

## The nature of motives for human consciousness

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### ABSTRACT

Human conscious experience and voluntary activity are animated and co-ordinated by motives that arise in individuals and that are shared with companions in communities. Motives are organised cerebral events that generate forms of behaviour. They are capable of transmitting information about their generative dynamics and emotional evaluations to other human beings. The foundations of this intersubjectivity are evident in infants from birth; indeed, from prenatal stages. This paper explores the theory that motive functions arise from motor images generated in the brain, which are guided by perceptual experience that is sought to effectively complete each intended action. It then discusses how the innate foundations of human communication arise by adaptation of matching rhythms and forms of motor image, and emotional adjustments to experience. Evidence is presented from research on the motive of early infant communication, its imitative sensitivity to and support by behaviours of caregivers, and its development toward co-operative understanding and cultural learning.

*Key Words:* Infants, intersubjectivity, motives.

### Introduction: Axioms for a theory of human sympathy

This paper is adapted from one on the perceptual world of the *inter-subjective* self in infancy (Trevarthen, 1993a). Here I focus on the *motives* that seek human sympathy and their *innateness*, and on how motive activity passes *between persons* to sustain their mutual awareness and shared purposes. The evidence comes principally from the development of communication with infants. First, however, I offer a scientific definition of the word «motive», and I attempt to clarify what I, as a developmental biologist, mean by the word «innate».

I believe that these issues – of how to

conceive the motives for human imitative sympathy and co-operative imagination, and their innateness – are fundamental in the science of the mind, underpinning and complementing research on the functions of 'perception', 'cognition' and 'learning', the empiricist trinity of modern psychology. We do not understand motives if we restrict attention to the input-processing side of mental life.

The concentration of main-stream psychology on how separate single minds function creates a problem. The concept of «the Self» as a psychological unit has enhanced significance in a culture that cultivates awareness of individual experience, personal responsibility and rational (essentially verbal) accountability. However, in

spite of what our educated appearances may pretend, we are not just separate units of awareness and cognition defending the integrity of our 'selves' in a universe (or «context») of physical and social phenomena. Much of what each of us seeks to do is incomplete and senseless if it does not actively relate to other subjects and their mental life. True, we perceive a unified Cartesian centre for personal awareness and memories created in each of us by our coherent impulses to act, and by the emotions that evaluate and regulate what we do. But, from birth we are more than thinking, feeling and acting selves. We express an intuitive need to relate our consciousness to that of other persons. In this relating an unrationalised exchange of feelings with others plays an essential part.

*Intersubjective consciousness* is not comprehensible from the individualist cognitive perspective. Human sympathy and imitations cannot be explained if one assumes that representations in each person's mind are nothing but the accretions of sensory effects on an impressionable neural net, impressions that acquire value simply by association to effects on bodily needs of that individual. Furthermore, we are not entirely explained by the way we verbally rationalise and give conventional identification to our experiences. Our life narratives are accounts of changing personal relationships and in them we are appreciated actors with socio-dramatic and co-operative roles, not just rational intenders.

Every human consciousness appears to arise from a non-rational, un verbalized, conceptless, totally atheoretical potential for rapport with other persons' thoughts. This core of consciousness is made up of a dynamic system of motives that coordinate actions between individuals and that alert perceptions in shared imaginings. In this view it is not surprising to find that social and emotional processes are inextricably intertwined with the cognitive systems in the brain throughout its development (Damasio, 1994; Trevarthen & Aitken, 1994). Given that human intersubjective sympathy exists, how does it start? Our psychological tradition, observing the weakness and limited cognitive powers of the newborn, has

given great value to the vigour and cultivated intelligence of an educated man. In comparison, the mind of an infant is perceived as incoherent, with undefined perceptions and incapable of contributing to communication, except to solicit help reflexly for biological functions. This view is rapidly passing, in part because of new information about infants' abilities, and about innate structures and activities of the human brain.

One philosophical theory of the 18th century, so famous for its enlightened rationalism, acknowledged the key role of intersubjective interpretations in the generation of human consciousness. The Theory of Sympathetic Motives enunciated by the Scottish philosophers Hutcheson (1755) and Smith (1759) held that *an innate human sympathy* generates companionship in awareness of meaning, pursuit of co-operative purposes that use common knowledge, and universal moral sentiments. Human sympathy constitutes a reflective self-awareness with a conscience. Some non-European philosophies have comprehended human relating in similar ways. For example, the developmental psychologist Nakano (1996) defining the unity of Self-with-Other as 'the space of the We', roots this in the traditional Japanese concept of *joh* or *nasake*, the central element of emotion that generates sympathy and compassion attracted to the other's inner state. It is associated with the responsibilities of *amae*, a feeling of indulgent interpersonal responsibility, as of a parent for a child.

The mind of a linguistically and thoughtfully sophisticated adult may be said to have learned to articulate an individual «self-awareness». His or her consciousness may have gained an autonomous expertise in thinking out meaningful propositions and moral rules «in one head», as European philosophers from Plato to Kant have assumed. But, this is evidently not the first of essential state of our consciousness and thinking. As Hutcheson and Smith argued, an immediate dynamic with-the-Other awareness comes first and persists through life in our moral core (see also Macmurray, 1961; Buber, 1958; Benjamin,

1988). Human self-awareness is just one manifestation of mind in a person who is capable of being a companion and confidant at a direct emotional level.

I will show evidence that this is true from birth. Infants communicate and think emotionally, and their selves and self-regulations reflect relatedness to other persons, or «otherness». They possess motives, preferences and cognitive propensities that are specifically adapted to perceive, respond to, attract and influence how other persons feel and what they, in response, will perceive and do. Infants possess functions of *intersubjectivity*.

### Theory of intersubjectivity

To explain any imaginative consciousness of this kind, one ready to take active part in a community of understanding, a psychologist must begin with principles or working concepts of the causes of communication in subjects. I believe that the four following are essential:

1. *Perceptions are to be conceived as motivated experiences* (Latin; *experiri* = «to try») – that is, as informations generated «from trying to know», from *purposes* seeking those stimuli that the subject is «caring about» (Donaldson, 1992). If we imagine what is going on in our brains, it is clear that our awareness is automatically part of and relevant to *motives* – the multiplying intentions of our moving. Motives process, make sense of, the information from senses.

The intrinsic *motor image* (Sperry, 1952; Jeannerod, 1994), with dynamic organisation that anticipates concurrent sensory guidance in several modalities at once, and in reference to one body-centred time and space, is required for perception of any goal or object. Periodic division of purposes in a complex body, between different limbs and between the special receptors (eyes, ears, hands, mouth), imposes a need for programming of intentions in a coherent pattern or strategy of successive orienting steps or foci of attending (Trevarthen, 1978).

2. Regularities of form and rhythmic timing, which prevail through each person's life in all investigative behaviours and voluntary actions, can be expected to give rise to *unambiguous signals about motives* that produce them. Actions of experience, even if they are not clearly felt by the actor's self, are rich in mental evidence for others. Intentions can be as evident to a sympathetic partner as to the person in whom they have arisen. Note that picking up these primary symptoms of motives requires no added conceptual representations or «theories» about minds.

The internal self-regulations of consciousness and thinking in every adult are impressed with body-related dynamic impulses and evaluations, and these, little changed, have regulated his or her direct interpersonal engagements from birth. Consequently, a mother and her infant, in spite of their very different histories, can have immediate mutual sympathy (Beebe et al., 1985; Trevarthen, Kokkinaki & Fiamenghi, in press). They resonate inherently to the same beat, and 'think' in similar phrases. Physiological time bases in consciousness (Pöppel, 1994) give humans of all ages a common currency in motivation.

The core mechanism of inter-subjectivity has been given an elegant and powerful formal explanation by Bråten in his Theory of the Virtual Other. Bråten (1988) describes the mutual assimilation of two subjects in intersubjective communion as «dialogic closure» in the mode of felt immediacy. The efficiency of the processes of human sympathy is explained in terms of how the mind's innate organisation with a virtual companion perspective includes actual others in «companion-space», permitting «co-enactment» of self with other, each in 'alter-centred' agency.

3. This readiness for intersubjective work that inheres in motive programs that direct conscious purposes will be reflected inside each individual's stream of consciousness as a kind of dialogue; that is, *thinking is a motivated conversation between lines of thought*. Ideas flow from several intentional sources or «voices» that arise within us and interact (Bakhtine, 1981). Vygotsky's developmental theory (Vygotsky, 1962), accepts

that this «intra-mental» work is an internalised image of the 'inter-mental'. Evidently, however, private thinking and social communicating exist in corresponding and complementary forms from the start of mental life, changing with the same rhythms and cycles. Neither is the source of the other. The crucial element is a purposeful intersubjectivity that allows mental collaboration as well as propositional cognition.

4. As Darwin proposed in his famous treatise on emotions in man and animals (Darwin, 1872), sympathetic communication is regulated by *universal emotional expressions*, shared *contrastive movements and attitudes that transmit motive values* between subjects, signalling in their forms and tempi many shades of pleasure and unpleasure, purposefulness or uncertainty, in flowing narratives or abrupt explosions of transitory display. The motive impulses of human subjects are adapted to pass readily between them; their sadness or joy, confidence or fear, anger or satisfaction, agitation or peace is immediately shared. Emotions of love, coquetry, shame, jealousy, hate, and so on, measure the quality of relationship or sympathy, positive or negative, between persons.

Darwin thought that emotional expressions have evolved from voluntary, «serviceable» acts adjusting an individual's exploration or performance, and that, through repeated activation of the nerve pathways, these behaviours became instinctive. Thus he placed *motivated actions, aimed to regulate experience* of behavioural transactions with the environment, at the evolutionary source of the intuitive expressions of emotion that come to serve exclusively in communication.

#### **Innateness: Psychological states at, and before, birth**

To explain how intersubjective motives originate, and to establish that they are innately determined, a scientific psychology must suppose that antenatal developments of the embryo brain generate mechanisms for the above

principles of motor imagery and perceptual processing, mechanisms that will assimilate the rhythms and emotive forms of other subjects' motives, and that will learn through communication. Such a theory is also needed to explain the effects in learning of congenital «empathic disorders», such as autism (Trevarthen & Aitken, 1994).

The newborn baby can alert to a human presence and make efforts to follow and communicate with human emotions (Trevarthen, 1993b; Trevarthen, Kokkinaki & Fiamenghi, in press). It is from motoric expressions of the infant's brain activity, resonating to the effects expressed by other brains, that impulse comes for the child's subsequent learning of socially constructed meaning. Meaning in the human world is an acquired consciousness of the affordances of an artificial reality that each of us shares with a community and a culture. It becomes a narrative about the cosmos – what can or might be in our world. Shared meanings are part of a long tradition of knowledge, as well as of common every-day, pragmatic or recreational sense. And each child is eager to learn this story of cultural life, having been born able to communicate purposeful mind work with the minds of those persons who already know and believe the story.

*Early communication.* Neonates, including prematurely born ones, attend to expressions of persons and can be led by them into rudimentary communication. The sequences of expression do not have the coherence and regularity of 'protoconversation' with a 2-month-old, described below. The infant's orientation is insufficiently focused and reactive to encourage lively expressions from a partner. Nevertheless, newborns do respond selectively to people and they will look at faces, listen to voices, smile and vocalise. These responses can have a profound effect on the motives and behaviour of an adult, and intricately coordinated exchanges of expression between adult and newborn may ensue. Oster & Ekman (1978) made a meticulous study of the facial motor actions of neonates, demonstrating many discrete configurations of

expression. Alegria & Noirot (1978) demonstrated sensitive orientation and searching in response to the mother's voice within hours after birth. The interactive regulations of such expressions are still far from clear, but evidence is accumulating (Trevarthen, 1993a; LeCanuet et al., 1995).

The communicative reactions of a newborn infant are weak, but perhaps not as chaotic as is assumed, for example, by contemporary Dynamic Systems Theory (Fogel & Thelen, 1987; Fogel, 1992). Newborns select goals for purposeful acts, including acts of communication. The emergence of order in the playful interactions between a newborn infant and a caregiver, while benefiting from stochastic elaboration, is constrained by human motives in both parties, motives which are lacking, for example, in a kitten or a puppy. Their 'chaos' of moving and sensing is a different chaos from that of a baby, with different intermental goals.

*A revolution in neonatology.* Medical management of birth and care of prematurely born or sick infants have been changed since the '70s by recognition that sensitivity to human care and communication is elaborated in the infant before term (Brazelton, 1973, 1979; Als, 1995). Alert newborns are capable of co-ordinating their behaviour in relation to events in the outside world, and this is helped when their heads are supported in upright position (Amiel-Tison, 1985). Focus of neonatal care and assessment on the physiological state regulation and reflex responses of newborns has gradually been supplemented by examination of co-ordinated adaptations for communication with affectionate mothering (Brazelton, 1982; Wolke, 1987). Observation of foetal movements *in utero* by ultrasound has dramatically changed ideas of the coordinative abilities of the preterm brain. Now, thanks to ultrasound imagery of intrauterine life, it is accepted that postnatal behaviours and their motive state regulations are continuous with the rhythmic and smoothly integrated spontaneous patterns of activity and repose observed before birth in a healthy foetus (Prechtl, 1984; Cioni & Castellaci, 1990; Lecanuet et al., 1995).

*Neonates' imitations.* When tongue

protrusion, mouth opening, vocalisations and facial expressions of emotion are presented with rhythmic insistence to a newborn, followed by waiting, the infant may become attentive, and then make a matching expression (Maratos, 1973, 1982; Meltzoff & Moore, 1983; Meltzoff, 1985; Field et al., 1982; Field, 1985; Kugiumutzakis, 1983, 1985; Heimann, 1989; Heimann & Schaller, 1985). The imitations that respond to these decontextualised or unmotivated 'models' are not mindless reflexes. They are neither immediate nor 100% reliable. Thus they can easily be «disproved» by experimental regimes that assume they should be so automatically reliable. In fact, neonatal imitations appear to be adapted to dynamic regulation of a probabilistic and co-operative encounter with a human partner who may also imitate, and the infant's imitation is treated by an affectionate parent to be a signal of recognition, like a smile. It is taken as part of reciprocal communication, and as much a model to be imitated as a reproduction (Trevarthen, Kokkinaki & Fiamenghi, in press).

Newborn infants often observe or «watch» the emphasised expression of a «model» for several seconds, and when they do imitate they do so with evident effort and progressive approximation to the model. Furthermore, imitations require that the newborn is in an optimal state of calm alertness, and the modelling must adjust to the infant's differentiated signs of attentiveness or interest. The imitations are expressions in a rhythmic, counterbalanced exchange of gestures and oriented phases of attention. Some subjects do not imitate the most careful and persistent modelling (Kugiumutzakis, 1985; 1993). Evidently there are considerable individual «temperamental» (i. e., motivational) differences in readiness to imitate (Field, 1985; Heimann et al., 1989). An active readiness, or motivation, for sympathetic reciprocal involvement with another person is an essential component of the ability to imitate.

Interpretation of neonatal imitation has proved controversial because observers have started with different assumptions. Human mimicry has

been a contentious topic in philosophy for more than 2,000 years (Kugiumutzakis, 1983). Most perception psychologists have held the view that newborn cognitive processes would be too uncoordinated to permit intermodal matching, as is assumed to be required for a visible model of a protruding tongue to be reproduced by the tongue that the infant cannot see, and therefore the inter-modal aspect has been emphasised as a paradox (Meltzoff, 1985). It has been assumed by behaviourists and cognitive theorists alike that in the first few months a baby could not possibly «represent» another person's face, and a multiplicity of ways of «explaining away» the behaviour as not true imitation have been proposed (see Kugiumutzakis, 1985).

It appears evident that to explain imitation one must turn attention away from exclusive preoccupation with problems of sensory information processing, perceptual equivalence and symbolic representation in thinking, to consider the perception-readying motives and rhythmic motor co-ordinations that are required for production and reproduction of forms of movement, and also for the kind of developing exchanges of expression that make protoconversation possible (Trevarthen, Kokkinaki and Fiamenghi, in press). Neonatal imitation, like neonatal eye-hand co-ordination in «prereaching», is the result of activity of an *investigative motive system* that is seeking an aspect of reality (an object) that will complete or satisfy it in dynamic ways (Trevarthen, 1986a, pp. 236-241).

Neonates imitate expressive movements that are close to their own spontaneous repertoire of expressions. As Baldwin (1894) showed, learning a new motor co-ordination involves repeated practice, which he called «self-imitation». This was subsequently incorporated into Piaget's theory of «circular reactions» and the «object concept», the latter portrayed by Piaget (1953) as the emergent product of motor activity exciting perceptions. Imitations of other persons actions provide the Other, who gave the model, with a reflection of that Self-related act. Imitations are also «meta-communicative acts» of play that

comment on the communicative relationship (Bateson, 1956) – they become a classic form of «joke» in communication between children (even infants) and their playmates (Trevarthen, Kokkinaki & Fiamenghi, in press). Toddlers use immediate imitation to create co-operative ritualised games (Nadel, 1986).

The fact that neonates imitate shows that they are ready to begin exploring with *communication about (or in) communication*. This ability may, in a human newborn, be an essential preparation for the development of referential or linguistic communication. In his recent study of spontaneous expressions between mothers and young infants in natural play at home, Kugiumutzakis (1993) has found imitations in both directions, mothers imitating infants and infants imitating mothers, and these imitations are selective of behaviours that are constitutive of, or preparatory to, speech and gesture.

*Feelings communicated with an infant.* Responses of a non-imitative kind that infants make to persons indicate that they are capable at birth of complementing a partner's expressions with an *emotionally appropriate response*. For example, Van Rees & De Leeuw (1987) have recorded how a prematurely born infant can smile to an affectionate vocal greeting from the parent. Analysis of vocal imitations in the original recording of one such exchange shows that the father and the 8-week premature infant are exchanging coos on a regular pulse, both generating alternating mono-syllables and phrase-length pauses (Trevarthen, Kokkinaki & Fiamenghi, in press).

To perceive another person and respond appropriately, the neonate must be capable of integrating, from perception of the Other's vocalisations, touching and face movements, an awareness of, or sympathy with, the generative emotion behind these expressions. A detection of *emotion-defining invariants* in the stimuli from the other's expressions must occur. This requires a specific readiness to grasp the other's behaviour, one that can discriminate and respond differentially to the different emotions behind the expressions, and to the changing value of

motives. Thus both imitation and the communication of complementary emotions require the infant to be ready to interact with the Other in a matching and self-coordinated, actively-attuned way. In this sense the neonate's mind does represent *motive qualities or states of the Other*.

*Foetal learning of maternal vocalisation: readiness for care and companionship.* DeCasper's discovery of a foetal learning that recognises maternal voice pattern confirms a readiness for communication (DeCasper & Fifer, 1980; DeCasper & Spence, 1986). The auditory awareness of a newborn is already aimed to human vocal communication and to the establishment of a preferential relationship with the mother (Fifer & Moon, 1995). DeCasper has shown that neonates can quickly learn to discriminate events that are contingent on their own activity, and that they rapidly develop preferences for effects that they have brought under the control of their own actions (DeCasper & Carstens, 1981; DeCasper & Prescott, 1984). He considers this to be evidence of a voluntary «self-awareness» that distinguishes the «self-produced» from the «external». Neonates' bias toward learning how to interact predictively with human expressions would seem to be evidence for an «interpersonal-self-awareness» of a doubly volitional kind, capable of organising activity combining *two centres of will*.

*Intuitive parenting.* Pregnant mothers talk to their foetuses, and what they say reveals that they are anticipating a partner in feelings and communication – a readiness that Winnicott (1960) called «primary maternal preoccupation». The emotional preparation of the new mother to contact her infant, and her eagerness to develop new forms of communication and co-operation as the infant's motives grow, has strong relation to the eventual success of her mothering and the baby's development (Klaus & Kennel, 1976; Stern, 1985; Trad, 1990; Murray, 1992). It is increasingly clear that the natural mother-infant system is one that is sustained by specialised forms of interpersonal consciousness *on both sides*. This has been described by Papousek and

Papousek (Papousek, H., 1994; Papousek & Papousek, 1977, 1987) in their theory of «intuitive parenting».

A mother's containing and complementing of the infant's feelings and activity, dependent on her intuitive «previewing» (Trad, 1990), can be contrasted with the ministrations of a trained and practised nurse in an intensive care unit (Van Rees & Leeuw, 1987). In the latter's hands the infant is not being treated as a person who has the capacity to accept the intruder into an exchange of feelings on an equal plane, or reject them. The baby is perceived as a sensitive and reactive body with more or less coherent movement and reflex response, one that may even be presumed, in that situation, to have little or no sense of pain. The reflex infant 'patient' is 'taken in hand' and made calm and satisfied. It is not granted a dialogue or a voluntary and shared exploration of feelings. The approach of a doctor or nurse to an infant, intending to minister to overriding physiological needs, often a matter of life and death in the carer's mind, appears to cause the infant to withdraw into stoical acceptance of «intervention». Adults, too, become «patients» in medical care, and the infant's passivity in such a situation is an adaptive response. A kitten, too, goes limp and silent when picked up by the scruff of the neck; an important reflex when the mother is stealthily carrying it away from a predator.

An affectionate and communicative approach brings out potentialities for expressive action in a newborn, as Wolff (1963), Sander (1964) and Brazelton (1973) demonstrated. Als (1995) shows how brain activity in a prematurely born infant is stimulated by gentle and affectionate handling of care-givers. Effects are particularly evident in the frontal lobes, which play a critical part, later in infancy, in the development of communication and in the emotional regulation of cognitive abilities (Schore, 1994; Dawson & Fisher, 1994; Damasio, 1994).

**Motives: Coherent, and observable,  
sources of knowing and doing**

Psychological activities, as properties of a growing organism, are autopoietic, or self-creating. Their function is to generate both awareness and the action in it. The word «motive» («That which moves or induces a person to act a certain way; a desire, fear, reason, etc., which influences a person's volition». *Shorter Oxford English Dictionary*, Third Edition, 1944) seems appropriate to describe psychological functions that develop in a subject's mind in readiness for perceiving information for acting. The ethologists' Innate Release Mechanism (IRM) of von Uexküll (1957) and Lorenz (Tinbergen, 1951; Eibl-Eibesfeldt, 1970) is a motive, but it is defined as behaviour triggered or released by a «sign stimulus». We need a term for the function that explores and that orients towards the consummatory response or goal, choosing a path.

Other terms also fail to grasp the *activity* of motives. Neisser, making use of Gibson's theory (Gibson, 1966; 1979), argued that perceiving must not be conceived divorced from action and he connected perception of objects with exploratory action by means of a «cognitive schema» (Neisser, 1976). But perception coupled to action happens over time, and the word «schema» suggests a static plan that can keep a record in its shape. It has latent efficiency in its structure. The term we need must designate an active process closely identified with the life of the subject and possessed constitutionally. «Program», the term used in cognitive science and Artificial Intelligence, is a formulation, a set of logical or mathematical instructions that determines how information is computed or «processed» through the system, defining its input-output relations. A program, even one called «generative», has to be written, and then put into effect by some agency who delivers the right input language of energy and information to the programmable system. It is a rational, symbolic insertion that misses the inner generative and developmental aspect of psychological activities.

«Motive» designates a distributed mental function that is a *cause and director* of movement (a «motor image», Jeannerod, 1994) and, at the same time, an incomplete expectant state, *seeking* appropriate information to guide movement (Trevarthen, 1978; 1982; 1984a). A motive causes behaviour that is investigative, purposeful and effective. It regulates both what will be perceived and what will be remembered.

*Motives are observable.* We can detect mind-states of another instantly from their expressions, with no training. When we take up human company, the signals from our motives are offered in accentuated form, controlled by others' attention to us – and our interest is in meeting and mixing with the mind- or person-states that lie behind the signals that they make to us. Those expressions include the features we select to describe that general aspect of another person's consciousness called «personality».

Each human consciousness sets up essential conditions for pick-up of the necessary interpersonal *IN*-formation about motives in other humans and what they want to express. We each detect evidence from others' behaviour about the *PRO*-formation of their activity, their propensities for acting and communicating – what they are *going to do*, and how it senses us. In the way newborn infants interact with other persons we see evidence that human mental activity is seeking experience from the start. The infant's motives, while being observed, are observing. Anticipatory urges and feelings, attentions, intentions and emotions, are 'transparent' in these behaviours.

Motives may originate in largely inaccessible cerebral activity involving the greater part of the brain at one time. But, because they generate a wealth of movements for aiming and focusing perception as well as for acting on the world, they are as real and readily observable as any regular principle in behaviour, provided the observer is motivated to detect their invariant indices. The central energy and self-regulating quality of motives are expressed in *emotions*.

*Complementarity and equivalence of behaviours and perceptions as evidence for self-*



*regulating motives*. Intelligent behaviour has great flexibility of goals and expression, yet it is co-ordinated or cohesive in each individual. The subject moves to execute integrated purposes or plans. These are determined by activity distributed widely in the brain, working through efferent nerve activity and muscle action to organise and complement input factors of body mechanics and mechano-proprioception, and assimilating the flow of supporting and guiding information from environmental stimuli (Anokhin, 1974). Indeed, the extra cerebral sources of co-ordination, from the body and from the world, can contribute only if they are assimilated in appropriate form, timing and strength to the dynamically cohesive motives in the brain that instigate behavioural action in a co-ordinated form (Bernstein, 1967; Jeannerod, 1994).

The activity of the brain exhibits *synchrony*. Excitatory output to the muscles is regulated by extensively synchronised neurone activity. It is effectively co-ordinated by one «conductor» or «ecphorator» (Bernstein, 1967) with a single time base coupling a set of rhythmic motor impulse-generators or oscillators (Von Holst, 1936 in Gallistel, 1980). Perception shares the same temporal unity and the same rhythms as motricity, as a manifestation of the functional integration of the neural net (Pöppel, 1994).

Acts with the same effect can be performed by different parts or postures of the body. This *motor equivalence* has been demonstrated and considered theoretically, notably by Lashley (1951), Sperry (1952), Anokhin (1974) and Bernstein (1967). One can draw a shape in the sand with finger or toe, sign one's name with a pencil in the mouth, or play a tune on the piano with one's nose. A conceived form of activity (motor image, or, better, «perceptuo-motor scheme») is put into effect in the outside world by movements selected from a vast number of potentially effective ones. Motor equivalence and the co-ordination it manifests are not dependent on culture-sensitive symbolic mentation. Their precursors are evident in many simple animals (Horridge, 1968).

There is a corresponding *perceptual*

*equivalence* or trans-modal awareness of phenomena. The same effect (the same event-configuration in one time-space referred to the same self at a single «observation point») can be perceived through different modalities, as well as from different aspects or in different contexts within one modality (perceptual constancy). One can see a letter drawn in the sand and feel it with a hand. The modalities are not equally competent for detecting a given event. The making of the letter might be heard if the sand was «squeaking» and one listened very carefully while the shape was being built – the gestures of drawing might be heard although the motionless result is inaudible. But such differences in awareness of the effects of movement through different modalities are biases, not absolute distinctions. The senses give compatible perspectives on reality, supplementing one another. Experience is generally coherent about one self, many invariant features being picked up by several modalities at once.

The coincident physical invariants synthesised in the information of perception, such as, for example, the *rhythm* or *intensity* of experiences generated by locomotion, inform many modalities in parallel about the actions of the single body acting from a single locus in one time and one space (Gibson, 1966). In addition, the central integrity of behaviour and experience also depends upon the *mapping of the body* in one individuated neural system. Brain maps of the body of embryogenic origin confer on the active self its primitive coherence or unity.

In short, there is an anatomical-physiological basis in the brain for the endogenous rhythm that holds together all of a subject's behaviours and perceptions from moment to moment, and that determines how they will evolve through the body in time, confirmed and guided from the exogenous perception of the environment. Consciousness is set up by this synchronised central generative activity of the brain, and it carries the *organised space/time parameters* of this activity.

### Person perception and inter-subjective action

*Prospective control of other subjects.* The psychological subject perceives and acts in ways that are fitted to the real world's layouts, events and objects, discriminating their different and changing «affordances» (Gibson, 1979). The acting self has to assume prospective control as it «gears» its movements to this environmental arena (Lee, 1993). On the basis of this control, the active subject learns new cognitive interpretations and concepts of what can be in the world, what can happen and what can be done. Alone in an inanimate world, such a perceiving self does not need to allow for any prospective psychological control outside its own. But, when another subject appears, this changes the potentialities of the world.

Intersubjective encounters become psychological *inter*-actions, *between* selves, in which part of each subject's prospective control is estimating what the other subject, a «person», is knowing and intending (Macmurray, 1961; Hamlyn, 1974) – i. e., what they are perceiving for intersubjective, *dual-prospective motor control* (Trevarthen, 1986a). The kind of perception needed is neither proprio-ceptive or extero-ceptive nor ex-proprio-ceptive. It is *altero-ceptive*, seeking awareness of, and a potentiality for interaction with, another psychological being. It determines the experience of an Interpersonal Self (Neisser, 1993).

Appropriate «psychophysical» experiments demonstrate that human perceivers have remarkable sensitivity to beings with animacy and intentionality outside themselves, and that they can readily detect parameters of motivation in other subjects' behaviour, such as the «emotion» of an action, or its «effort» and «vitality» (Michotte, 1962; Johanssen, 1975; Runeson, 1977). Similar perceptual powers exist in young infants, though they appear not well understood by «single head» psychology of perception and cognition (Legersee, 1992). But the ability to detect and observe qualitative differences in actions of others, and thereby to perceive their motives, is

but a small part of the capacity for *imitative identification, emotional empathy and reciprocal communication* that all humans possess. Most importantly, a communicating subject is trying to make an effective complementary reply; to enter into, and jointly regulate, a dyad of *expressive, «conversational» exchange* with the Other. A motive transfer, and co-operative use of motives, is being sought. This is what Bråten (1988) means by the term «dialogic closure».

*Human communication differs from that of other species.* Intersubjective control (social intelligence) is, of course, not unique to humans. It originates far back in animal evolution, adapted to serve communication and co-operative action both within and between species. Intersubjective communication has boosted the evolutionary success and diversification of the species that possess it, and it emerges as the principal factor in a phenomenal acceleration of the rate of evolution of bodies and brains in the last few million years, a process that has culminated in the explosive emergence of humans as the dominant life form (Wilson, 1985; Donald, 1991).

Human cultural intersubjectivity and human socio-biology should be contrasted to a social motivating capacity that is restricted to producing a mutual behavioural adjustment of self-serving acts or acts that immediately serve species or group survival (Lotman, 1979; Hurford, 1989). Most animals exchange signals to co-operate in the performance of acts that at the same time are changing each communicating subject's own physiological state or relations with the inanimate world. They communicate *coactively*, to coordinate what they are doing for themselves with partners who are prepared to act in a complementary or opposing way in a group – they are together locomoting, feeding, mating, caring for young, defending a territory, trying to catch and eat another animal or to avoid being eaten. This is the level of behavioural coordination that Piagetian ethologists call «sensory-motor» (Chevalier-Skolnikoff, 1989).

Species with a higher level of social intelligence have additional powers of estimating in more detail what other animals are conscious

of or intending to do, and their societies have a sort of 'political' organisation or hierarchy of decision-making and alliance formation (De Waal, 1982; Whiten, 1990). Some even use signals to pass on to partners useful information about non-present (remembered) items of interest, quasi-symbolically (Gouzoules, Gouzoules & Marler, 1985; Cheney & Seyfarth, 1992).

Human beings have a still more elaborate capacity for direct interaction with one another's motives, emotions and perceptual processes, which serves in effective and sustained *co-operative action enlarged by tradition*. Human powers for representing, learning about and recording cultural (social, environmental, technical and scientific) knowledge about non-present objects and events are unique, and human intersubjectivity has certain extra specialisations for intense mutual regulation of motive states and joint action in the shared world. To accomplish this it has an exceptional referential and narrative productivity; for being «about» something. Donald (1991) identifies the first «break through» in human evolution with the development of a power of *mimesis*, by which experiences, beliefs, plans and stories can be recreated in pantomime and ritual by body movements that are perceived as significant objects and events.

The human world is dependent on an intricate, direct interaction of the motives of actors who demonstrate personalities, obligations, roles, reputations, authority, expertise, and so on. It speaks in many socio-cultural «voices» (Wertsch, 1991). Each human possesses a moral conscience in which the individual confronts his or her often conflicting motives (Midgley, 1994).

*Adaptations for conversation.* Human communication is often closed between participants who are intensely interested in maintaining the interpersonal state of mind and in transferring ideas face-to-face about non-present things, by acting out, gesturing and speaking. Infants show remarkable precocity in the non-verbal parts of this conversational expression and they have many specialised organs of brain and body for the task (Trevarthen, Murray & Huble,

1981). They are potential mimics and «show-offs» (Trevarthen, 1990b).

Moments of attending and directions of orientation of an infant's mind can be detected by a wealth of muscle activity by which he or she «gates» and aims uptake of perceptual information – changes in posture of the body and limbs, which positions the chest and belly, head, face, hands and feet of the baby in comfortable contact with the mother; the opening, orienting and focusing of the eyes; movements of the muscles of the brows and lids around the eyes linked to stabilisation and focusing of the visual image, and to protection of the eyes, opening and exploring movements of the nostrils, lips, tongue and jaw; breathing and vocalising; the extension of the arms and opening out and grasping of the hands. These are the kind of movements that Charles Darwin explored so assiduously in his attempt to explain the evolution of expressions for communicating «states of mind», or emotions. He thought the expressions came from «serviceable associated habits» that were originally voluntary and then became instinctive through repeated practice (Darwin, 1872; Montgomery, 1985).

#### **Emotions as symptoms of mental activity adapted to communication**

A new theory of psychogenic processes claims that a selection (called «neural Darwinism») between neurone populations and interconnections originally generated in chaotic excess, «evolves» categories of perception and cognitive planning in post-natal experience (Edelman, 1987). These functions are said to emerge as a probabilistic consequence of inter neuronal wars of attrition. For some psychologists, this argument brings back unconstrained faith in the construction of consciousness by experience in a plastic brain.

However, the antecedent morpho-genesis of brain circuits in embryo and foetus is itself an intricate and elaborate dynamic selection process, and this endows the newborn infant with

structures with latent psychological powers, as Darwin himself proposed for emotions. These will «regulate», «constrain» or «channel» the post-natal fabrication of co-operative communities of neurones, and «condition» all effects due to contingencies of stimulation from the body and from the environment. In the embryo, the basic integrity and form of body-mapping motives, in the form of an Intrinsic Motive Formation (IMF), was created in the developing central nervous system before it had become the receiver of input from the body and the intra-uterine environment (Trevarthen & Aitken, 1994).

Nor does the object-perceiving mind have to be constructed in the infant after birth by «mutual assimilation» or conditioning of reflex systems presented as separate sensory-motor elements in the baby, as Piaget (1953) believed. Nevertheless, redundancy of elements and processes of accretion and selection in the «dynamic system» play an essential part in further differentiation and development, for motor functions and for communication (Fogel & Thelen, 1987).

We can specify features of motivation that express the primary organisation of the infant brain. The co-ordinated motivation of the baby varies from moment to moment: 1) in the *rate in time* at which it is generated; 2) in its *energy or power*; and 3) in its *spatial distribution or form* over the body, or in the modality of sensory information it is aimed to excite. Thus the coherence of the infant's motivation is expressed in *regular kinematic, energetic and physiognomic* parameters of movement (Trevarthen, 1986a), which are reflections of the cerebral activity patterns of motives. Innate regularities in these parameters allow for sympathetic «resonance», «recognition», «entrainment» or «attunement» between motives in different subjects. The transmitted effects are *emotions*, best understood, not as categories of expressive movement, but as 'dynamic affects' (Stern, 1985, 1993).

*Motives and cultural learning.* For a mind seeking communication, defined features of a subject's motivation become symptoms of the

inner psychological activity of the individual who is generating and co-ordinating them (Trevarthen, 1986a). It is these *core, transmodal features* of motivation, coded as emotions, and transferred from subject to subject in emotive form, that permit the inter-coordination of inner psychological states between subjects. Corresponding generative parameters in the two subjects enable them to «resonate with» or «reflect» one another as minds in expressive bodies. Their action patterns can become «entrained» and their experiences can be brought into register and imitated. These are the features that make possible the kind of affectionate sympathetic communication that occurs, for instance, between young infants and their mothers (Stern, 1985; Trevarthen, 1984a, 1993b).

Core motivating processes of the brain-mind that determine temporo-spatial patterns to explore environmental affordances and guide actions, also determine what will be learned. Communication of core motives by way of emotions can, therefore, enable one subject to influence not only the perceptions and actions of a partner, but also *their own* learning, and future knowledge and remembering. The partner's replies can change what is perceived or learned. The appearance of efficient communication of motives in the first phase of an infant's postnatal life suggests that human learning is founded on a social curiosity designed to be regulated inter-subjectively, between minds.

### How infants and their partners regulate communication

*The discovery of protoconversation.* Communication between a mother and a young infant was first called «proto-conversation» by Mary Catherine Bateson (1979). Using films made by Margaret Bullowa (1979), she described 7- to 15-week-old infants focusing on the mother's face and voice, and reacting with smiles and coos in a give-and-take, address-and-reply manner. Before her, psychologists had examined parts of the behaviour, observing the infant for reactions to

stimuli, not the communication in interactions. (e.g., Spitz & Wolf, 1946; Ahrens, 1954; Fantz, 1963; Haith, 1966; Robson, 1967). Even when observing natural play, they were recording eye-aim, smiles, vocalisations, or sucking. Observations were made in experimental or clinical situations where, even when the context was reactive to their movements, the infant had limited opportunity to negotiate exchanges (e.g., Papousek, 1967; Carpenter et al., 1970; Watson, 1972). Babies were expected to make unitary responses to specified stimuli or physical complexes of stimuli.

The psychoanalysts, who were more interested in emotions in mother-infant communication (e.g., Fairbairn, 1954; Winnicott, 1960; Klein et al., 1972; Mahler, Pine & Bergman, 1975), described the mother's holding and identification, without seeing what the very young infant could do autonomously, when it was fully playful and expressive and could mentally interact with other persons.

M. C. Bateson's claim that the infant was trying after something more mutual and co-operative, and, furthermore, potentially constructive for the learning of language and other cultural skills, received support as soon as accurate descriptions were made of films of mother and infant at play. Around the time of her first report there was good evidence that two- or three-month-old were highly competent at a kind of miming of conversation, expressing not merely unitary emotional reactions to the mother's presence in close reaction to her expressions of feeling, but entering an interaction, regulating, as well as being regulated by, the mother's behaviour, and now and then attempting a complex of expressive movements something like an utterance (Bullowa, 1979; Stern, 1974; Trevarthen, 1977; Trevarthen, Murray & Huble, 1981).

*Setting up protoconversational cycles.* A protoconversation in full swing between mother and a 6- to 10-week-old has both a developing programme of rhythmic phases of excitement, building in intensity and complexity then subsiding, and a refined micro-structure in which

mother and infant exchange similar or matching contributions on a faster rhythm.

The mother puts herself in a face-to-face position, gently taking up the baby so that the baby's face is lined-up with her own. She is intuitively «in tune with» the infant's «state» of awakesness and orientation. She acts particularly quiet and soft if the baby is sleeping, calming if the baby acts distressed, friendly and inviting if the baby is attentive (Papousek, M., 1994; Papousek & Papousek, 1989; Papousek, Papousek & Bornstein, 1985; Papousek, Papousek & Symmes, 1991; Stern, 1985; 1993). Although many of her actions seem to be directed to obtaining a eye-to-eye contact, she leads with touch and voice, and she may use the «feel» of the infant's body, especially the hands, to sense awakening and readiness to be active. Her approach will almost always be vocal from the start, calling the infant's attention, but some mothers favour touching more. Her speech is modulated to reflect the dynamic expressions of the baby, as she gives what Papousek & Papousek (1987) call «intuitive parenting», and what Stern et al. (1985) describe as «affect attunement». Note that these researchers use musical terms to characterise the communication. Indeed, the time patterns generated show a pattern of rhythms and melodic forms that anticipates the structures and processes of music (Trevarthen, Kokkinaki & Fiamenghi, in press).

The start of communication is marked by the baby orienting to the mother, with the baby 6 weeks or older making clear focus on her face, and expressing concentrated interest by stilling of movement, and a momentary pause in breathing. The infant's interest as a whole conscious being is indicated by the co-ordination and directedness of this behaviour which aims all modalities synchronously to take up information about the mother's presence and expressions. Hands, and feet, move and clasp the mother's body or her supporting hand, the head turns to face her and eyes fix her eyes or mouth, while ears hold and track her voice.

The next phase is signalled by the infant making a «statement of feeling» in the form of a

movement of the body, a change in hand gesture away from clasping the mother, a smile or a pout, a pleasure sound or a fretful cry. The mother, if she is alert and attentive, reacts in complementary way. A positive, happy expression of smiling and cooing causes her to make a happy imitation, often complimenting or praising the baby in a laughing way, and then the two of them join in a synchronised display which leads the infant to perform a more serious «utterance» that has a remarkably precocious form. The whole performance develops a pronounced rhythmic pattern, each partner showing immediate sensitivity to the pulses and phrases of the other.

This infant utterance is the behaviour, in that context of interpersonal co-ordination and sharing of feelings, which justifies the term «proto-conversation», because it looks and sounds as though it is replying with a message or statement about something the infant knows and wants to tell. Mothers speak to these bursts of expression as if the infant were really saying something intelligible and propositional. Typical utterances are: «Really?»; «Oh yes!»; «That's right»; «Tell me a story»; «Oh what a lot you have to say»; or, if the infant is just watching, «Aren't you going to talk to me?»; «Come on then». The infant appears to be led and supported, not by the language, but by the mother's expressions of focused interest and sympathetic emotional response, and by her short, highly rhythmic utterances of that unique repetitive register of speech now known as «intuitive motherese» (Stern et al., 1982; Fernald, 1985; Fernald & Kuhl, 1987; Papousek et al., 1985; Trevarthen, Kokkinaki & Fiamenghi, in press).

I am describing protoconversations that have been staged in a research laboratory with infants 6 to 12 weeks of age. Before or after this period the infant's playfulness and social sensitivity is different. Home recordings show that mothers, fathers, siblings and other partners excite the infant to join in the same kind of protoconversational interactions with imitations and games leading to laughter. Charles Darwin described a 45-day-old infant smiling socially in such a game (Darwin, 1872, p. 211).

*Is protoconversation a universal human trait?*

The behaviours of African and European infants and mothers with very different culture, language, education and literacy support the conclusion that we are describing universal phenomena (Trevarthen, 1988). Nevertheless, protoconversations have been described as an artificial, cultural form of play peculiar to middle class Americans or Europeans who consciously train their infants to be talkers. It has been suggested that in some cultures infants are never spoken to in a protoconversational way (Ochs, 1983). Practice of protoconversation may not be essential to the normal development of language, provided communication is supported in other ways. However, the motives revealed in protoconversations are clearly preparatory to subsequent development of linguistic communication and thinking, as Bateson (1979) proposed. They certainly require appropriate support from others' communication for this development to occur.

There are, indeed, interesting cultural differences in the ways infants are perceived, which show how prone humans are to make up 'mythical' understandings of their life. Observations on the ways mothers and other carers attend to and communicate with infants in different cultures (Goshen-Gottstein, 1980; Weintraub & Shapiro, 1968), as well as analyses about what carers say when they are interrogated about their ideas of infancy (Tulkin & Cohler, 1973; Ninio, 1988; Goodnow, 1984), have supported claims that perception of these behaviours is either profoundly influenced or entirely determined by cultural rules and beliefs (Bradley, 1991). Some groups are said to discourage verbal communication with infants because they think infants can make no sense of language (e.g., Tulkin & Kagan, 1972). They simply care and comfort them with touch and movement, as well as breast-feeding.

Traditional cultures and lower socio-economic groups in technologically advanced cultures are recorded to have differing ideas from the much studied urban Western middle class on the rate at which infants develop their own minds

with intentions and perception (Schiefflin, 1979). Apparently the former kind of culture believes that children mature rapidly in moral skills of relating, but slowly in cognition; western cultures are impressed now with how fast infants develop cognitively, but they do not find emotions and moral abilities to be part of the early endowment (LeVine & White, 1986). None of these observations is incompatible with the evidence for innate motive processes that has been obtained from detailed observations of behaviours that pass between infants and carers when they are fully involved in one-anothers' expressions.

A continuous microanalysis of the behaviours of protoconversation recorded on video, backed up by photographs, brings out what mother and infant are each seeking to perceive through different modalities and confirms their mutual co-ordination in time (Trevarthen, Murray, & Hubley, 1981; Fogel, 1977; Beebe et al, 1979, 1985; Mayer & Tronick, 1985). We can plot the searching and interlocking of two integrated perceptual/expressive systems, one of a person so young and untutored that we can be confident of picking up from that side a largely innate repertoire of expressions, sensitivities and dynamic patterns. The adult Other appears to move to complement the set morphological, temporal and emotional requirements of the infant's Self. The observed patterns reveal the expressive motive impulse (assertion), and the cycles of alerting and localising in receptivity (apprehension or acceptance), that are the innate basis for ebb and flow in human communication (Trevarthen, Kokkinaki & Fiamenghi, in press).

*The infant's orientations to and from a partner in mutual mimicry.* Many of these complex, organised movements of infants can be related to self-regulatory exploring, *perception-seeking*, or *perception-avoiding*, processes. But other movements, such as smiles, coos and hand gestures, are communicative signals for the partner to perceive. The vocal apparatus of a young infant can signal subtle changes in interest and emotion (Lester, 1984), including positive need for vocal-facial-manual interaction with the mother (Wolff, 1963). Newborns perceive the

vocalisations of other babies as different from their own, and when they imitate crying, which Piaget assumed must be reflex «contagion» (Piaget, 1962), they in fact do so as if to join in communication with the «other» infant (Martin & Clark, 1982; Sagi & Hoffman, 1976). Some movements of the hands to touch the mother, or projected in complex gesticulations, with individuated finger movements different from those made in «pre-reaching» directed toward objects (Trevarthen, 1984c, 1986b), and the accompanying kicks and pulling up of the legs with opening and contraction of the toes, also appear to have the potential to be communicative expressions. Face expressions of infants, whatever their evolutionary origins, are obviously adapted from birth to signal shifts in emotion and need (Oster, 1978; Trevarthen, 1985b; 1993b).

When mothers are looking for the beginning of communication, they, like researchers, give the mutual visual contact (eye-gaze) high importance, but the other responses, too, are dependable signs of the infant's readiness for perceiving the mother and her expressions (Weinberg & Tronick, 1994). A totally blind baby can orient face and eyes toward a mother's voice, «centring» on her so well that the blindness can go undetected, but Fraiberg (1979) documented that mothers of blind babies can be misled by the baby turning to aim one ear towards her, to better locate her voice, the mother thinking her infant is looking away. Mothers of blind infants may also fail to respond to the expressive movements of the baby's hands.

Mothers can use the tenseness and movements of the arm and hand to monitor the infant's state of alertness or emotion (Papousek & Papousek, 1977). In protoconversation, many mothers unconsciously favour their infants' right hand when seeking «contact» (Trevarthen, 1986b). In short, orientations of any of the special receptors (eyes, ears, mouth or hands) offer a mother critical evidence about the pace and direction of information-seeking by the baby, and they transmit signals for communication. Asymmetries of expressive behaviour in both mother and infant indicate that the motive

mechanisms are differently constituted on left and right sides of the brain. Gestural and expressive asymmetries of infants anticipate the elaborate cognitive and linguistic asymmetries that develop over the years of childhood (Trevarthen, 1990a, 1996).

*The mother's orientations and supportive behaviours.* The behaviours of a mother seeking contact with her baby match, complement and confirm the information-and-communication-seeking, efforts of the baby (Papousek & Papousek, 1977, 1987; Trevarthen & Marwick, 1986). She looks intently at her infant's face, fixating the eyes for many seconds at a time, and she feels the baby's hands or body while alert for any vocalisation. Her expressive behaviour has special characteristics that are clearly adapted to, ready to match or «mesh» with, the multi-modal perceptual readiness of the baby. These movements of the mother, which will simultaneously excite her own self-awareness, include general dynamic features detectable simultaneously by most sensory modalities, such as the fundamental beat of repeating movement, short bursts of expression, repetition of rhythmic groups of movement, exaggerated dynamic expressive «sentic» forms (Clynes, 1980), and precise modulation of the intensity or force of expression in a moderate to weak range. These paralinguistic or poetic aspects are described by such terms as «animacy», «vitality» or «energy», and they transmit emotion to confirm infant expressivity by «affect attunement» (Stern et al., 1985; Stern, 1993). The cyclic, repeating rhythms of mothers movements with a regular pulse appear to tap into a fundamental level of motivation for human contact (Trevarthen, Kokkinaki & Fiamenghi, in press).

When she speaks to her baby, a happy mother's face expressions are exaggerated and, «friendly», playful and affectionate. Her voice assumes a gentle, relaxed, breathy quality, with a singing pitch set high, about 300 Hz, i.e., within one octave either side of middle C. She makes short utterances with spiked, undulating or gliding pitch contours. These are the defining characteristics of «intuitive motherese» which has

been shown to be the same when mothers are speaking different languages. That is, the prosodic, tonal and syllabic features peculiar to the language of the mother's culture are modified to convey universal temporal and intonational patterns (Fernald et al., 1989; Grieser & Kuhl, 1988; Papousek, M., 1994; Papousek & Papousek, 1989; Papousek et al., 1985; Papousek et al., 1991). Mothers' utterances when they are talking to their young infants in Mandarin Chinese (a tonal language) and English (which uses few tonal inflexions to vary meaning) show the same «motherese» features.

The hand movements the mother makes as she pats or strokes the baby are gentle, periodic and with repeating rhythms superimposed. The frequency of these touchings gives a clear message of her emotion and sensitivity. Face and head movements, vocalisations and hand movements are co-ordinated or synchronised; clearly they are regulated by one mechanism in the mother that conveys the dynamic motive states of her integrated self as she seeks to have the best communication with her infant (Papousek & Papousek, 1987).

*Joint generation of the «utterance».* When they have greeted one another, the further communication between a mother and her infant shows how each has become open to motivation from the other. The excitement builds between them by an imitative traffic of signals that have instant emotional effect (Stern, 1974; Stern et al., 1985). At first the mother calls in an *inviting/questioning* tone, watching closely for the response and imitating or shadowing the baby's movements. Distress is comforted with different down falling intonation and slower insistent rhythms (Papousek et al., 1985). Expressive reactions are imitated and as soon as the baby gives a clear *positive reaction*, the mother smiles and signals her pleasure and excitement with undulating cries.

After watching her invitations closely, the infant smiles, and then becomes animated in that expressive complex that resembles effort at an *utterance*. There is a momentary relaxing of the interpersonal emotion (the baby often stops



smiling and seems to get «seriously» involved). Coo vocalisations, or «prespeech» movements of jaws, lips and tongue (Trevvarthen, 1974a, 1977) are made in synchrony with gesture-like hand and finger movements, most often with the right hand raised higher than the left (Trevvarthen, 1986b). Coos (in French, «les a-geu») comprise a lax vowel [u], [a] or [ ] and may be articulated with a glottal stop [k] or [g], as in [ku], [a gu] or [angu], i.e., they are already formed as rudimentary speech units (Oller, 1986; Lynch et al., 1995). The cyclic opening and closing and pointing hand movements directed to a person are distinct from those made when the infant's attention is fixed on an object and «pre-reaching» is elicited (Von Hofsten, 1983; Rönnqvist & Hofsten, 1994) and they are coupled to the other expressions (Fogel & Hannan, 1985). Commonly, the infant breaks eye-contact from the mother at the moment of the utterance and usually turns away to the right, and asymmetries appear in hand gestures as well (MacKain et al., 1983; Fogel & Hannan, 1985; Trevvarthen, 1996).

The timing of expressive cycles has predictable features. The two subjects may entrained on one beat so the pulses of engagement draw them along together in a duet of synchronised or alternating parts, to the regulation of which both contribute (Condon & Sander, 1974; Beebe et al, 1985; Trevvarthen, Kokkinaki & Fiamenghi, in press). The mother is helping the infant maintain the exchange, and she gives animation and a framework in time and space to the baby's expressions, but the basic rate and duration of their joint performance is paced by what draws out the infant best and the infant is actively contributing both perceptual preferences and spontaneous displays. Protoconversations are generally organised about a relatively slow adagio pulse or beat (approximately 1 every 700-800 msec., or 90/minute). The infant tends towards phrase-cycles of 3-5 seconds, but does not usually sustain a lively communication for more than a minute of two.

We conclude that, whatever prescriptions, recommendations or other rules of baby-care

mothers may operate on in different social classes and different cultures or ethnic groups, and whatever mothers are led to believe, the above behaviours, of both mother and infant, are universally available – when the interaction is spontaneous and close, and provided that neither infant nor mother are distracted by some self-conscious reserve, distress or fear. It is necessary to underline that young infants do not tend to be «conversational» unless the appropriate receptive invitations are given by the partner, and the frequency of invitations may differ considerably in different families and cultural groups. It is also important to allow that infants under one month of age may be incapable of becoming engaged in reciprocal communication as quickly as older infants – they appear to take several seconds of observation of the partner before becoming sufficiently animated to respond (Holmlund, 1990).

*Imitation and preferences as manifestations of attachment.* Two-month-olds can imitate the mother's expressions, and they often mirror her changes of mood immediately, but they are more reluctant to imitate isolated expressions than the newborns described above. Most imitations in protoconversation with a two-month-old are by the mother or father of the infant (Trevvarthen, Kokkinaki & Fiamenghi, in press). Often, the communication is sympathetic in tone or feeling, rather than imitative in form, and many responses are complementary translations of the partners' expressions, creating a *negotiation of feelings* by a sequence of differing signals. However, the imitations that occur spontaneously in ordinary proto-conversational play with a young baby may have a function in teaching speech and language, as Bateson (1979) proposed. Kugiumutzakis (1993) has found that mother's of young infants imitate sounds that are related to speech, and the infants are also selective in their imitating. Both of them are more likely to match language-related communicative expressions, not accidental or self-regulatory expressions, such as sneezes.

Tests show that infants have preference for all the features of the mother's behaviour that have been described above, and for their synchronous

use to show the mother's feelings. Recognition of the mother from her voice and attachment to her as a person is an important factor from the beginning, but there appear to be general criteria for perception of any other person's affection and willingness to communicate. Infants prefer «intuitive motherese» in the female voice (Fernald, 1985), and Langlois (Langlois et al., 1990) has found that they can discriminate and prefer the photograph of a young female full-face who has a configuration or expression that adults, too, judge to be more beautiful. Computer blends of photographs of young female faces become more attractive as more individuals are added to the blend (Langlois & Roggman, 1990). The basis for this preference, and the sense of personal beauty, is likely to be related to a harmonious and slightly animated expression of the face that signals an affectionate readiness for gentle play. Beauty of the person is not only «in the eye of the beholder», though it must appeal there – it expresses readiness for interpersonal relating, like the joy of a smile (see Darwin, 1872, for discussion of the social functions of smiling).

### Emotions in protoconversation and its breakdown

Happy protoconversation is sustained by an active mutual engagement of highly specific intersubjective motives or programs of communicative expression in mother and baby. Very different behaviours occur if either mother or infant does not act in the appropriate way. A breakdown of maternal responses causes the infant to show confusion, withdrawal and anger or distress. If the mother does not approach her baby with attentive and responsive concern and happy affection, and does not adapt her style of expression to the baby's needs, the baby will not engage with her (Brazelton et al., 1975; Papousek & Papousek, 1977; Tronick, 1989; Tronick et al., 1978). If her responses are of the correct, positive form, but inappropriately timed, the baby will look puzzled, then protest and withdraw (Murray, 1980; Trevarthen et al., 1981; Murray &

Trevarthen, 1985; Trevarthen, 1985b).

Failure of the infant to engage is signalled by organised patterns of expression that signify anger or distress, or a condition of withdrawal with motivational and emotional «freezing» (Murray & Trevarthen, 1985; Trevarthen, 1985b; Tronick, 1989). At all times the infant has control of the contact, to the extent that the mother cannot continue to speak and move as if with a conversational partner if the infant does not smile and withdraws gaze from her eyes. If the baby's behaviour is artificially «detached» from the mother, as is done by replaying to her a video record of the baby communicating, without her knowledge that it is a replay, she feels something is wrong and she gives one of a variety of expressions of concern, unease or distress, projecting the «problem» to the baby, or blaming herself (Murray & Trevarthen, 1986).

The expectation of the infant for affectionate, happy and playful responses from the mother is also shown dramatically when the mother has a clinical depression that is focused on the infant (Murray, 1988). Even simulated maternal depression causes a severe disruption of protoconversation, the infant becoming withdrawn and distressed (Cohn & Tronick, 1983). Murray has found that depression that is focussed on the baby can have a severe immediate effect on the baby's cognitive and social development over the first year (Murray, 1992).

*The functions of emotional dynamics in direct communication.* Perceptual uptake of information for interpersonal knowing cannot be divorced from the generation of expressive forms of acting, because the communicative signals are made by highly specific forms of movement that are adapted to fit a perceiver's sensitivities. The peculiar character of intersubjective control is that the feelings perceived directly identify with differentiated forms of expressive movement and the flow of expression – a smile is happy, as is walking with a fast, tripping step; tears are sad, as is a slow dragging way of walking and a downcast look, and emotions expressed by one person can lead to instantaneous sympathetic mimicry in an

other. Expressions of the self «invade» the mind of the other, making the moving body of the self resonant with impulses that can move the other's body too. The close following of emotions between persons in intimate communication (in 'felt immediacy', Bråten, 1988) permits transfer and imitation of internal motives by which each is regulating the dynamics of consciousness and purpose. Mental processes are communicated in chains of *transient emotional shifts* or *emotional transients*.

Details in the intrinsic organisation of the human motivation system that are adapted to fine and rapid transfer of mental dynamics between subjects may be observed in the various glides and leaps of pitch or volume of voice, eye-brow flashes, pre-beat syllables, suffix morphemes, rhythmic details and «embellishments», rapid hand gestures, quick head moves, shifts of gaze and so on that appear in abundance in all spontaneous «conversational» communication (Duncan & Fiske, 1977; Buck, 1984; Eibl-Eibesfeldt, 1989; Kendon, 1980). As «vitality affects» or 'dynamic affect' (Stern, 1985; 1993), these are the fundamental carriers of information about motivation changes in the short term. These behavioural particles are organised in a stream of emotional signals, which can have the equivalent of syntactical organisation or narrative structure – they may be described as forming an *emotional narrative*. Stern (1993) describes the engagement in terms of a «dynamic emotional envelope». Organisation at both levels, morphemic and syntactic, is adapted to intersubjective functions, i.e. the co-ordination of cognitive dynamics, attention shifts, impulse of purpose, changes in motive force, etc. in each self and between selves.

McNeill (1992) has shown, by a cross-cultural and developmental TV study of how people convey thinking in gestures and speech when they are telling of a dramatic story, that there is an unconscious unity of expression that unfolds in with regulated timing. People, including toddlers just beginning to master sentences, «think aloud» in an integrated mixture of hand gestures and speech that must come from one stream of «inner

speech». The coupling of hand gestures with coos, «prespeech» and other facial expressions in young infants (Trevarthen 1986b; Fogel & Hannan, 1985) indicates that this expressive system has an inherent unity, presumably adapted to transmission of mental dynamics that precede language and become incorporated in it later in development.

*The field of emotions colouring motives.* The total range of emotional shifts seen in spontaneous communications in every-day life shows the organisation and dynamic availability of the Emotion Field. People can describe this field, naming the emotions in their felt relationships (Plutchik, 1980; Kellerman, 1980). Although it is difficult to obtain agreement about the meanings of emotion words, and different cultures «map» the emotions into their languages differently, the relations between the forms, the oppositions, affinities or tensions between the emotions appear to be the same, and there is agreement about the positive or negative valence of feelings and their relative power or weakness. Reactions to experiences are shared by universal signals of momentary or discrete emotions; of interest, surprise, puzzlement, disgust, etc. (Ekman & Friesen, 1971). These emerge in a universal field of emotions that is also reflected in the ways we categorise personalities, emotional illnesses and dramatic performances (Darwin, 1872; Kellerman, 1983). A good analogy is the field of colour vision. Cultures vary in their discrimination of colours and the ways they codify colour in language, but the relationships and mixing rules between colours and the principal colour categories are universal and innate (Bornstein, 1985; Thompson et al., 1992).

In the theory of Innate Intersubjectivity, the Emotion Field is held to be set out *in utero* (Trevarthen, 1990a, 1993b). The frequency and variety of transient emotional shifts indicates the «mobility» of the emotions over the whole field, which is restricted or unresponsive when the subject is in a pathological state (Kellerman, 1980), as in infantile autism (Kanner, 1943; Hobson, 1993; Trevarthen et al., 1996), or when the human environment is not responsive and

supportive, e.g., in the infant when the mother has postnatal depression (Murray, 1992).

«Emotional narratives» are organised in «healthy» communication by motivating processes that transform and sequence emotions in the field. To understand the organisation of these narratives, their motivational under-structure, we need to consider both the temporal base for emotional dynamics and the qualitative distinctions that are laid out in the emotion field. The emotions constitute a time-space field of intrinsic brain states of mental and behavioural vitality that are signalled for communication to other subjects, and that are open to immediate influence from the signals of these others (Buck, 1984; Tronick, 1989; Tucker, 1991).

In young human infants the use of emotional signalling is primarily developed for intimate and direct engagement or communication with a loving and playful partner (Reddy, 1991; Nakano, 1996) – for «out-going», fully shared and playful *companionship*, as well as for soliciting acts of care and maintenance. Other 'bio-behavioural' functions of emotions (Plutchik, 1980), that are strong between adult animals in their societies, have no purpose at this stage of human development, because the infant has none of the associated life-sustaining 'responsibilities'. It may not help us understand the interpersonal functions of infant emotions to go into the theory of how lower animals with less intersubjectivity evolved emotions specialised to regulate such as group 'politics', mating or the vital integrity of the individual in risk-taking activity.

### **Development of communication on a topic; The self-consciousness of the message-giver**

*Memory and motive dynamics: Adaptations of the Mother-Infant System that aid infant learning.* As pointed out above, cognitive dynamics and the «chronometrics» of awareness and thinking in active behavioural engagement with the environment are coincident, or co-dimensional, with motive dynamics – i.e., behaving and

perceiving are generated in the same core motivating system of the brain. If motive dynamics can be coupled efficiently between psychological subjects, this would, under optimal conditions of intersubjectivity, result in near complete confluence or harmonisation of their internal thinking, learning and remembering. If the directions and targets of interest in the environment they share were also specified in this communication, to express orientation to designated events and objects, then they would tend to perceive the same world.

Emotions generated and perceived intersubjectively appear to have a unique function in regulating learning and memory in human society. Emotional processes carry the «cognitive prospectuses» of the individual and the society, which construct the memory records of what a child has needed and will need to become proficient in co-operative communication. Emotions mediate cognitive transfer of meanings or knowledge in teaching/learning. In other words, the emotions regulate the development of the 'socio-ecological' or 'cultural' self, the self that is cognitively co-operative, interpreting and using the world according to agreed meanings conferred on acts and objects (Trevarthen, 1992).

Papousek & Papousek (1977) have considered the mother's role as providing the infant with a «cognitive head start». If optimal mother-infant (and later mother-child) communication is achieving the same kind of confluence of emotions as one observes in conversation between adults, analysis of it will bring out an accurate and detailed indication of the components of motivation that are active in the child's mind at each age. It will, furthermore, reveal how the mother is able to direct and reinforce the child's cognitive exploration and learning through play. Darwin (1872) concluded that teaching of the young was a main function of human emotions; and this is endorsed by the interpretation of the motives of teaching and learning described by Bruner (1996).

Indeed, developments in the dynamic regulation of play beyond the stage of protoconversations show that, in the course of the

first year, the motives of infants are undergoing rapid change in a direction which leads to just this kind of communication-guided or «guided participation» learning (Rogoff, 1990). The developments place the interpersonal communications of the early months in a new practical context, giving them developmental function (Trevvarthen, 1992b). The infant's interpersonal self is transforming step-by-step to become a co-operative self, capable of sharing experiences and purposes that refer to a common consciousness of reality and its affordances; that is, to «meaning».

*Emotional dynamics and meta-communication in baby games and baby songs.* The complex communications of teasing games and rituals in play (including baby songs) that appear in the middle of the first year give evidence on the exercise of negotiations of will between the infant and a sympathetic, affectionate partner in Nakano's Space of the «We» (Nakano, 1996). Such negotiation appears to be necessary to establish new, more efficient, and more intricate, intersubjective co-operation. The games bring out the tendencies of both subjects to project the interaction, and to negotiate agreement of purpose, or rivalry. They also confer on the infant a new kind of self-awareness that is capable of studying and adjusting to the other person's reactions. Soon the baby is experimenting with a wide range of «self-presentations».

In the «period of games» (3 to 9 months), the infant's technique of self-presentation grows conspicuously (Trevvarthen, Murray & Hubley, 1981; Trevvarthen, 1990b). He or she is becoming markedly more complex and sensitive to the «audience-spectator». One can discern a growing «Self-consciousness», too; that is, the Other's attention and feelings become increasingly the main part of the control of the communication. The infant's behaviour aims the interaction with the Other so that the Other's attention is drawn back to the infant, not absorbed in the direct exchange of feelings, and not directed sideways to some «third person» or object. It becomes communication about communication — 'metacommunication', to use Gregory Bateson's

term (Bateson, 1956). Now this is the first step to defining a Social Self, a «Me», with the potentiality for a superego, self-regulated by other's attitudes. It is characteristically manifested in «teasing, joking, showing off and mucking about» (Reddy, 1991). It ebulliently, and sometimes outrageously, has fun. There is even a conspiratorial quality to the way infants in the second half of the first year share feelings about events and other persons with identified trusted familiars — as if they are starting to feel glimmerings of the pleasure of «gossip» (Levi, 1986).

Increased social awareness brings increased attachment to familiar, trusted companions, and heightened fear of strange persons. The interactions of infants about 6 to 12 months old with strangers are very interesting. They include timidity, coyness, showing off and angry dislike. The opponent is watched intently as the baby probes the feelings of the person who is assumed to be a threat until proven innocent.

This is also the time when infants make deliberate orientations to their familiar caretakers for help and for emotional information about unfamiliar objects or situations, a behaviour known as «emotional referencing» (Klinnert et al., 1983). All this increased social discrimination finds application in the next year when the infant begins to be an imitator and pupil seeking conventional knowledge about the world and what one should, and should not, do in it. Establishment of efficient and creative co-operation is favoured by feelings of affection on recognition of a familiar and trusted partner. Attachment relations, and their converse, the suspicious watchfulness or fear given to strangers, regulate contact and the sharing of meaning. Enjoyment in felt security is a prerequisite for the efficient transfer of motives which co-operation requires (Schore, 1994; Sroufe, 1996).

*The separateness of pragmatic and communicative motives prior to language.* Integration between the infant's motives for object tracking and haptic exploration, which develop after 4 months, and motives for communication in protoconversation that were already established

in the first 3 months, continues in games. Gradually the infant is enticed to play with objects that other people are presenting in a game. «Person-Person» games give way to «Person-Person-Object» games (Trevarthen & Hubley, 1978).

A mother's play with her infant is transformed as the baby gains more vigorous ways of moving the body and experiencing its feel. Then the infant has to learn how to control and subordinate body action to achieve a stable base for precise inspection of and action on objects in manipulation. This leads the infant often to refuse play, to push a would-be playmate aside, so the task in hand can be achieved. Further changes in agency are experienced with development of independent locomotion and standing. Expansion of the memorable field of experience is a prerequisite for learning to share knowledge about the family world of day-to-day activity. In time, foci of routine activity are recognised and named, and this needs a space-time context in the learner's mind.

Observations of how infants communicate around the end of the first year show how, in a small community of the family in its familiar social and cultural context, a shared world view and shared purposes are built up, with the option for each participating subject, infant or adult, to innovate and instruct. Messages of meaning give news and affirm knowledge and belief. Negotiations of meaning match, contrast, revise, displace, give and take ideas and plans. Assertive differencing (in the form of refusals, antagonistic repulsions, withdrawals, etc.) is as necessary as compliant or encouraging agreement. As a result of genuine negotiations, reasonable (meaning «fair» and not necessarily rational or calculated) agreement is obtained without threat to relationships or to the security of interpersonal selves. Passionate, unreasonable insistence on agreement and violent disagreement both threaten relationships, not only the co-operation within relationships. Willing co-operation strengthens relationships.

All this implies that the infant beyond one year of age is moving into an increasingly clear moral

as well as co-operative set of relationships, where such feelings as loyalty, jealousy, shame and guilt can be differentiated. We have much to do in the exploration of the motives that define these more complex interpersonal states.

### **Conclusions: The meaning of early communication, and why it was not studied**

*Basic human communication is direct and intuitive; its intersubjectivity is innate.* Conversation, the main traffic of human social understanding and meaningful co-operative work, is full of an immediate interpersonal vitality that goes beyond, or beneath, the words. Formal, rule-bound, rational or decontextualized discussion, as well as texts and their reading, are special, cultivated forms; they are acquired in individual learning, as in history of the culture, on the foundation of the more informal, spontaneous kinds of communication. Every-day conversational discourse is held together, not by cognitively tidy grammatical rules, or by abstract theoretical explanations, but by empathic co-operation of an immediately persuasive, «phatic» kind (Jakobson, 1960). Interpersonal relationships in the family and in society are certainly supported on this level of direct, intuitive and emotional communication.

Given this universal immediacy of human interpersonal understanding or *sympathy* in communication, why should we be surprised that a young infant can experience an Other and their psychological activities with a well-formed and discriminating perceptual readiness that requires little practice to be functional? Perhaps we should question if awareness of the human Self in relation to the human Other is, in any sense, constructed by reason from an accumulating social experience, or built from verbally encoded «concepts» or «theories» about other persons' minds, personalities, intentions, consciousness, beliefs, etc.? Mead's social «Me», for example, when it reflects on itself with the aid of learned social judgements, standards and codes (Mead, 1934), is built around an intuitively communicative

«I» who does not need to learn how to gain responses from the Other in an I-Thou relation (Buber, 1958; Macmurray, 1961). Humans do not need to be instructed in the first communicative motives, by mothers acting «as if» babies knew and training them in the skills of turn-taking and emotional response, as has been assumed by developmental psychologists influenced by Mead's social behaviourism (e.g., Lock, 1980; Kaye, 1982). Nor is it possible to explain the development of their communication entirely from the effects that emerge by «co-construction» in the dynamic interactions between the systems of sensory-motor co-ordination in the mother and infant (Fogel & Thelen, 1987; Fogel, 1992). Infants have the ability for priming communication in them, and this grows from within as well as by entering into dialogues with others.

The way a young infant behaves when face-to-face with the right kind of «available» person supports a theory of Innate Intersubjectivity, a theory which I proposed on the evidence of descriptions of mother-infant interactions (Trevathan, 1974b; 1977; 1979). A newborn infant does not know much – at least not of the tried and tested, conscious and reasoned experience of the world we adults are expected to have. Yet a baby a few weeks old does respond sensitively, actively and appropriately to signs of mental activity in the mother, and most of all to her emotions – without training, and apparently, when properly approached, with little searching or constructive thought. The infant's expressions seem, at times, when they are well-motivated and well-supported by the Other, to enter quickly into *direct and immediate contact* with the motives and emotions of the other person.

Infants are potentially so proficient at communication a very short time after birth that we are led to reconsider every-day adult knowing of the human Other. Is it, too, driven by these basic innate motives, and similarly direct and immediate? We, at least intellectuals, may be in the habit of exaggerating the cognitive and rational (or, if we are psychoanalysts, symbolic) aspect of our own responses to others, whether they be adults or children.

*The problem of reason in relating.* Use of the widely accepted terms for cognition, chosen as they are to describe the thoughts in a unitary, isolated Cartesian thinker, solving problems, have generated profound misapprehensions of human relating and its emotional regulation (Damasio, 1994). Communication of what Wittgenstein (1972) came to recognise as «forms of life» cannot be explained rationally.

The progress of our enquiry is constrained by the conventions of our discipline, because contemporary psychology has preferred explanations in terms of rational or computational processes. Generally, emotions are treated as by-products of cognition. Behaviourists assumed that processes of perceiving, thinking and willing are entirely built up from atoms of experience by learning. Cognitivists now conceive them as innate modules for processing different forms of information. The conservative main stream of cognitive psychology is as reluctant as was behaviouristic psychology to allow innate or prefabricated motives that would be capable of directing awareness of a coherent self, especially such a specialised motive as would be required for a human subject to detect another human subject and to interact immediately, with little learning, intimately and productively.

*The objective reality of subjective states in communication.* A major philosophical obstacle to understanding human communication, and, therefore, a distortion of our understanding of human consciousness and thinking, lies in the idea that mental processes are inaccessible except within the self, that they are inevitably obscure in others and that they are essentially different or immiscible with facts of «objective» reality. The theories, arguments and beliefs that I am referring to are those called dualistic, positivistic and rationalistic. They are the product of a tradition of highly artificial scholarly discussion and introspection, distanced from every-day accomplishments of human communication and the ordinary, practical, conscious use of a reality that communication has made meaningful. Such concepts have gained influence because they are appropriate, indeed

essential, to the logical analysis of propositions about elements in an extensive body of knowledge that has become formalised in verbal texts, theories, systems of description and belief, and above all in scientific knowledge. There is, however, much in human consciousness that they do not immediately comprehend. An effort at translation has to be made.

The effect on the natural science of psychology of this text-bound epistemological tradition has been to give primary authority to research findings on the perceptual and cognitive achievements of single minds, their individual perceptual discriminations and judgements, concepts, reasonings and so forth, and to seek explanation for higher mental phenomena, including communication, either in associative learning and conditioning or, more recently, in the constructive cognitive work of problem-solving and computation. Of course, it is paradoxical to conclude that the mental phenomena of thinking and reasoning are, on the one hand, subjective, hidden and different, and at the same time learned from experience of objective reality or solving problems in mastery of reality, but that is what is believed in modern psychology.

The facts of an infant's communication, above all its efficiency and organising potency over the infant's experience as well as the interests of other persons who are in communication with the infant, support a different conception of human consciousness which can be more easily reconciled with common sense. It is also more compatible with what we know of how the human brain grows (see Schore, 1994; Trevarthen & Aitken, 1994).

*Primary to Secondary Intersubjectivity: From direct conversational consciousness to negotiation of conventional knowledge and communication by symbols.* Very soon after birth infants can enter into a dynamic exchange of mental states which has a *conversational*, potentially intention-and-knowledge-sharing, organisation or motivation. The emotional and purposeful quality of these interchanges of motives undergoes a rapid differentiation in the *games* of ensuing months, becoming more

elaborate, more quickly reactive and more directive in relation to the responses of the Other and protracted into longer «*narratives*» of feeling. We say the infant is developing a more assertive, more conscious «self», but we mean that the infant's experience of being a *performer* in the eyes of the Other is gaining in power, presence and pleasure. This Self is essentially one «in relation» to the Other's (or several Others') consciousness – ready to enter into «dialogic closure» with their motives and thoughts (Bråten, 1988). The intersubjectivity of the communication, which was there from the first opportunity for its use, is developing new alertness and richness of emotions, and increased autonomy, within the affectionate attentions and companionship of caretakers, which is its natural context. There is already an element here of metacommunicative pretension, of «showing off» and making special which I have called *protosymbolic* (Trevarthen, 1990b), and which Wallon (1928) aptly named 'prestance', which signifies the bearing of an office-holder in ceremonial self-presentation. It is also relevant that many of the infant's «acting up» or demonstrative behaviours are recollected from previously marked occasions; they are favourite and customary and ritualised «tricks» for celebratory exchange.

We have touched on the crucial further development in communication and co-operative self-expression that makes it possible for the infant, at about one year after birth, to begin sharing and comparing experiences of reality, and to begin to play a part in the execution of tasks the aim of which is to transform the shared reality, to bring it under the organising influence of the human consciousnesses and intentions of the infant and partner together. From this point we can talk of *jointly constructed meaning* and of symbolic expressions that refer to items of negotiated knowledge and to ideas that have been given social significance in a community.

The infant demonstrates the essential co-operative motives before speaking, so the crucial awareness of the other's feelings and purposes with application to objects in the shared world comes first without the intervention of words and



language. It leads to the formation of concepts situated in a matrix of knowledge that has been built up arbitrarily in the history of the society.

The kind of communicative understanding that a one-year-old has contains primitive concepts that have been given value and distinctness through emotional referencing, joint attention and mimesis in communication games wherein the child is invited to be an active initiator of 'ways of acting'. Research has demonstrated that it is not instruction, demonstration, affective attunement or embellishment by the mother that leads the infant under about 35 weeks to observe and learn common, arbitrary ideas. The infant has to be ready to look for, imitate and complement what the mother is doing. The crucial change takes place when the infant is between 35 and 40 weeks of age (Hublely & Trevarthen, 1979; Trevarthen & Hubley, 1978). By 60 weeks infants generally are *co-operatively aware* and active in the production of vocalisations and gestures in the «acts of meaning» of protolanguage, by which other persons' actions and interests are manipulated (Halliday, 1975; Trevarthen, 1987, 1990c). They are quick to share the 'joint attention' which is essential to learning of language (Tomasello, 1988; Locke, 1994).

Subsequent development of concepts of other people, of their interests, purposes, beliefs and feelings depends on *discussion*, and it gains from the capacity of language to specify ideas about non-present things, events and places, and peoples' actions and feelings. It is built up by learning of stories that people tell about themselves, each other and the world; that is, from character-full and dramatic narratives. The value terms and dynamic processes recorded in such narratives are not new for the one-year-old, even though an entirely new vocabulary is being learned. The *narrative dynamics* are built on the intuitive empathic understandings of persons' awareness of each other that have been in evidence since the early months. What is new is use of language to strengthen and extend the remembered, imagined and referred to things – the facts. In time the actions of play themselves become part of the discussion, as does the

described and retained verbal description of the child's person and the individualities of known, and named, playmates. Eventually speaking and language forms themselves become topics for play (Locke, 1994). The talk becomes habitual, second nature; and it can increasingly assume the private form of an internal conversation, or thinking (Vygotsky, 1967).

Logic, propositional argument, arises out of the need for a verbally described consciousness to justify (prove) what it thinks to itself against what it says in conversation to others. The internal dyad and the external one have to be reconciled or made consistent in their stories. We are inclined to grant a responsible «self», and a reliable and sensible consciousness, to any person who can make a reasonably confident defence of their thought on some matter of common concern. Quickness of such thought is called «intelligence». But the whole existence of such a self and education of its consciousness depends on the prior activity of a communicator who was capable of being in immediate mutually-responsive communication with a companion at the level of motives and emotions, regardless of words and what facts words are «about». That is what the human person, with its inherently dyadic conversational mind, can do. Analysis of protoconversation between a mother and her infant gives us detailed information about the organisation and vitality of the primary and basic mental processes that make the communicative, and meaningful, life possible.

## References

- Ahrens, R. (1954). Beitrag zur Entwicklung des Physiognomie und Mimikerkennens. *Zeitschrift für Experimentelle und Angewandte Psychologie*, 2, 412-454.
- Alegria, J., & Noirot, E. (1978). Neonate orientation behavior towards the human voice. *Early Human Development*, 1, 291-312.
- Als, H. (1995). The preterm infant: A model for study of fetal brain expectation. In J.-P. Lecanuet, W. P. Fifer, N. A. Krasnegor & W. P.

- Smotherman (Eds.), *Fetal development: A psychobiological perspective* (pp. 439-471). Hillsdale, NJ: Erlbaum.
- Amiel-Tison, C. (1985). Pediatric contribution to the present knowledge on neurobehavioral status of infants at birth. In J. Mehler & R. Fox (Eds.), *Neonatal cognition: Beyond the blooming, buzzing confusion*. Hillsdale, NJ: Erlbaum.
- Anokhin, P. K. (1974). *Biology and neurophysiology of the conditioned reflex and its role in adaptive behavior* (Scientific and Translation Editor, S. A. Carson). Oxford: Pergamon.
- Bakhtine, M. M. (1981). *The dialogic imagination*. (Edited by M. Holquist). Austin: University of Texas Press
- Baldwin, J. M. (1894). *Mental development in the child and the race*. New York: Macmillan.
- Bateson, G. (1956). The message «This is play». In B. Schaffer (Ed.), *Group processes*. New York: Josiah Macy Foundation.
- Bateson, M. C. (1979). The epigenesis of conversational interaction: A personal account of research development. In M. Bullowa (Ed.), *Before speech: The beginning of human communication* (pp. 63-77). London: Cambridge University Press.
- Beebe, B., Jaffe, J., Feldstein, S., Mays, K., & Alson, D., (1985). Inter-personal timing: The application of an adult dialogue model to mother-infant vocal and kinesic interactions. In F. M. Field & N. Fox (Eds.), *Social perception in infants*. Norwood, NJ: Ablex.
- Beebe, B., Stern, D., & Jaffe, J. (1979). The kinesic rhythm of mother-infant interactions. In A. W. Siegman & S. Feldstein (Eds.), *Of speech and time: Temporal speech patterns in interpersonal contexts*. Hillsdale, NJ: Erlbaum.
- Benjamin, J. (1988). *The bonds of love: Psychoanalysis, feminism, and the problems of domination*. New York: Pantheon.
- Bernstein, N. (1967). *Coordination and regulation of movements*. New York: Pergamon.
- Bornstein, M. H. (1985). Infant into adult: Unity into diversity with the development of visual categorization. In J. Mehler & R. Fox (Eds.), *Neonatal cognition: Beyond the blooming, buzzing confusion*. Hillsdale, NJ: Erlbaum.
- Bradley, B. S. (1991). Infancy as paradise. *Human Development*, 34, 35-54.
- Bråten, S. (1988). Dialogic mind: The infant and adult in protoconversation. In M. Cavello (Ed.), *Nature, cognition and system*. Dordrecht: Kluwer.
- Brazelton, T. B. (1973). *Neonatal Behavioural Assessment Scale* (Clinics in Developmental Medicine, 50. Spastics International Medical Publications). London: Heinemann Medical Books.
- Brazelton, T. B. (1979). Evidence of communication during neonatal assessment. In M. Bullowa (Ed.), *Before speech: The beginning of human communication* (pp. 79-88). London: Cambridge University Press.
- Brazelton, T. B. (1982). Joint regulation of neonate-parent behavior. In E. Z. Tronick (Ed.), *Social interchange in infancy: Affect, cognition and communication*. Baltimore: University Park Press.
- Brazelton, T. B., Koslowski, B., & Main, M. (1974). The origins of reciprocity: The early mother-infant interaction. In M. Lewis & L. A. Rosenblum (Eds.), *The effect of the infant on its caregiver* (pp. 49-76). New York: Wiley.
- Brazelton, T. B., Tronick, E., Adamson, L., Als, H., & Wise, S. (1975). *Early mother-infant reciprocity*. *Ciba Foundation Symposium*, 33. Amsterdam: Elsevier.
- Bruner, J. S. (1996). *The culture of education*. Cambridge, MA: Harvard University Press.
- Buber, M. (1958). *I and Thou* (2nd Edition). Edinburgh: T. & T. Clark.
- Buck, R. (1984). *The communication of emotion*. New York: The Guilford Press.
- Bullowa, M. (Ed.) (1979). *Before speech: The beginning of human communication*. London: Cambridge University Press.
- Carpenter, G. C., Tecce, J. S., Stechler, G., & Friedman, S. (1970). Differential visual behavior to human and humanoid faces in early infancy. *Merrill-Palmer Quarterly*, 16, 91-108.
- Cheney, D. L., & Seyfarth, R. M. (1992). Précis of *How Monkeys See the World*. *Behavioral and*

- Brain Sciences*, 15, 135-182.
- Chevalier-Skolnikoff, S. (1989). Spontaneous tool use and sensorimotor intelligence in *Cebus* compared with other monkeys and apes. *Behavioral and Brain Sciences*, 12, 561-627.
- Cicchetti, D., & Hesse, P. (1983). Affect and intellect: Piaget's contributions to the study of infant emotional development. In R. Plutchik & H. Kellerman (Eds.), *Emotion: Theory, research and experience: Vol. 2. Emotions in early development*. New York: Academic.
- Cioni, G., & Castellaci, A. M. (1990). Development of fetal and neonatal motor activity: Implications for neurology. In H. Block and B. Bertenthal (Eds.), *Sensory-motor organization and development in infancy and early childhood*. Dordrecht: Kluwer.
- Clynes, M. (1980). The communication of emotion: Theory of sentics. In R. Plutchik & H. Kellerman (Eds.), *Emotion: Theory, research and experience, Vol. 1: Theories of emotion*. New York: Academic.
- Cohn, J. F., & Tronick, E. Z. (1983). Three-month-old infants' reaction to simulated maternal depression. *Child Development*, 54, 185-193.
- Condon, W. S., & Sander, L. (1974). Neonate movement is synchronised with adult speech: Interactional participation and language acquisition. *Science*, 183, 99-101.
- Damasio, A. R. (1994). *Descartes error: Emotion, reason and the human brain*. New York: Putnam.
- Darwin C. (1872). *The expression of emotion in man and animals*. London: Methuen.
- Dawson, G., & Fischer, K. W. (1994). *Human behavior and the developing brain*. New York: The Guilford Press.
- de Waal, F. (1982). *Chimpanzee politics*. New York: Harper and Row.
- DeCasper, A. J., & Carstens, A. A. (1981). Contingencies of stimulation: Effects on learning and emotion in neonates. *Infant Behavior and Development*, 4, 19-35.
- DeCasper, A. J., & Fifer, W. P. (1980). Of human bonding: Newborns prefer their mother's voices. *Science*, 208, 1174-1176.
- DeCasper, A. J., & Prescott, P. (1984). Human newborns' perception of male voices: Preference, discrimination and reinforcing value. *Developmental Psychobiology*, 17, 481-491.
- DeCasper, A. J., & Spence, M. J. (1986). Prenatal maternal speech influences newborns' perception of speech sounds. *Infant Behavior and Development*, 9, 133-150.
- Donald, M. (1991). *Origins of the modern mind*. Cambridge MA: Harvard University Press.
- Donaldson, M. (1992). *Human minds: An exploration*. London: Penguin Books.
- Duncan, S., & Fiske, D. W. (1977). *Face-to-face interaction*. Hillsdale, NJ: Erlbaum.
- Ekman, P., & Friesen, W. (1971). Constants across cultures in the face and emotion. *Journal of Personality and Social Psychology*, 17, 124-129.
- Edelman, G. M. (1987). *Neural Darwinism: The theory of Neuronal Group Selection*. New York: Basic Books.
- Eibl-Eibesfeldt, I. (1970). *Ethology: The biology of behavior*. New York: Holt, Rinehart and Winston.
- Eibl-Eibesfeldt, I. (1989). *Human ethology*. New York: Aldine de Gruyter.
- Fairbairn, W. R. D. (1954). *An Object Relations theory of the personality*. New York: Basic Books.
- Fantz, R. L. (1963). Pattern vision in newborn infants. *Science*, 140, 296-297.
- Fernald, A. (1985). Four-month-old infants prefer to listen to motherese. *Infant Behavior and Development*, 8, 181-195.
- Fernald, A., & Kuhl, P. K. (1987). Acoustic determinants of infant preference for motherese speech. *Infant Behavior and Development*, 10, 279-293.
- Fernald, A., Taeschner, T., Dunn, J., Papousek, M., Boysson-Bardies, B. de., & Fukui, I. (1989). A cross-language study of prosodic modifications in mothers' and fathers' speech to preverbal infants. *Journal of Child Language*, 16, 477-501.
- Field, T. N. (1985). Neonatal perception of people: Maturational and individual differences. In T. N. Field & N. Fox (Eds.),

- Social perception in infants* (pp. 177-197). Norwood, NJ: Ablex.
- Field, T. N., Woodson, R., Greenberg, R., & Cohen, D. (1982). Discrimination and imitation of facial expressions by neonates. *Science*, 218, 179-181.
- Fifer, W. P., & Moon, C. M. (1995). The effects of fetal experience with sound. In J.-P. Lecanuet, W.P. Fifer, N. A. Krasnegor, & W. P. Smotherman (Eds.), *Fetal development: A psychobiological perspective* 351-366. Hillsdale, NJ: Erlbaum.
- Fogel, A. (1977). Temporal organization in mother-infant face-to-face interaction. In H. R. Schaffer (Ed.), *Studies in mother-infant interaction: The Loch Lomond Symposium*. London: Academic.
- Fogel, A. (1992). Movement and communication in human infancy: The social dynamics of development. *Human Movement Science*, 11, 387-423.
- Fogel, A., & Hannan, T. E. (1985). Manual actions of nine- to fifteen-week-old human infants during face-to-face interaction with their mothers. *Child Development*, 56, 1271-1279.
- Fogel, A., & Thelen, E. (1987). Development of early expressive action from a dynamic systems approach. *Developmental Psychology*, 23, 747-761.
- Fraiberg, S. (1979). Blind infants and their mothers: An examination of the sign system. In M. Bullowa (Ed.), *Before speech: The beginning of interpersonal communication* (pp. 321-347). London: Cambridge University Press.
- Gallistel, C. R. (1980). *The organization of action: A new synthesis*. Hillsdale, NJ: Erlbaum.
- Gardner, H. (1983). *Frames of mind: The theory of multiple intelligences*. New York: Basic Books.
- Gibson, J. J. (1966). *The senses considered as perceptual systems*. Boston: Houghton Mifflin.
- Gibson, J. J. (1979). *The ecological approach to visual perception*. Boston: Houghton Mifflin.
- Goodnow, J. (1984). Parent's ideas about parenting and development: A review of issues and recent work. In M. E. Lamb, A. L. Brown, & B. Rogoff (Eds.), *Advances in developmental psychology* (Vol. 3). Hillsdale, NJ: Erlbaum.
- Goshen-Gottstein, E. R. (1980). Treatment of young children among nonwestern Jewish mothers in Israel: Sociocultural variables. *American Journal of Orthopsychiatry*, 50, 323-340.
- Gouzoules, H., Gouzoules, S., & Marler, P. (1985). External reference and affective signalling in mammalian vocal communication. In G. Zivin, (Ed.), *The development of expressive behavior: Biology-environment interactions*. Orlando, FL: Academic.
- Grieser, D. L., & Kuhl, P. K. (1988). Maternal speech to infants in a tonal language: Support for universal prosodic features in motherese. *Developmental Psychology*, 24, 14-20.
- Haith, M. M. (1966). Response of the human newborn to visual movement. *Journal of Experimental Child Psychology*, 3, 235-243.
- Halliday, M. A. K. (1975). *Learning how to mean*. London: Arnold.
- Hamlyn, D. W. (1974). Person-perception and our understanding of others. In T. Mischel (Ed.), *Understanding of other persons*. Oxford: Blackwell.
- Heimann, M. (1989). Neonatal imitation, gaze aversion and mother-infant interaction. *Infant Behavior and Development*, 12, 495-505.
- Heimann, M., & Schaller, J. (1985). Imitative reactions among 14-21 days old infants. *Infant Mental Health Journal*, 6, 31-39.
- Heimann, M., Nelson, K. E., & Schaller, J. (1989). Neonatal imitation of tongue protrusion and mouth opening: Methodological aspects and evidence of early individual differences. *Scandinavian Journal of Psychology*, 90, 90-101.
- Holmlund, C. (1990). Development of turntaking as a sensorimotor process in the first 3 months: A sequential analysis. Paper presented at the 5th International Congress of Child Language, Budapest, Hungary.
- Hobson, R. P. (1993). Through feeling and sight

- to self and symbol. In U. Neisser (Ed.), *The perceived self: Ecological and interpersonal sources of self-knowledge* (254-279). New York: Cambridge University Press.
- Horrige, G. A. (1968). *Interneurons: Their origin, action, specificity, growth and plasticity*. London: Freeman.
- Hubley, P., & Trevarthen C. (1979). Sharing a task in infancy. In I. Uzgiris (Ed.), *Social Interaction during infancy: Vol. 4. New directions for child development* (pp. 57-80). San Francisco: Jossey-Bass.
- Hurford, J. R. (1989). Biological evolution of the Saussurean sign as a component of the language acquisition device. *Lingua*, 77, 187-222.
- Hutcheson, F. (1755). *A system of moral philosophy*. Glasgow.
- Izard, C. E. (1980). The emergence of emotions and the development of consciousness in infancy. In J. M. Davidson & R. Davidson (Eds.), *The psychobiology of consciousness*. New York: Plenum.
- Jakobson, R. (1960). Closing statement: Linguistics and poetics. In T. A. Sebeok (Ed.), *Style in language*. Cambridge, MA: The MIT Press.
- Jaffe, J., Stern, D. N., & Peery, J. C. (1973). Conversational coupling of gaze behavior in prelinguistic human development. *Journal of Psycholinguistic Research* 2, 321-330.
- Jeannerod, M. (1994). The representing brain: Neural correlates of motor intention and imagery. *Behavioral and Brain Sciences*, 17, 187-245.
- Johanssen, G. (1975). Visual motion perception. *Scientific American*, 232, 76-88.
- Kanner, L. (1943). Autistic disturbances of affective contact. *Nervous Child*, 2, 217-250.
- Kaye, K. (1982). *The mental and social life of babies*. Chicago: University of Chicago Press.
- Kellerman, H. (1980). A structural model of emotion and personality. In R. Plutchik & H. Kellerman (Eds.), *Emotion: Theory, research and experience: Vol. 1. Theories of emotion*. New York: Academic.
- Kellerman, H. (1983). An epigenetic theory of emotions in early development. In R. Plutchik & H. Kellerman (Eds.), *Emotion: Theory, research and experience: Vol. 2. Emotions in early development*. New York: Academic.
- Kendon, A. (1980). Gesticulation and speech: Two aspects of the process of utterance. In M. R. Key (Ed.), *The relationship of verbal and nonverbal communication*. New York: Mouton.
- Klaus, M. H., & Kennel, J. H. (1976). Parent-to-infant attachment. In D. Hull (Ed.), *Recent advances in paediatrics* (pp. 129-152). Edinburgh, UK: Churchill Livingstone.
- Klein, M., Heinmann, P., Isaacs, S., & Riviere, J. (1952). *Developments in psychoanalysis*. London, Hogarth.
- Klunnert, M. D., Campos, J. J., Sorce, J. F., Emde, R. N., & Svejda, M. (1983). Emotions as behavior regulators: Social referencing in infancy. In R. Plutchik & H. Kellerman (Eds.), *Emotion: Theory, research and experience: Vol. 2. Emotions in early development*. New York: Academic.
- Kugiumutzakis, G. (1983). *Imitative phenomena: A new challenge*. MA Thesis, Department of Psychology, University of Uppsala.
- Kugiumutzakis, G. (1985). *The origins, development and function of early infant imitation*. Uppsala University, Ph D Thesis. *Acta Universitatis Uppsaliensis*, 35.
- Kugiumutzakis, G. (1993). Intersubjective vocal imitation in early mother-infant interaction. In J. Nadel & L. Camaioni (Eds.), *New perspectives in early communicative development*. London: Routledge.
- Langlois, J. H., & Roggman, L. A. (1990). Attractive faces are only average. *Psychological Science*, 1, 115-121.
- Langlois, J. H., Roggman, L. A., & Rieser-Danner, L. A. (1990). Infant's differential social responses to attractive and unattractive faces. *Developmental Psychology*, 26, 153-159.
- Lashley, K. S. (1951). The problems of serial order in behavior. In L. A. Jeffress (Ed.), *Cerebral mechanisms in behavior*. New York: Wiley.
- Le Vine, R. A., & White, M. I. (1986). *Human conditions*. London: Routledge and Kegan

- Paul.
- Lecanuet, J.-P., Fifer, W. P., Krasnegor, N. A., & Smotherman, W. P. (Eds.). (1995). *Fetal development: A psychobiological perspective*. Hillsdale, NJ: Erlbaum.
- Lee, D. N. (1993). Body-environment coupling. In U. Neisser (Ed.), *The perceived self: Ecological and interpersonal sources of the self-knowledge* (pp. 43-67). New York: Cambridge University Press.
- Legerstee, M. (1992). A review of the animate-inanimate distinction in infancy: Implications for models of social and cognitive knowing. *Early Development and Parenting, 1*, 59-67.
- Lester, B. (1984). A biosocial model of infant crying. In L. P. Lipsett & C. Rovee-Collier (Eds.), *Advances in Infancy Research (Vol. 3)*. Hillsdale, NJ: Ablex.
- Levi, P. (1986, June 24). About gossip. *La Stampa* (Reprinted in *The mirror maker: Stories and essays by Primo Levi*, Trans. R. Rosenthal. New York: Schocken Books).
- Lock, A. (1980). *The guided reinvention of language*. London: Academic.
- Locke, J. L. (1993). *The child's path to spoken language*. Cambridge, MA: Harvard University Press.
- Lotman, Y. (1979). Culture as collective intellect and problems of artificial intelligence. In L. M. O'Toole, & A. Shukman (Eds.), *Dramatic structure: Poetic and cognitive semantics. Russian Poetics in Translation, 6*, 84-96.
- Lynch, M. P., Oller, D. K., Steffens, M. L., & Buder, E. H. (1995). Phrasing in prelinguistic vocalizations. *Developmental Psychobiology, 28*, 3-25.
- MacKain, K. S., Studdert-Kennedy, M., Spieker, S., Stern, D. N. (1983). Infant intermodal speech perception is a left hemisphere functions. *Science 219*, 1347-1349
- Macmurray, J. (1961). *Persons in relation: Vol. II. The form of the personal*. London: Faber and Faber.
- Mahler, M. S., Pine, S., & Bergman, A. (1975). *The psychological birth of the human infant*. New York: Basic Books.
- Malatesta, C. Z. (1985). Developmental course of emotion expression in the human infant. In G. Zivin (Ed.), *The development of expressive behavior: Biology-environment interactions*. Orlando, FL: Academic.
- Maratos, O. (1973). *The origin and development of imitation in the first six months of life*. Unpublished doctoral dissertation, University of Geneva, Switzerland.
- Maratos, O. (1982). Trends in development of imitation in early infancy. In T. G. Bever (Ed.), *Regressions in mental development: Basic phenomena and theories* (pp. 81-101). Hillsdale, NJ: Erlbaum.
- Martin, G. B., & Clark, R. D. (1982). Distress crying in neonates: Species and peer specificity. *Developmental Psychology, 18*, 3-9.
- Mayer, N. K., & Tronick, E. Z. (1985). Mothers' turn-giving signals and infant turn-taking in mother-infant interactions. In T. Field & N. Fox (Eds.), *Social perception in infants*. Norwood, NJ: Ablex.
- McNeill, D. (1992). *Hand and mind: What gestures reveal about thought*. Chicago: University of Chicago Press.
- Mead, G. H. (1934). *Mind, self and society*. Chicago: Chicago University Press.
- Meltzoff, A. N., & Moore M. H. (1983). Newborn infants imitate adult facial gestures. *Child Development, 54*, 702-709.
- Meltzoff, A. N. (1985). The roots of social and cognitive development: Models of man's original nature. In T. M. Field & N. A. Fox (Eds.), *Social perception in infants*. Norwood, NJ: Ablex.
- Michotte, A. (1962). *Causalité, permanence et réalité phénoménales*. Louvain: Publications Universitaires.
- Midgley, M. (1994). *The ethical primate: Humans, freedom and morality*. London: Routledge.
- Montgomery, W. (1985). Charles Darwin's thought on expressive mechanisms in evolution. In G. Zivin (Ed.), *The development of expressive behavior: Biology-environment interactions*. Orlando, FL: Academic.
- Murray, L. (1980). *The sensitivities and expressive capacities of young infants in communication with others*. Unpublished doctoral

- dissertation, University of Edinburgh, Scotland, U.K.
- Murray, L. (1988). Effects of postnatal depression on infant development: Direct studies of early mother-infant interactions. In I. Brockington & R. Kumar (Eds.), *Motherhood and mental illness* (Vol. 2). Bristol: John Wright.
- Murray, L. (1992). The impact of postnatal depression on infant development. *Journal of Child Psychology and Psychiatry*, 33, 543-561.
- Murray, L., & Trevarthen, C. (1985). Emotional regulation of interactions between two-month-olds and their mothers. In T. Field & N. Fox (Eds.), *Social perception in infants*. Norwood, NJ: Ablex.
- Murray, L., & Trevarthen, C. (1986). The infant's role in mother-infant communication. *Journal of Child Language*, 13, 15-29.
- Nadel, J. (1986). *Imitation et communication entre jeunes enfants*. Paris: P.U.F.
- Nakano, S. (1996, June). «I» don't know what's happening, but «we» do. Paper presented at the conference on «New Psychologies», Tarbert, Scotland, U.K.
- Neisser, U. (1976). *Cognition and reality: Principles and implications of cognitive psychology*. San Francisco: Freeman.
- Ninio, A. (1988). The effects of cultural background, sex and parenthood on beliefs about the timetable of cognitive development in infancy. *Merrill-Palmer Quarterly*, 34, 369-388.
- Ochs, E. (1983). Cultural dimensions of language acquisition. In E. Ochs & B. B. Schiefflin (Eds.), *Acquiring conversational competence*. New York: Routledge and Kegan Paul.
- Oller, D. K. (1986). Metaphonology and infant vocalizations. In B. Lindblom & R. Zetterstrom (Eds.), *Precursors of early speech*. Basingstoke: Macmillan.
- Oster, H. (1978). Facial expression and affect development. In M. Lewis & L. A. Rosenblum (Eds.), *The development of affect* (pp. 43-75). New York: Plenum.
- Oster, H., & Ekman, P. (1978). Facial behavior in child development. In A. Collins (Ed.), *Minnesota Symposia on child psychology*. (Vol. 11). New York: Crowell.
- Papousek, H. (1967). Experimental studies of appetitional behavior in human newborns and infants. In H. W. Stevenson, E. H. Hess, & H. L. Rheingold (Eds.), *Early behavior: Comparative and developmental approaches*. New York: Wiley.
- Papousek, H. (1994). Intuitive parenting: Arguments for comparative approaches. *Early Development and Parenting*, 3, 1-3.
- Papousek, H., & Papousek, M. (1977). Mothering and cognitive head start: Psychobiological considerations. In H. R. Schaffer (Ed.), *Studies in mother-infant interaction: The Loch Lomond Symposium*. London: Academic.
- Papousek, H., & Papousek, M. (1987). Intuitive parenting: A dialectic counterpart to the infant's integrative competence. In J. D. Osofsky (Ed.), *Handbook of infant development* (2nd. Edition). New York: Wiley.
- Papousek, M. (1994). Melodies in caregivers' speech: A species specific guidance towards language. *Early Development and Parenting*, 3, 5-17.
- Papousek, M., & Papousek, H. (1989). Forms and functions of vocal matching in interactions between mothers and their precanonical infants. *First Language*, 9, 137-158.
- Papousek, M., Papousek, H., & Bornstein, M. H. (1985). The naturalistic vocal environment of young infants: On the significance of homogeneity and variability in parental speech. In T. M. Field & N. Fox (Eds.), *Social perception in infants*. Norwood, NJ: Ablex.
- Papousek, M., Papousek, H., & Symmes, D. (1991). The meanings and melodies in motherese in tone and stress languages. *Infant Behavior and Development*, 14, 415-440.
- Piaget, J. (1953). *The origins of intelligence in children*. London: Routledge and Kegan Paul.
- Piaget, J. (1962). *Play, dreams and imitation in childhood*. London: Routledge and Kegan Paul.
- Plutchik, R. (1980). A general psychoevolutionary theory of emotion. In R. Plutchik & H. Kellerman (Eds.), *Emotion: Theory, research*

- and experience: Vol. 1. *Theories of emotion*. New York: Academic.
- Pöppel, E. (1994). Temporal mechanisms in perception. *International Review of Neurobiology*, 37, 185-202.
- Prechtl, H. F. R. (1984). Continuity and change in early human development. In H. F. R. Prechtl (Ed.), *Continuity of neural functions from prenatal to postnatal life*. Oxford: Blackwell.
- Reddy, V. (1991). Playing with others' expectations: Teasing and mucking about in the first year. In A. Whiten (Ed.), *Natural theories of mind: Evolution, development and simulation of everyday mindreading* (pp. 143-158). Oxford: Blackwell.
- Robson, K. S. (1967). The role of eye to eye contact in maternal-infant attachment. *Journal of Child Psychology and Psychiatry*, 8, 13-25.
- Rogoff, B. (1990). *Apprenticeship in thinking: Cognitive development in social context*. New York: Oxford University Press.
- Rönnqvist, L., & von Hofsten, C. (1994). Neonatal finger and arm movements as determined by a social and an object context. *Early Development and Parenting*, 3, 81-94.
- Runeson, S. (1977). On the possibility of «smart» perceptual mechanisms. *Scandinavian Journal of Psychology*, 18, 172-179.
- Sagi, A., & Hoffman, M. L. (1976). Empathic distress in the newborn. *Developmental Psychology*, 12, 175-176.
- Sander, L. (1964). Adaptive relationships in early mother-child interaction. *Journal of the American Academy of Child Psychiatry*, 3, 231-264.
- Schiefflin, B. B. (1979). Getting it together: An ethnographical approach to the study of the development of communicative competence. In E. Ochs & B. B. Schiefflin (Eds.), *Developmental Pragmatics*. New York: Academic.
- Schore, A. N. (1994). *Affect regulation and the origin of the self: The neurobiology of emotional development*. Hillsdale, NJ: Erlbaum.
- Smith, A. (1759). *The theory of moral sentiments*. Glasgow, 6th edition 1790 (D. D. Raphael and A. L. Macfie, General Editors. Oxford: Clarendon, 1976; Reprint, Indianapolis: Liberty Fund, 1984).
- Sperry, R. W. (1952). Neurology and the mind-brain problem. *American Scientist*, 40, 291-312.
- Spitz, R. A., & Wolf, K. M. (1946). The smiling response: A contribution to the orthogenesis of social relations. *Genetic Psychology Monographs*, 34, 57-125.
- Sroufe, L. A. (1996). *Emotional development: The organisation of emotional life in the early years*. New York: Cambridge University Press.
- Stern, D. N. (1974). Mother and infant at play: The dyadic interaction involving facial, vocal and gaze behaviors. In M. Lewis & L. Rosenblum (Eds.), *The effect of the infant on its caregiver*. New York: Wiley.
- Stern, D. N. (1985). *The interpersonal world of the infant: View from psychoanalysis and development psychology*. New York: Basic Books.
- Stern, D. N. (1993). The role of feelings for an interpersonal self. In U. Neisser (Ed.), *The perceived self: Ecological and interpersonal sources of the self-knowledge*. New York: Cambridge University Press.
- Stern, D. N., Hofer, L., Haft, W., & Dore, J. (1985). Affect attunement: The sharing of feeling states between mother and infant by means of intermodal fluency. In T. N. Field & N. Fox (Eds.), *Social perception in infants*. Norwood, NJ: Ablex.
- Stern, D. N., Spieker, S., & MacKain, K. (1982). Intonation contours as signals in maternal speech to prelinguistic infants. *Developmental Psychology*, 18, 727-735.
- Thompson, E., Palacios, A., & Varela, F. J. (1992). Ways of coloring: Comparative color vision as a case study for cognitive science. *Behavioral and Brain Sciences*, 15, 1-74.
- Tinbergen, N. (1951). *The study of instinct*. Oxford: Clarendon Press.
- Trad, P. V. (1990). *Infant previewing: Predicting and sharing interpersonal outcome*. New York: Springer.
- Trevarthen, C. (1977). Descriptive analyses of



- infant communication behavior. In H. R. Schaffer (Ed.), *Studies in mother-infant interaction: The Loch Lomond Symposium* (pp. 227-270). London: Academic.
- Trevarthen, C. (1978). Modes of perceiving and modes of acting. In J. H. Pick (Ed.), *Psychological modes of perceiving and processing information* (pp. 99-136). Hillsdale, NJ: Erlbaum.
- Trevarthen, C. (1979). Communication and cooperation in early infancy: A description of primary intersubjectivity. In M. Bullowa (Ed.), *Before speech: The beginning of human communication* (pp. 321-347). London: Cambridge University Press.
- Trevarthen, C. (1982). The primary motives for cooperative understanding. In G. Butterworth & P. Light (Eds.), *Social cognition: Studies of the development of understanding* (pp. 77-109). Brighton: Harvester Press.
- Trevarthen, C. (1984a). Biodynamic structures, cognitive correlates of motive sets and development of motives in infants. In W. Prinz & A. F. Saunders (Eds.), *Cognition and motor processes* (pp. 327-350). Berlin: Springer Verlag.
- Trevarthen, C. (1984b). Emotions in infancy: Regulators of contacts and relationships with persons. In K. Scherer & P. Ekman (Eds.), *Approaches to emotion* (pp. 129-157). Hillsdale, NJ: Erlbaum.
- Trevarthen, C. (1985). Facial expressions of emotion in mother-infant interaction. *Human Neurobiology*, 4, 21-32.
- Trevarthen, C. (1986a). Development of intersubjective motor control in infants. In M. G. Wade & H. T. A. Whiting (Eds.), *Motor development in children: Aspects of coordination and control* (pp. 209-261). Dordrecht: Martinus Nijhof.
- Trevarthen, C. (1986b). Form, significance and psychological potential of hand gestures of infants. In J.-L. Nespoulous, P. Perron, & A. R. Lecours (Eds.), *The biological foundation of gestures: Motor and semiotic aspects* (pp. 149-202). Hillsdale, NJ: Erlbaum.
- Trevarthen, C. (1987). Sharing makes sense: Intersubjectivity and the making of an infant's meaning. In R. Steele & T. Threadgold (Eds.), *Language topics: Essays in honour of Michael Halliday*. Amsterdam and Philadelphia, John Benjamins.
- Trevarthen, C. (1988). Universal cooperative motives: How infants begin to know the language and skills of the culture of their parents. In G. Jahoda & I. M. Lewis (Eds.), *Acquiring culture: Cross cultural studies in child development*. Beckenham, Kent, U.K.: Croom Helm.
- Trevarthen, C. (1990a). Growth and education of the hemispheres. In C. Trevarthen (Ed.), *Brain circuits and functions of the mind: Essays in honour of Roger W. Sperry* (pp. 334-363). New York: Cambridge University Press.
- Trevarthen, C. (1990b). Signs before speech. In T. A. Sebeok & J. Umiker-Sebeok (Eds.), *The semiotic web, 1989* (pp. 689-755). Berlin: Mouton de Gruyter.
- Trevarthen, C. (1992). An infant's motives for speaking and thinking in the culture. In A. H. Wold (Ed.), *The dialogical alternative* (Festschrift for Ragnar Rommetveit). Oslo: Scandinavian University Press.
- Trevarthen, C. (1993a). The self born in intersubjectivity: The psychology of an infant communicating. In U. Neisser (Ed.), *The Perceived self: Ecological and interpersonal sources of the self-knowledge* (pp. 121-173). New York: Cambridge University Press.
- Trevarthen, C. (1993b). The function of emotions in early infant communication and development. In J. Nadel & L. Camaioni (Eds.), *New perspectives in early communicative development*. London: Routledge.
- Trevarthen, C. (1996). Lateral asymmetries in infancy: Implications for the development of the hemispheres. *Neuroscience and Biobehavioral Reviews*, 20, 571-586.
- Trevarthen, C., & Aitken, K. J. (1994). Brain development, infant communication, and empathy disorders: Intrinsic factors in child mental health. *Development and Psychopathology*, 6, 599-635.

- Trevarthen, C., Aitken, K. J., Papoudi, D., & Robarts, J. Z. (1996). *Children with autism: Diagnosis and interventions to meet their needs*. London: Jessica Kingsley.
- Trevarthen, C., & Hubble, P. (1978). Secondary intersubjectivity: Confidence, confiding and acts of meaning in the first year. In A. Lock (Ed.), *Action, gesture and symbol: the Emergence of language* (pp. 183-229). London: Academic.
- Trevarthen, C., Kokkinaki, T., & Fiamenghi, G. A. Jr. (in press). What infants' imitations communicate: With mothers, with fathers and with peers. In J. Nadel & G. Butterworth (Eds.), *Imitation in infancy*. Cambridge: Cambridge University Press.
- Trevarthen, C., & Logotheti, K. (1987). First symbols and the nature of human knowledge. In J. Montangero, A. Tryphon & S. Dionnet (Eds.), *Symbolisme et connaissance/ Symbolism and knowledge* (pp. 65-92). Cahier No. 8, Jean Piaget Archives Fondation. Geneva: Jean Piaget Archives Fondation.
- Trevarthen, C., & Marwick, H. (1986). Signs of motivation for speech in infants, and the nature of a mother's support for development of language. In B. Lindblom & R. Zetterstrom (Eds.), *Precursors of early speech* (pp. 279-308). Basingstoke: Macmillan.
- Trevarthen, C., Murray, L., & Hubble, P. (1981). Psychology of infants. In J. Davis and J. Dobbing (Eds.), *Scientific foundations of clinical paediatrics* (2nd edition). London: W. Heinemann Medical Books Ltd.
- Tronick, E. Z. (1989). Emotions and emotional communication in infants. *American Psychologist*, 44, 112-126.
- Tronick, E. Z., Als, H., Adamson, L., Wise, S., & Brazelton, T. B. (1978). The infant's response to entrapment between contradictory messages in face-to face interaction. *Journal of the American Academy of Child Psychiatry*, 17, 1-13.
- Tucker, D. M. (1991). Developing emotions and cortical networks. In M. Gunnar & C. Nelson (Eds.), *Minnesota symposium on child psychology: Vol. 24. Developmental behavioral neuroscience*. Hillsdale, NJ: Erlbaum.
- Tulkin, S. R., & Cohler, B. J. (1973). Child-rearing attitudes and mother-child interaction in the first year of life. *Merrill-Palmer Quarterly*, 19, 95-106.
- Tulkin, S. R., & Kagan, J. (1972). Mother-child interaction in the first year of life. *Child Development*, 43, 31-41.
- Van Rees, S., & de Leeuw, R. (1987). *Born too early: The kangaroo method with premature babies*. Video by Stichting Lichaamstaal, Scheyvenhofweg 12, 6092 NK, Leveroy, The Netherlands.
- Von Hofsten, C. (1983). Developmental changes in the organization of pre-reaching movements. *Developmental Psychology*, 20, 378-388.
- Von Holst, E. (1936). Versuche zur Theorie der relativen Koordination. *Archives für Gesamte Physiologie*, 236, 93-121. (English translation in Gallistel, 1980).
- Von Uexküll, J. (1957). A stroll through the worlds of animals and men. In C. H. Schiller (Ed.), *Instinctive behavior*. New York: International Universities Press.
- Vygotsky, L. S. (1962). *Thought and language*. Cambridge, MA: The MIT Press.
- Vygotsky, L. S. (1967). Play and its role in the mental development of the child. *Soviet Psychology*, 5, 6-18.
- Watson J. S. (1972). Smiling, cooing and the game. *Merrill-Palmer Quarterly*, 18, 323-339.
- Wallon, H. (1928). La maladresse. *Journal de Psychologie*, 25, 61-78.
- Weinberg, M. K., & Tronick, E. Z. (1994). Beyond the face: An empirical study of infant affective configurations of facial, vocal, gestural and regulatory behaviors. *Child Development*, 65, 1503-1515.
- Weintraub, D., & Shapiro, M. (1968). The traditional family in Israel in the process of change: Crisis and continuity. *British Journal of Sociology*, 19, 284-299.
- Wertsch, J. V. (1991). *Voices of the mind: A sociocultural approach to mediated action*. Cambridge, MA: Harvard University Press.

- Whiten, A. (1990). *Natural theories of mind: Evolution, development and simulation of everyday mindreading*. Oxford: Blackwell.
- Whiting, B., & Whiting, J. (1975). *Children of six cultures: A psychocultural analysis*. Cambridge, MA: Harvard University Press.
- Wilson, A. C. (1985). The molecular basis of evolution. *Scientific American*, 253, 164-173.
- Winnicott, D. W. (1960). The theory of the parent-infant relationship. *International Journal of Psychoanalysis*, 41, 585-595.
- Wittgenstein, L. (1972). *Philosophical investigations* (Trans. G. E. M. Anscombe). Oxford: Basil Blackwell and Mott.
- Wolff, P. H. (1963). Observations on the early development of smiling. In B. M. Foss (Ed.), *The determinants of infant behavior*, (Vol. 2 pp. 113-138). London: Methuen.
- Wolke, D. (1987). Environmental and developmental neonatology. *Journal of Reproductive and Infant Psychology*, 5, 17-42.