated by symbolic and conceptual distinctions.

***Intersubjective communion***: mutual engagement between subjects who consensually attend and attune to one another's emotive states, expressions and gestures in a pre-reflective and nonverbal mode of felt immediacy. Discovering such reciprocal and motivated occurrences in early infant-adult interplay, Colwyn Trevarthen terms this *primary intersubjectivity,* distinguished from the stage of *secondary intersubjectivity* when objects of joint attention are brought into play (at around nine months of age), precursory to verbal communication.

***Learning by altercentric participation***: imitational learning by Ego's virtual participation in Alter's act from Alter's stance as if Ego had been facing the same direction or been hand-guided (and which in face-to-face learning situations entails perceptual mirror reversal of Alter's enactment) giving rise to shared temporal vitality (affects) contours, reflecting the manner in which the enactment is felt to be virtually co-enacted and the feeling that directs the co-enactment, enabling circular re-enactment from e-motional memory of such other-centred participation.

***Mimetic culture***: term proposed by Merlin Donald to characterize the patterns of imitational transfer and creative re-enactment that may have distinguished the Homo erectus culture from the previous stage of primate patterns relying on episodic memory.

***Mirror neurons***: neurons that fire at the sight of another individual's performing an act and in oneself upon doing that act, for example of grasping a morsel, discovered in the macaque monkey brain by Giacomo Rizzolatti and his co-researchers, and later found to be operative as a mirror system also in the human brain, involving the Broca's area (which not only supports speech but is also involved in hand rotation and imagination of hand rotation). This discovery is rich in implications concerning language evolution and speech perception, empathy, imitation, imitative learning by altercentric participation, and simulation of mind.

***Model power theorem***: the conjunction of the simulation version of theory of mind and the Conant-Ashby theorem (every good regulator of a system must be a model of that system) implies that if you regard the other to be the source of the only valid model of a domain D, then by adopting the other's model, you thereby enhance the other's model monopoly and control over you by giving him the power to simulate even your simulations (Bråten 1973c).

***Momént of meeting***: defined by Daniel Stern as a present moment of mutual other-centred participation in which two partners create and undergo a joint experience of resolving a crisis created by a preceding now-moment arising, for example, during a clinical conversation. The resonant experience of such a moment of meeting enlarges the intersubjective field between them which then opens up new possibilities for exploration. This change may be lasting and does not require any verbalization or narration in order to be maintained.

***Perceptual reversal***: reversal from the altercentric frame of reference for perceiving the model in face-to-face situation, who invites imitation of gestures or object manipulation, to the body-centred (egocentric) frame of reference required for executing the re-enactment.

***Presentational immediacy***: term introduced by A.N. Whitehead to distinguish such a primary mode from Cartesian modes of representational mediacy (cf. also *felt immediacy*).

***Prosocial behaviour***: behaviour onto others entailing affordance of help, care, or consolation, which not only human adults can do; such behaviours can also be exhibited by apes, as documented by Frans de Waal, and even by human infants who sometimes may even be prosocial in an altruistic manner; e.g., sharing the sweet dessert with the caregiver.

***Protoconversation***: term introduced by Mary C. Bateson on the basis of her analyses of filmed infant-mother interplay to denote the way in which such interplay already in the second month of life has some of the characteristics – including turn-taking – of a verbal conversation.

***Reciprocal altruism***: term introduced by R.L. Trivers to denote the way in which participants of the same tribe or group experience that a member helped in an altruistic manner may later on come to return the help in an equally altruistic manner. In a sense this brings in selfish exchange through the back door: I help you today if you help me tomorrow.

***Secondary intersubjectivity***: term introduced by Trevarthen and Hubley to distinguish the stage (around nine months of age), when the infant is motivated to join other in shared object-recognition and joint attention inviting co-operation in object-oriented task performance.

***Theory of mind or T-o-M***: the social-cognitive ability to imagine or simulate others' minds and emotions (the simulation version) or to draw inferences from a theory of other minds (the theory version), attributed to children from about 3 or 4 years of age.

***Virtual Other*** (***Virtual Alter***): an innate non-specific companion perspective postulated by Stein Bråten to complement the bodily self perspective with the operational efficiency (*virtus*) of an actual companion perspective, and inferred to enable alteroception and altercentric mirroring with the likely support of the mirror (neurons) system.

***Vitality Affects***: term introduced by Daniel Stern to distinguish from categorical and discrete emotions (such as surprise, anger, etc.) the more subtle and continuous life feeling flow accompanying activities, including shared activities. He uses the term 'vitality contour' to denote the temporal contour of feeling flow patterns with a characteristic intensity time-course of vitality affects which reflect the manner in which an activity has been enacted and the feeling that directs the enactment.

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