

# “Stepping Away from the Mirror: Pride and Shame in Adventures of Companionship”

## Reflections on the Nature and Emotional Needs of Infant Intersubjectivity

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### ABSTRACT

This chapter contends that classical attachment theory and the contemporary transformation of it into a theory of maternal external regulation of the neonates physiology and emotional processes fail to grasp the importance of motives for relationships between offspring and their parents that serve shared discovery of new ways of behaving. A good human mother is more than a protector of the human infant from fear, and more than a known and secure “base” from which the infant may explore and gain experience. She, like others whom the infant may know and like, is a friend and playmate.

Infants take initiative in their learning and have rich intersubjective powers. Descriptive studies of infant communication with any persons who offer sympathetic human response show that, from the moment of birth, other processes are active besides those that seek protection and regulation of vital state. There is a mental engagement between interests and purposes and an emotional evaluation of the quality of concordant activity to discover and use experiences. Developments before language show that meaning is discovered in playful collaborative friendships, and that its discovery is motivated by pleasure in dynamically responsive company. The young child seeks a place in a community of “common sense,” not just security in attachments.

Investigation of core brain mechanisms—which coordinate and guide intentional and investigative movements, that infuse actions with emotion, that evaluate goals and discoveries aesthetically in the regulation of learning, and that signal all these motivating events to others—indicates that deep-seated emotional systems have a role in both the sharing of emotions and experiences with other individuals, and adaptive change in the growing brain and its cognitive capacities.

It is proposed that human beings have a specially adapted capacity for sympathy of brain activity that drives cultural learning. We need to understand the passions of this

capacity if we are to appreciate normal child learning, and how to recognize and alleviate the effects of deprivation, inadequate parenting, and psychopathology intrinsic to the child.

## INTRODUCTION

In the intimacy of the family and in the less intimate company of people in the community, life, for all of us, depends on mutual awareness — on intersubjectivity. We meet others as persons with intentions, consciousness, and feelings who interact with ourselves as friends or strangers. Persons may offer affection or antagonism, but their behavior is always in some sort of sympathy, never indifferent to perception of our presence.

A mirror offers a poor substitute for the living other we meet who meets us. A peculiar inversion in reflected light, its image lacks all psychological reciprocity. It cannot have sympathy. It can only show us how we move.

I offer “stepping away from the mirror” as a metaphor for a mind taking initiative in company—for a person asserting free will and independent curiosity. He or she may never be quite alone, may always be expecting to be active under real or imagined scrutiny by the attention of others, but should not wish to be dependent on their will. Infants are born with a bold self-consciousness of this kind; one that soon takes responsibility for independent acting and thinking, but that also may feel pleasure and pride in the approval of others, and shame at failure before them.

Taking initiative awakens a conscience that may bring joy or terrible regret. This is how we are able to belong in what the Italian psychiatrist Stanghellini (2001; Stanghellini and Ballerini 2002) calls “common sense,” which is governed by complex affections and a sense of moral involvement. We can seek vain gratification in a mirror, and we can check our appearance, but the image in the mirror is not free, and it gives us no part in a friendship.

Vasu Reddy (2000) showed that a two- to three-month-old infant will look away with a “coy” smile when held up to face a mirror by the mother (Figure 4.1). Reddy notes that the behavior has the same form as that which regulates other humorous displays of self-consciousness with familiar others by young infants, i.e., in contexts of social attention by people whom the infant knows and likes (Reddy 2001a, 2003). Human relationships are motivated by innate emotions of affection, or of disaffection that display and evaluate shared purposes and interests. These emotions of “attachment for companionship,” innate affective systems for testing the opportunity and value of shared activity and experience, are as important for mental health as the emotions of “attachment for care.”

Intelligence is the product of animate activity, of being interested, making “experience.” It depends upon what Panksepp (1998, 2000) identifies as “seeking” motives that prompt investigation and experiment (Table 4.1). Like other



**Figure 4.1** An 11-week-old infant shows a classic “coy” reaction when her mother holds her up to a mirror. (Reddy 2000). (Photos reproduced with permission of Dr. Vasudevi Reddy).

**Table 4.1** Motives for regulation of the well-being of the body, for engagement with objects and the physical environment, and for communication with persons are necessarily different. In combination they regulate attachments, practical activities, and cooperation in the companionship by which knowledge and skills of culture are propagated. There are different physiological systems in the brain for these functions, and they are differently represented in fields of scholarship, in technology and in social institutions.

Motives and Goals	Attachment and Care	Creative, Practical Consciousness	Companionship and Collaboration
Functions	<ul style="list-style-type: none"> <li>• Seeking or giving care, comfort and protection</li> <li>• Love</li> <li>• Sex</li> <li>• Nurturing, being nurtured</li> <li>• Therapeutic relationships</li> </ul>	<ul style="list-style-type: none"> <li>• Object cognition</li> <li>• Praxis, making things</li> <li>• Skills</li> <li>• Exploring nature and existence</li> <li>• Objective experience and knowledge</li> </ul>	<ul style="list-style-type: none"> <li>• Knowing/acting through communication, teaching/learning culture and language</li> <li>• Thinking theoretically, symbolically</li> <li>• Causing objects and actions to become meaningful.</li> </ul>
Academic and research field	Physiological and clinical psychology	S-R and learning theory, cognitive psychology	Intersubjective psychology
Application	<ul style="list-style-type: none"> <li>• Parenting</li> <li>• Nursing</li> <li>• Social work</li> <li>• Psychotherapy</li> </ul>	<ul style="list-style-type: none"> <li>• Science and Engineering.</li> <li>• Technology.</li> <li>• Artificial Intelligence</li> </ul>	<ul style="list-style-type: none"> <li>• Art and Education</li> <li>• Business</li> <li>• Politics</li> <li>• Shared knowledge and skills</li> </ul>
Affective system	<ul style="list-style-type: none"> <li>• Consummation (well-being or contentedness)</li> <li>• Mutual pleasure</li> </ul>	<ul style="list-style-type: none"> <li>• Individual action and cognition</li> <li>• Seeking (anticipation or desire incentive)</li> </ul>	<ul style="list-style-type: none"> <li>• Both social and intellectual</li> </ul>
Neurobiology	Trophotropic	Ergotropic	Integrating all systems

young mammals, infants are born with “investigative intelligence” (Wemelsfelder 1993), as well as with needs for parental care and protection of their bodies. A young child makes games with the body and with what the world and other persons offer, imagining new tricks and solutions to problems that arise from acting on objects and in communication. This kind of information-seeking “assimilatory” intelligence builds the “object schemata” that Jean Piaget (1954) discovered. However, the rationalist Piaget gave little attention to the social aspect of the infant’s search for experience.

From birth, a child’s learning depends upon sharing his or her impulsive acting and thinking with other familiar persons, who themselves are experimenters, discoverers, and communicators, eager to share what they think and do (Trevarthen 1982). It is a serious deficiency of modern cognitive psychology that this interpersonal motivation for intelligence remains on the margins of the experimental psychology of early childhood, or a “special case” of consciousness of impersonal objects. The learning of meaning, of culture in all its forms, the getting to be part of “common sense,” requires discovery in experimental or playful joint activities. What teachers call the child’s “disposition to learn” is an urge of an inventive self that wants to be recognized by others, a self who teachers discover needs collaboration and encouragement from them (Bruner 1996; Rogoff 1998; Trevarthen 2001b).

In the discussion we are having about the importance of early attachments for mental health, I want to underline the two concerns we all have known from birth: to be both free in our hopes and enterprises, and to be accepted with approval by those who experience our acting (Trevarthen 2001a). We have always known who are the most important of our acquaintances, and we care what they think of us and how they receive the independence of our minds.

It is important to attend to the intellectual aspect of Freud’s theory about the forces of emotional life and morality. I believe he, too, underestimated the innate capacity of a child to share understanding and to collaborate in intentions, and to have responsibility for them, without intellect. Thus his psychoanalytic explanation of anxieties and delusions of the self finds it simpler to attribute such failures of the spirit to lack of care and love, as if the child must have emotions molded by the responses of others to simple pleasures and pains of the self. I do not believe the infant’s ego is unaware of the “alter” as a purposeful agent who may offer joy in collaboration.

### **THE NATURE OF SYMPATHETIC COMMUNICATION OF INITIATIVES, AND THEIR EMOTIONS**

Animal agency is never just imitative, never just instructed, and never just protected. It does not just react to stimuli. There are emotionally charged negotiations of interest and purpose with every object or subject that attracts interest. Negotiations with objects, or in layout of the physical world within which we

move, need prospective awareness of the “affordances” of things (Gibson 1979). This requires anticipatory guidance of the forces of the body in movement to fit environmental information (Lee 1998). Negotiations between active subjects, between persons, depend on communication of states of vitality and consciousness between bodies, on socio-emotional affordances (Neisser 1993).

The intensity and aim of an animal’s agency is communicated by the pulse, expressive form, and orientation of movement, even in invertebrates. As bodies have evolved more complex capacities for moving in, investigating about, and using the environment, they have gained in complexity, and the adaptive strength of the consciousness of the brain-regulated “self” has grown (Merker 2003). As social beings, animal bodies have evolved sympathetic detection between subjects of the motives inherent in one another’s ways of moving (Rizzolatti et al. 2001; Trevarthen 1986a, 1997b). All social cooperation depends on this mysterious intersubjective sympathy (Trevarthen and Aitken 2001). Communication of emotions serves to increase the efficiency of cooperative action and the formation of dependable alliances in activity (Trevarthen 2004a). Impulses to move excite, not exactly “mirror” effects in the motor centers of other brains, but negotiable “sympathetic” impulses in the emotional systems of other individuals (Decety and Chaminade 2003). By this means the couple, family, group, or society gains the properties of an “organism” of higher adaptive order, the cohesion of which depends on the matching and mutually supportive emotions of its members. It depends on “sympathy.”

My principal point is that care is but one form of cooperative behavior between subjects. Sympathy, from Greek *sympatheia*, means “moving and feeling with,” in collaboration or in competition, not just solicitous concern, sensitivity, kindness, or help. Nor is it the effusion of emotion, described by the Greek word *empathia*, which is one-sided and suitable only to describe aesthetic contemplation of a passive object that is felt to inspire emotion, or, as in modern Greek, the deceitful projection onto another of malicious feelings of envy or hate. Respectful and responsive sympathy respects autonomy in its object, even when it disapproves; it is like an active form of Adam Smith’s thinking “conscience,” a “disinterested” presence that is firm in judgment about right and wrong in one’s actions, but free to be indulgent, affectionate, and understanding (Smith 1759).

### **MOTIVES FOR COMPANIONSHIP IN THE EMOTIONS OF LEARNING**

In my observations of the spontaneous communication of purposes, interests, and experiences of discovery between infants and their mothers or fathers, I see powerful innate motives and emotions on both sides that promote the shared pleasures and sometimes tough negotiations of friendship (Figure 4.2). These require more than just “rhythms of approach and withdrawal” (Winnicott 1960). A pleasure in discovering more than one mind can conceive, seeking and finding



**Figure 4.2** (A) At three months, Laura is a source of pleasure and pride to her family. Here we observe three degrees of intimacy in her presence: her mother seeks protoconversation, her three-year-old sister wishes to be part of the game, and her father sits at a distance but is clearly admiring. On the right, Laura smiles and coos while “chatting” with her mother in the laboratory at the University of Edinburgh (photos by Colwyn Trevarthen). (B) Leanne is very curious about her mirror image at five months. At four months she tried to catch a ball presented by her mother, and enjoyed a musical game while her mother held her hands (photos by Colwyn Trevarthen).

approval for an original act or idea, is essential, and it grows rapidly with shared experiences in the life history of the relationship.

From birth to the beginning of language the child makes expressive moves to have adventures and ideas with known companions, to express impulses of thought that gain in meaning by being shared (Stern 2000; Trevarthen 1998, 2003). Memories and ideas are built in communication, in increasingly rich narratives of imaginative “mimesis” (Donald 2001). These intrinsically prompted developments have profound effects on the behavior of an affectionate, firmly “attached” parent, binding him or her to the life experience of the child. The child “educates” the adult how to discover meanings that make sense, and joy, for both of them.

It is increasingly realized that in effective psychotherapy a process has to be set in motion that is close to the dynamic relationship of mutual affection and trust that grows between a parent and child (Schorer 2003a). When there is pain and suffering, there is need for compassion, supportive affection, and comfort. When there is the beginning of hope, there is need for praise and reflected pleasure, for fun and collaboration in a confident friendship.

Finally, a word has to be said about education and how it compares with therapy or “treatment,” because I believe we have the same need to re-conceive the fundamental needs of children and their teachers for *collaborative learning* (Rogoff 1998; Trevarthen 2004c). It may be convenient for the management of a

complex industrial society to plan education as a construction of skills according to curricular formulae that are “quality tested” at each prescribed stage. This is an artificial cultivation of the natural process by which children need to master cultural knowledge and for which adults give natural encouragement. The “intent participation” of the child in mastery of meaning with known and liked teachers must be respected (Rogoff et al. 2003).

### **THE ACHIEVEMENT AND LIMITS OF ATTACHMENT THEORY**

The clinical observations of infants’ and toddlers’ distress after separation from parental care that led John Bowlby to his attachment theory required child psychiatrists and social workers to conceive more clearly what infants need from their mothers, and to change professional practices where these needs had been disregarded. It opened the way for a more coherent biological theory of how the emotions of the infant are open to maternal care (Bowlby 1988). Bowlby defined a form of emotional involvement that protects the young child in intimacy with a sensitive caregiver, and that leads to a kind of grieving when a parent’s presence is lost. Approach behaviors of the child, and “imprinting” on the stimulations from parents (from eye contact, smiles, vocal signals of affection, body contact), became comprehensible as essential biological foundations for human relationships, and for the building of representations (working models) of a parent as a source of emotional strength and security.

The experimental investigations of Ainsworth (Ainsworth and Bell 1970) proved that different qualities of attachment between one-year-old children and their mothers could be rigorously identified, by recording the behavior of the child on reunion with the mother after a stressful separation. Main, who was also the first to draw attention to the fact that a child may actively distance itself from a parent (Main and Weston 1982), made the important discovery that the quality of a mother’s relationship to her toddler could be correlated not only with a later stage of that relationship, and the child’s social functioning, but also with the mother’s thoughts and memories about her own childhood (Main and Goldman 1984). Thus a transgenerational transmission of emotional security in relationships, or of how these relationships are represented in person’s minds, was demonstrated.

With advances in brain science, and especially in the understanding of emotional systems and their role in regulation not only of bodily well-being, but also of cognition and learning (Damasio 1999; Freeman 1999), the fundamental importance of subconsciously mediated affections in support of the development of a child’s strong and confident self has become evident (Damasio 1999; Schore 1994, 2003b). Protection from the damaging effects of stress on the vulnerable infant brain can be demonstrated as one of the main benefits of close and consistent maternal contact and responsive care.

However, preoccupation with the support and protection a parent must give for the healthy development of a child's neurohumoral processes of alertness, stress-reduction, and energy recuperation does not address the more creative and positive needs of a human child who is motivated to explore meanings of experience in play with companions. Attachment theory, in its classical form, and especially in the form that has been tested experimentally with animals and through statistical analysis of socio-emotional developments in populations of children with different qualities and quantities of maternal care, does not explain the drive of young humans to invent new ways of behaving or thinking, and to discover new things to be interested in, and then to seek confirmation, praise, and practical cooperation from the minds of others. Though being given love, ease and food for living is necessary and good, affectionate human company, even for a very young infant, offers more than provision of comfort and sustenance. A "secure base" is not an appropriate metaphor for the "intuitive parenting" of a mentor or companion in play and learning (Papousek and Papousek 1987). We must also consider the biological foundations for imagination and thinking that makes a child's experience meaningful by giving it values and uses that other people have found to be important. We must comprehend the adaptive needs of human common sense, and the cruel suffering with diminished vitality that can be the effect of exclusion from meaning, whatever its cause.

Attachment theory has often been criticized for paying exclusive attention to maternal care. A mother has a unique importance for the nurturance of a newborn infant, and her loving presence gains a special power from its intimacy, which can remain as a lifeline for the child and for the adult, he or she becomes. No young child thrives without affectionate "mothering" from someone who cares consistently. However, the infant's pleasure in companionship and discovery can be shared with any playful partner, of any age, even a peer, and with more than one other (Belsky 1981; Fivaz-Depeursinge and Corboz-Wanery 1999). This point is forcefully presented by Selby and Bradley (2003) in a study of negotiations of mutual interest and emotion between infants communicating in triads, without any adult help. Human *sociability* innately seeks to build meaning by sharing the narratives implicit in adventurous activity, and by playing with ways of acting and experiencing. It is adapted to support exploration of life in a community that eventually extends over many generations, not just in parent-child dyads. The process of discovery in development of the imagination is best motivated in symmetric, or at least mutually valued, relationships where initiatives are exchanged between different identified persons and where stories with conventional meanings can be built. In addition, most loving mothers immediately become playmates and "best friends" as well as caregivers to the infants.

It is perhaps a product of social organization and planning in industrial societies, and a reaction to the abuses of child labor as Rogoff et al. (2003) indicate,

that mothers are seen as protectors or keepers of their infants, who may or may not be substituted by sufficiently sensitive surrogates, and teachers are seen as instructors, neither being understood as available friends and collaborators who benefit from the infant's or child's instinctive companionship and playfulness. The psychology we have created to support our society and measure its effects on individuals is one that attempts to assess the mental success of each person separately. We have come to think of ourselves as communicating just information about what each of us perceives is real and practical. Inevitably our conceptions of sympathetic and intuitive mental life have become over-cognitive and impoverished in emotional and imaginative aspects. Freud made a powerful effort to redress this imbalance, but left the unconscious mind at the mercy of language, the vehicle of clear thought. He did not have full confidence in the intuitive communication of purposes and concerns by nonverbal means. Like Piaget, he did not investigate how the process of communication begins in infancy (Bradley 1989).

### **CULTURAL LEARNING REQUIRES COLLECTIVE IMAGINING, CONSTANTLY INVENTED**

Social animals communicate sensitively their immediate interests and impulses to action, and their young are playfully inventive in their movements. Play and humor, which may have a specific emotional/motive system in the brain, is obviously an adaptation for communicating motive impulses through exaggeration of movements, including movements to make contact with other individuals (Bekoff and Byers 1998; Panksepp and Burgdorf 2003). In more restrained form, "play" movements may have a "serious" function for the individual or in interaction. Their messages are "meta-communicative," emphasizing why something is done by doing it more than is necessary (Bateson 1956). Adult humans play with the discoveries of the young and continue to be playful, in varying degrees and with different goals, through adult life, in ways no ape can match. Adult mammals are not often playful, though the young, especially those of socially cooperative species, are.

Monkeys and apes are highly sensitive of one another's moods and attentions, and apes learn skillful techniques of foraging by emulating the effects of what their companions do. They can take up strategies that engage with or outwit the inferred intentions of others in the social group. Human behavior is different in fundamental ways (Tomasello 1999). It displays a capacity for reflective thinking or the imaginative reconstruction of actions, events, and objects in a narrative history that extends into an imagined future with new events (Donald 2001). It also depends on the picking up of entirely novel knowledge and skill accumulated by transgenerational transmission of meanings.

Human cultural learning requires the young to have deep insight into the thinking behind the moves that elders make, and into the expressions of

approval or disapproval that signal the value of experiences. The young learn an historically established cosmology and the meanings of behaviors and objects that have been invented and created among persons who were intensely aware of one another's interests and purposes. Interests that are discoveries of new ideas and ways of acting are especially attractive to human minds, even to those that are very young and inexperienced. This curiosity for meaning has innate motivation, and it needs an exceptional emotional sensitivity that goes far beyond the expression of immediate bodily needs (Trevarthen 1979b, 1982, 1988). The process can build in comfort, confidence, and confiding in a loving family and community, or it can fall prey to fear and distress, loneliness, and self-doubt. This is why infants crave the consistent sensitive company of an affectionate parent or other person who can be trusted to sustain the shared memories that have been discovered in their company.

Human knowledge is passed on by persons expressing to one another their dynamic inner state as well as their cognitive engagement with the "facts" of objective experience in a shared external world. Convergent relations of subjects with objects (overlapping "object concepts") are controlled by *joint attention*, mostly made evident by orientations of organs of perception or prehension, and may lead to shared practical actions or collaborations (Butterworth 1991; Scaife and Bruner 1975; Tomasello 1988). Interpenetrations of states of motivation depend upon *mutual attention*, the sympathetic mimicry of affects that signal internal states and their changes and that govern both affectionate play and moral relationships as well as attachments (Reddy 2001b, 2003).

All such intersubjective coordination of actions or states of motivation between animals require *sympathetic mirroring of the dimensions of movement* as well as physiognomic recognition of similarities or congruencies of body form between perceiver and perceived (Trevarthen 2004a). Matching rhythm or pulse of movement offers a powerful correspondence by which minds states may be coupled and "march in step," but they are complemented by affect signaling gestural contours the accelerations of which are a standardized measure of power in motivation (Trevarthen 1999). Daniel Stern (1993, 1999) describes the delicate matching of expression between a mother and her infant as "attunement" of "vitality contours," which terms convey well the essential "musicality" of this signaling through modulations of the intensity of movement. Mechthild Papousek (1996) has also described the essential musicality of intuitive parenting communication.

## THE ART AND EMOTION OF CULTURAL LEARNING

Victor Turner (1974) explains the community-building function of drama as "the human seriousness of play." John Blacking (1971/1995, p. 31) accounted for the universal place of music in human society as follows: "The function of music is to enhance in some way the quality of individual experience and human

relationships; its structures are reflections of patterns of human relations, and the value of a piece of music is inseparable from its value as an expression of human experience.” The celebration of rituals in drama music and dance gives support for social identities of individuals, and promotes solidarity in the group.

Art is, as Ellen Dissanayake (2000) says, the product of human intimacy and that explains why it can be a source of solace for a troubled human spirit. These are the factors of communication by nonverbal means that make improvisation of music with a trained therapist such an effective means of bringing order into confused feelings and harmony in relationships (Pavlicevic 1997). All human cultural achievements arise in the intimacy of shared meaning, even when they appear to be lonely products of dreaming. Thoughts, imagining experiences generated by actions, gain value through sharing their originality and “truthfulness” with others, who judge their value and “significance.” Human effort is directed to build relationships through cooperative and inventive works.

A cognitive information processing, perception categorizing, memorizing approach to human cumulative intelligence is unable to comprehend its social motivation or its intersubjective psychological foundations in evolution. The theory of cognitive modules in separate heads contrasts with a psychobiological theory of culture as a product of human intentions to make and understand in relationships and communities (Donald 2001). Cultural learning is not just a cognitive achievement of the human mind. It is a new development in animal social initiative, and in ways of relating intelligently. There are many features of the human body and brain that are developed to enable this unique level of cooperative awareness.

### **ADAPTATIONS OF THE HUMAN BODY AND BRAIN FOR COMPANIONSHIP IN EXPERIENCE**

Human beings sense one another in unique ways by all modalities. Mammals take note of one another’s eyes and regulate intimacy by shifts of looking. Only humans, with white sclera, depend upon accurate registration of other’s changes of gaze to coordinate conscious awareness of shared surroundings and to receive information of others’ emotional evaluation of objects, and their thinking moments of vacantly gazing reverie. Human eyes are adapted for communication of states of thinking (Kobayashi and Kohshima 2001). Loss of understanding for what another’s eyes are signaling is one symptom of autism in a child. We need to know where other persons are looking to keep track of their thoughts and to detect the values they give to what they see, or imagine or remember seeing. Eye movements not only signal what a person is looking at in the present. They also convey evidence of the introspective retrieval from experience that Merlin Donald (2001) names “autocuing.”

Only humans have this monitoring of momentary shifts of gaze, which serves an intersubjectivity, face to face, capable of detecting shifts of thought and

feeling even when they indicate experiences of events of another time and place and with arbitrary meaning. The blind pick up intersubjective information from sounds of others' movements, from touch (the feel of hands reaching, grasping, and gesturing), and especially from changes in the direction and expression of the voice, or from reproductions of the vitality of the human spirit in music (Tønsgberg and Hauge 1996). The fact that a blind person can compensate with these other senses for the information about activity of the mind that is signaled by intelligent eye movements proves that, however specialized human eyes are as organs of communication, it is the thinking and feeling of the intentional self behind the looks that is the sought for message.

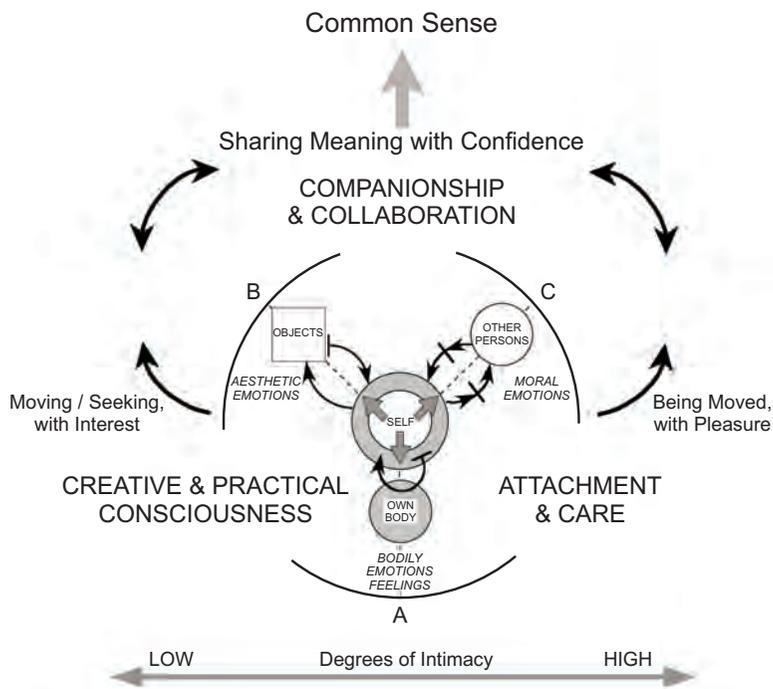
Human hands are also uniquely adapted in their form and movements to transmit intentions and feelings, and they do so from birth (Trevarthen 1986b). The hands of infants are communicative before they are effective organs of manipulation, and they express subtle changes in alertness, directions of interest, and confident or hesitant purposes. Their movements can be cultivated as organs of sign languages as competent as speech by voice, and the intuitive expression of metaphoric ideas by hand gestures is unequaled by the voice (Goldin-Meadow and McNeill 1999). They can mimic expressions of the voice and the rhythms of body movement in mime, in dance, with musical instruments, and in graphical art.

Speech and song turn the rhythms and accents of the mind into events that can bridge space between distant human bodies. The versatility of human vocalization for expressions of feelings is exceptional (Scherer 1986; Zei Pollermann 2002), and sustained phonation by the uniquely adapted human respiratory mechanism makes it possible for rapid and infinitely varied time-controlled sequences of articulation by lips and tongue in speech (MacNeilage 1999).

By all these extraordinary means of expression, human subjects exchange their thoughts in making and announce rich evaluations of their hopes and fears concerning every detail of the narrative. Human relationships require sensitivity for these hopes and fears, and support for adventures in thought that can only be brought to fruition by close and sustained cooperation in confirmed relationships.

## THE CIRCLE OF ATTACHMENTS

Minds active in awareness and the pursuit of experience undertake initiatives of three kinds: with the *body and its states*, with *physical objects and events*, and with *other subjects and their behavior*. These three kinds of purpose differ in their movements, senses, and emotions (Trevarthen 1993). The first is *interoceptive* and *proprioceptive*, monitoring the state of the body and the potential energy costs of acting, and regulating physiological processes with visceral muscle activity, breathing, and the pulses of the heart, skeletal muscle tonus of the whole body, and many means of chemical self-regulation and bodily defense



**Figure 4.3** The “circle of attachments” to objects, to one’s own body, and to other persons, and the different motive functions required for Attachment in Care, for Creative and Practical (Objective) Intelligence, and for Companionship and Collaboration with other persons, in “intersubjectivity.”

that implicate the neurohumoral and immune systems. The second requires pragmatic, realistic intelligence, and *exteroceptive* awareness of place and situation, anticipation of events, object concepts and the like. The third requires volitional and emotional sympathy with other persons and their minds; by direct *alteroceptive* perception that is not reducible to “social cognition” and that does not require a declarative “theory of mind” (Figure 4.3 and Table 4.1).

A person can act voluntarily toward the world outside the body in two ways, with very different expectations. They can anticipate what will happen when they move about or when they act upon an object, or they can look and listen to what will happen from communicating with another person. They will have different emotions in anticipation in these two kinds of experience, and they will also evaluate their progress differently. The emotions that appraise objects empathically can be called “aesthetic,” and those that engage with the potentialities for purposeful and self-regulated consciousness of other subjects are “moral.” The third kind of emotional regulation concerned with internal states and feelings of the subject’s body, which is sensed without reference to an outside reality, also has importance for relationships with other persons. “

Autonomic” emotions of well-being or distress require sympathetic responses from others, who may feel they want to share, assist, exploit, or avoid what another is feeling in their body. There are differences between the anticipatory and regulatory functions of emotion when a subject is acting in these three different ways, with different expectations and different goals.

However, this is just a first step in analyzing how emotions regulate an individual’s experience and their position in relation to the world and in society. Initiatives of the three kinds — to gain protection for internal well-being, to move actively about in and use the external physical world, and to communicate with other independently motivated subjects — all work in combination. Emotional expressions of the body, and especially the hands, eyes, face, and voice, appear to be concerned with integrating across these three facets of the active self. The affective domains of purposeful psychological activity may be distinguished as Cognition, Attachment, and Companionship (Figure 4.3 and Table 4.1). Each of these mediates in transitions between two of the three facets of brain output concerned with things, persons, and the subject’s body. Thus emotions signify transitional equilibria in the whole subject’s changing motives and the accompanying internal autonomic processes, and in the expression of outwardly directed actions and interests that the motives are generating. They define three realms of psychological life: respectively, these integrate bodily self-regulation with “cognitive and practical action” on physical reality, “attachment” to persons that offer care and comfort to the body, and “companionship” with partners in experience and purposes.

In thriving relationships, all three of the modes of regulating experience by body activity — for places and things, for care for the self and others in the body, and for relationships of trust and cooperation with other persons — operate together, expressing the emotions that evaluate all prospects of success or frustration in initiatives of living. A comprehensive conception of emotional health and the building of a personal narrative that has confidence in understanding the world and communicating its meaning with other persons requires a single dynamic circle of motives and emotions.

### **DEVELOPMENTS OF COOPERATIVE INITIATIVES IN BEFORE LANGUAGE**

The function of innate human initiative is neatly defined in a recent publication by Nagy and Molnar (2003). It is worth quoting the whole of the authors’ abstract to summarize their discovery:

“Searching for the mechanism of neonatal imitation resulted in the discovery of neonatal initiative capacity, here called “provocation.” Newborns spontaneously produced previously imitated gestures while waiting for the experimenter’s response. A psychophysiological analysis revealed that *imitation* was accompanied

by heart rate increase while gesture *initiation* was accompanied by heart rate deceleration, suggesting different underlying mechanisms. Results imply that infants are not only capable of responding to a model movement by imitating, but that they also have the capacity to provoke an imitative response, thus sustaining an interaction. These findings may constitute a laboratory demonstration of the first dialogue and, according to our hypothetical model, they represent how human imprinting begins.”

[Emphasis added; “initiation” leads to “provocation” in communicative exchange.]

If this is how human imprinting begins immediately after birth, human attachment is perhaps first to a *conversational partner* who reciprocates motive states, not to a caregiver (Figure 4.4). Moreover this research shows that neonatal imitation is not just the affirmation of likeness of brain and body actions — it is an intersubjective invitation as well (Kugiumutzakis 1999; Trevarthen et al. 1999). Newborn infants show themselves sociable persons with minds of their own. The needs for sociability, even for a newborn, go beyond a seeking for regulation, care, protection, stress-regulation, etc., that the internal body needs. Bodies are active mind-driven agencies; there is also a need for support of interests or “purposes and concerns” (Donaldson 1992).

Infants certainly begin life with a well-functioning awareness of the sounds of another person’s feelings in the voice, especially for that uniquely known other person, the mother, whose voice has familiar and preferred qualities learned before birth. There is no visual life before birth, but interest in a caregiver’s face and eyes begins immediately and develops rapidly. In a few weeks a baby is watching the other’s eyes with clear focus and reacting to their direct regard. A few months later the shifts of gaze of another occupied in seeking and acting can be followed easily. The mother is likely to be the principal and most effective caregiver for a young baby as well as the first companion, but soon she is not the only companion as others can share the infant’s expressions of interest and anticipation (Figure 4.2).

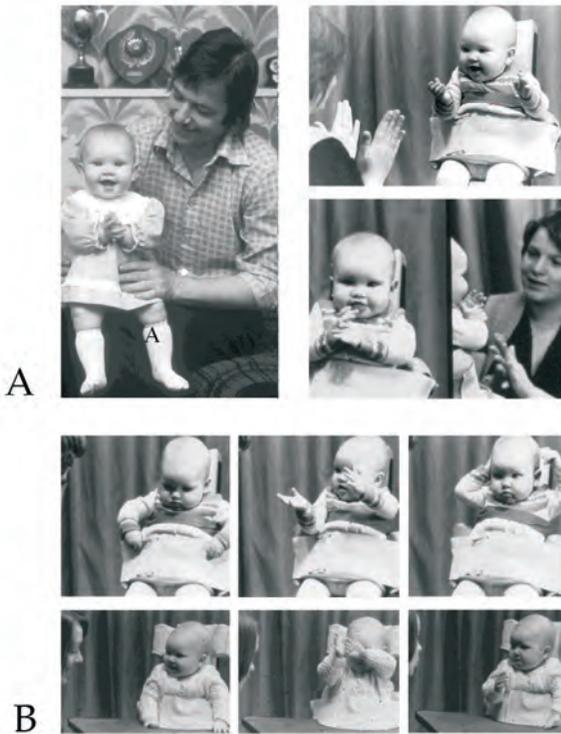
Description of the behaviors of infants from birth and of changes at different ages shows steps by which human motivation seeks and learns meaningful ideas



**Figure 4.4** A newborn infant, a few days old, imitates a gesture made by two fingers. An attachment round the infant’s chest records heart rate. (Photos by Dr. Emese Nagy in Szaged, Hungary)

and ways of acting (Trevarthen and Aitken 2003). An infant's motives change his or her relationship with those persons who seek to communicate with the baby and who are ready to share the baby's experiences. There are both advances and vulnerable times. Each phase is characterized by particular initiatives and emotional responses in interaction with other persons, and in exploration and exploitation of places and objects. Infants develop increasingly adventurous initiatives, making more vigorous use of their growing bodies, seeking to explore and to form concepts of objects, negotiating purposes and the tempo of experience with others (Figures 4.2 and 4.5).

The developments in expressive body signs before speech — from protoconversations of “primary intersubjectivity” with two-month-olds



**Figure 4.5** (A) Emma, six months, on the father's knee at home, is proud to show “clap-a-clap-a-handies” when prompted by her mother. She responds eagerly to imitate her mother in the laboratory at the University of Edinburgh [Colin: Please verify] and smiles to her image in the mirror of the camera window as she claps. (B) Emma, at the same age, is unhappy in the company of strangers and shows clear expressions of embarrassment or shame as she reacts to their attempts to communicate, in the laboratory. She tries to show hand clapping, but the message fails. The woman in the bottom row of pictures, who first approaches timidly, expresses sympathetic expressions as Emma starts to cry. (Photos by Colwyn Trevarthen, University of Edinburgh).

(Trevarthen 1979a), through games of the person and person–person–object games in the middle of the first year, to “secondary intersubjectivity” or “cooperative awareness” and protolanguage at the end of the first year (Trevarthen and Hubley 1978) — show that communication of intentions, experiences, and feelings is the foundation on which the precise references and recollections of language are built (Trevarthen and Aitken 2001).

The coordination, in all modalities of sense at once, of a total awareness of the moving body of the self and of the movements made by other persons can be understood once it is observed that there are common temporal and energetic features of movement that inform all senses *in one time* (Trevarthen 1999). Research on the temporal foundations of expression and the development of narratives of expression has been advanced by musical acoustic analysis of vocal interactions between mothers and infants, and concurrent analysis of body gestures made as signals to be seen, felt or heard. Malloch’s theory of communicative musicality (Malloch 1999) gives a basis for understanding the innate dynamics of action and thinking and the sympathetic transmission of mental events between subjects. Infants are proved to be well equipped with the same sense of time in body action as that offered to them by adults.

### THE MIRROR AS STRANGE PARTNER AND TEST OF SELF-EXPRESSION

Symptoms of the key changes in motives for engagement may be seen in the different ways babies behave when in front of the unnatural stimulation of a mirror, which reflects a visible face and body that moves with them in a strange way. An infant looking into a mirror does not find communication. There can be no “co-conscious” interaction with “coordinated interpersonal timing” and none of the contingency of emotional reaction that characterizes a protoconversation or game with a real other person. His or her reaction to the teasing immediacy of the image’s movements and expressions is to stare, then look away or to look “inward” to think or imagine (Trevarthen 1990, 2004c). Turning away from a reflection of the eye of the self, the “pupil” escapes.

At two months, the baby appears to sense the mirror image as intrusive and looks with fascinated surprise, then turns shyly away with a coy expression (Reddy 2003). At four to five months an infant can see the mirror self at a distance, across a room, and may stare as if fascinated, becoming lost and detached, or “reflective” in “contemplation” (Figure 4.2). At six to eight months the mirror self becomes a teasing playmate to be challenged, mocked with clownish expressions, made fun of (Trevarthen 1990). By one year, the baby uses meta-communicative ways of expression to play with the image, recalling rivalries or jokes, showing favorite “tricks” with exaggerated “pride,” or a timidity and “shame” (Reddy 2001a). We have found interesting differences in these

reactions between boys and girls, indicating that in the first year, sex differences in sociability are well established (Trevarthen et al. 1999).

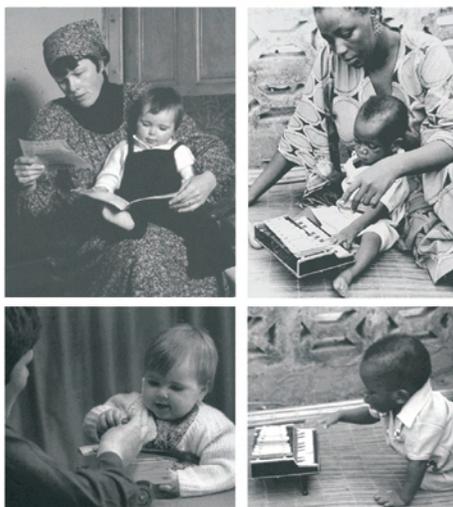
Toddlers may use a mirror as a stimulus to play but they never seem confused and to treat the image as a real companion. Developments in play and conversation with imaginary friends are more lively and real than the interactions with a mirror. When the child passes the Gallup test of “grooming” the self by removing a spot of rouge on the face (Gallup and Suarez 1986), this is but a special interest in the body that does not really test “self-awareness” as this is important in communication with other “selves.” Likewise the demonstrations of “shame” at being seen naked, which are seen in children even later than two, and the attainment of verbal skill in talking about thinking in one’s own head or by others by a three- or four-year-old must be behaviors that depend upon social learning (Lewis 1995). I do not accept that they are *beginnings* of a sense of self or of the capacity to feel moral emotions. Reddy argues that they are continuous with manifestations of self-consciousness in babies early in the first year (Reddy 2001c). It appears as if “complex basic emotions” of relating develop elaborately in infancy (Draghi-Lorenz et al. 2000).

One-year-olds have not discovered that others have minds or “subjectivity.” They have found new interest in sharing goals and purposes, probably because their own “seeking” has become systematic, better remembered, more precisely and constructively motivated. This “attracts” the interests of others and active purposefulness, changing the ways they address and respond to the infant (Figure 4.6).

A theory of mind is redundant to subconscious sympathy of motives and feelings. We no more need it than we need a theory of grammar to have a conversation. The intuitive subconscious collaboration of motives is clearly brought to light by a musical acoustic study of protoconversations that records the vocal gestural and facial moves (Malloch 1999; Trevarthen 1999).

The eagerness with which a toddler turns to a companion to share creations is surely more than an exploration *away from* a secure base. The evaluation of the other is necessary for an act to have any meaning. It is also important for the maker of meaning to defend his or her autonomy in finding things out or creating novelties. That is why there is so much discussion when toddlers are enjoying imaginative play, and when parents join in such play by becoming themselves challenging and self-conscious performers in the narrative of fantasies.

Research on the development of communication and cooperation in infancy indicates a different way of conceiving human teaching and learning and the propagation of cultural knowledge (Trevarthen 1988). It leads to surprising conclusions about the relationship between cultural learning, the form and movement of the human body, and the anatomical peculiarities of the human brain. The rich and rapidly developing sociability of infants and toddlers indicates that this brain has evolved for sharing knowledge and skill. The essential motivating and emotional systems are laid down long before birth as generators preparing



**Figure 4.6** Left: In Scotland, Basilie (one year old) reads her book while her mother reads a letter (photo by John and Penelope Hubley). She enjoys cooperating in a task when her mother asks her to take a wooden doll and put it in the toy truck (photo by Colwyn Trevarthen). Right: In Lagos, Nigeria, Adegbenro (also one year old) shares his piano with his mother and happily “sings” and plays (photos by John and Penelope Hubley).

the capacity of a human being for initiative in acting and experiencing, and for intersubjective communication.

### INTRINSIC SYSTEMS OF THE BRAIN FOR MOTIVATING ATTACHMENTS AND FRIENDSHIP IN LEARNING

A most startling discovery of functional brain imaging in the last few years has been how much human brain tissue is given over to activity in support of expressing oneself to and being aware of other human bodies and their expressions (Adolphs 2003). Large territories of the frontal and parieto-temporal cortex are implicated in the simple sympathy of a conversation, with its gestures, vocalizations, and facial expressions (Adolphs et al. 2003; Decety and Chaminade 2003). These neocortical components of emotional and emotive systems have effective functional organization very early in infancy, if not from before birth (Tzourio-Mazoyer et al. 2002). Penfield’s “homunculus” in the sensorimotor strip is largest for the organs of communication: face, hands, and vocal apparatus. These organs have evolved their emotion-communicating function from autonomic or visceral self-regulatory actions that are activated from the brainstem nuclei of the cranial nerves (Porges 1997). The parietal visual areas interconnected with the frontal eye fields are a great animator of a selective intelligence

that also communicates. Emotion in the face and voice figure large in the paralimbic neocortex, especially of the right hemisphere (Schoore 2003a, b). All the neocortical regions found to be implicated in intersubjective awareness and communication are intensely and reciprocally interconnected with subcortical motive systems. We are discovering a new map of cortical functions, one that represents the functions of neural systems, both cortical and subcortical, that are designed to sustain our special awareness of one another, and of one another's thoughts (Figure 4.7).

The Intrinsic Motive Formation (IMF) of the subcortical brain (Trevarthen and Aitken 1994) can be identified with many essential integrative functions of the conscious subject:

- as initiator — the body moves first, senses later;
- as regulator of well-being in the body;
- as communicator of motives, by movements of attentive organs;
- as regulator of cognitive growth, by influencing the morphogenesis of neocortical circuits.

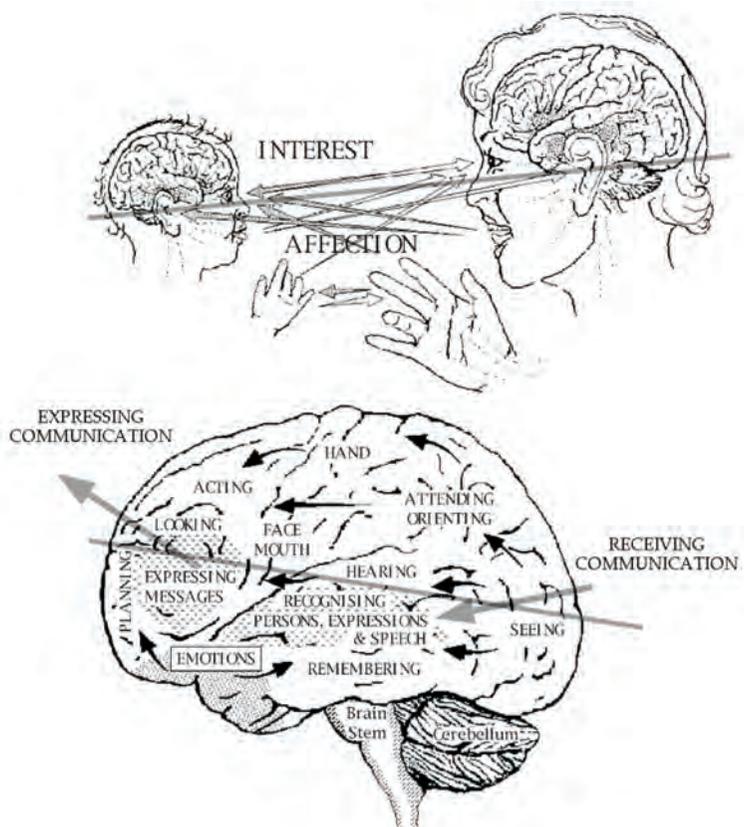
After birth, the intrinsic motives guide the development and learning of the child's brain, as acceptor of ideas and thoughts and as a cultural pupil (Trevarthen 2001a, b).

Information on brain activity in intersubjective engagements prompts a number of startling conclusions (startling for the rationalistic reduction of the cognitive psychology of individuals as sensorimotor systems with memories):

- Our brains make our minds ready to move our bodies in sympathetic ways when we see, hear, or feel the bodies of others move.
- Emotions are active states of agency in others' minds from their expressions and they are reflected in activity of a perceiver's brain.
- Purposeful activities, even executive ones, are adventures with emotional and emotive drama, not just problem-solving strategies or algorithms.
- The brain "feels" emotions in the preparation for moving, anticipating the feeling of effects of movements, not in sensory evidence of the body.

## **REGULATION OF BRAIN DEVELOPMENT AND MIND GROWTH: HOW NEURONS FORM FUNCTIONAL SYSTEMS OF COMMUNICATION**

Early brain development is a self-regulated process that prepares functional systems that will engage with the body and the outside world (Trevarthen 1985, 2001b, 2004b; Trevarthen and Aitken 1994). Cells in the developing embryo brain and spinal cord gain affinities for molecules on the surface of glia cells and on other neurons. These direct cell migration as well as the paths that axons and dendrites follow in the late embryo (weeks 5 and 6). Neuroblasts divide around the ventricle of the neural tube, migrate out along radial glia fibers, and form



**Figure 4.7** Mother and infant share expressions of interest and affection with pleasure in protoconversation. The human brain shows large territories of the cerebral cortex devoted to the functions of communication. These areas, which are functional from birth, are motivated and stimulated by inputs from subcortical centres (Trevvarthen 2004b).

layered arrangements in the hippocampus, cerebral cortex, and cerebellum. The tips of axons and dendrites are guided by “growth cones,” sensorimotor structures that explore the intercellular terrain, sensing different molecular environments and laying down the path of the nerve cell extension. Finally, nerve terminals form intricate arrays of synaptic contacts on other nerve cells, with hundreds of contacts per cell. The formation and maintenance of effective synapses is affected by the excitations received from other neurons, and by growth factors and steroid hormones produced by endocrine glands. Building of brain systems involves enormous programmed loss of elements, sculpting functional systems, survival of nerve cells depending on genes that promote or inhibit cell death, and on protein growth factors.

Psychological functions of the mature brain depend on “activity-dependent patterning” or “plasticity” of synapses, shaped by stimuli from the world and from the body. The brain is most “plastic” in early childhood; even in the fetus, electrical impulse traffic triggered by excitation of receptors modifies the structures formed by spontaneous developmental processes. Nevertheless, the brain is at no stage a passive receiver of stimulus input, and major structural responses to epigenetic factors or the environment are regulated to occur at certain ages in critical periods.

In the mid-embryo stage (week 4), the nervous system is electrically inactive. The first generalized movements occur in week 8, but already in week 5 monoamine transmission pathways grow from the brainstem into the primordial cerebral hemispheres. Key components of the emotional motor system (hypothalamus, basal ganglia, and amygdala) are in place when the neocortex is unformed (Holstege et al. 1996). By the end of the second month the main components of the brain are in place; eyes, vestibular canals and cochlear, hands, nose, and mouth are rapidly differentiating their distinctive forms, each dedicated to the picking up of a particular form of physical information from the environment. Core regulatory mechanisms of the central nervous system — the periaqueductal grey of the midbrain, the hypothalamus, reticular formation, basal ganglia, and limbic system — are laid down in the first trimester, but the cognitive systems of the cerebral cortex do not appear until the second trimester. The motivating and life-maintaining structures form a link between regulation of gene instructions in prenatal brain morphogenesis and the acquired adaptations of the developing mind. Defects in this link are implicated in disorders of empathy and cognition, including autism and schizophrenia (Aitken and Trevarthen 1997; Trevarthen and Aitken 1994).

The neocortex and cerebellum make their first steps of anatomical differentiation in the fetus, and these steps are guided by the subcortex. Brainstem monoaminergic neurons penetrate the cortical plate at 13 weeks, before sensory thalamic axons arrive. Thus neural motive regulators of cortical activity mature ahead of those that are destined to bring in environmental information. At the mid-fetal stage (week 24) dopamine axons, important in coordination of innate motor patterns, are concentrated in the deep parts of the cortex, at the time when thalamic sensory afferents end their waiting to make their entry. Earlier formed, deeper neuron layers in the cortex linked with limbic structures mediate in the development of cognitive structures, which take inputs from sensory and cortico-cortical connections.

Research on the behavior, psychology, and physiology of the fetus indicates that in the last trimester functions are established in anticipation of an active postnatal life, and especially for assimilating maternal care (Lecanuet et al. 1995; Trevarthen 1997a). It is of particular interest that heart rate changes are integrated with phases of motor activity from 24 weeks. This is indicative of the formation of a prospective control of autonomic state coupled to readiness for

muscular activity on the environment, a feature of brain function, which Jeannerod (1994) has cited as evidence for the formation of cerebral “motor images” underlying conscious awareness and purposeful movement.

The neurochemistry of the motor initiative that generates and explores experience (i.e., of *ergotrophic* motives) is complemented by more internally active movements that are adapted to maintain physiological well-being (the *trophotropic* motives) (Table 4.1). The former system operates particularly with the biogenic amines dopamine and noradrenalin; the latter invokes activity of a range of agents that include glutamate, neuropeptides, steroids, oxytocin, and others (Hess 1954; Luciana 2001; Panksepp 1998).

The link between expressive movements and reception of expressions, on the one hand, and core regulation of mind and behavior in the brain — and of brain systems and functions in development — identifies the mechanism that motivates communication of mental states between a child and others. This is the psychobiological system of cultural learning (Trevarthen 2004a).

## CONCLUSIONS: HUMAN MOTIVES AND THEIR DISCONTENTS

I believe we have found a new set of conceptions regarding the evolutionary origins of human motivation and emotions — one that goes beyond concerns with organic well-being, regulation of arousal, and reduction of stress. I conclude that mental health issues must take into account the powerful motives of companionship in experience as we seek to understand the causes of severe failure of motivations and self-esteem that affect increasing numbers of young human beings in a world given over to the creation of material novelty without concern for the social relationships that make productivity of human effort meaningful.

In every human relationship, the pleasure of active discovery and the mastery of experience and skill are regulated by interpersonal or moral feelings. As long as essential needs are provided for and the child is not distressed, sick, or exhausted, these feelings are asserted powerfully in every young child. They guide the growth of experience, and they do so by emotional regulation of the growth of the brain. They are manifested out of control in disorders of mania and depression.

I believe that the intensely shared pleasure of pride in knowledge and skill that others applaud as well as the feeling of shame in failure that threatens loss of relationship and hopeless isolation, are as important to the mental health of every human being as the emotions that seek comfort and care for the body (Figure 4.5). Indeed, I would suggest that attachment itself, if it is a friendship and not just the very asymmetric relationship between a weak and immature “patient” and sensitive caregiver, is animated by emotions of shared discovery and the creation of inventive art. Even authoritative teaching requires a minimal mutual respect, or its purpose is totally defeated. I suggest we need a “circle of

attachments” (Figure 4.3) — of emotionally charged relationships to care- and comfort-givers, to places and things that foster our discoveries and activities, and to friends and companions in adventure, discovery, and invention, persons who share the impulses of our thinking and acting, and of play with roles and meanings.

## REFERENCES

- Adolphs, R. 2003. Investigating the cognitive neuroscience of social behavior. *Neuropsychologia* **41**:119–126.
- Adolphs, R., D. Tranel, and A.R. Damasio. 2003. Dissociable neural systems for recognizing emotions. *Brain Cogn.* **52**:61–69.
- Ainsworth, M.D.S., and S. Bell. 1970. Attachment, exploration, and separation illustrated by the behavior of one-year-olds in a strange situation. *Child Dev.* **41**:49–67.
- Aitken, K.J., and C. Trevarthen. 1997. Self-other organization in human psychological development. *Dev. Psychopathol.* **9**:651–675.
- Bateson, G. 1956. The message “This is play.” In: *Group Processes: Transactions of the Second Conference*, ed. B. Schaffner, pp. 145–242. New York: Josiah Macy. (Republished in: Bateson, G. 1973. *Steps to an Ecology of Mind*. St Albans: Frogmore/Paladin.
- Bekoff, M., and J.A. Byers. 1998. *Animal Play: Evolutionary, Comparative and Ecological Approaches*. New York: Cambridge Univ. Press.
- Belsky, J. 1981. Early human experience: A family perspective. *Dev. Psychol.* **17**: 3–23.
- Blacking, J. 1971/1995. The value of music in human experience. In: *The 1969 Yearbook of the International Folk Music Council*, vol. 1, pp. 33–71. (Republished in: *Music, Culture and Experience: Selected Papers of John Blacking*, ed. P. Bohlman and B. Nettl. 1995. Chicago: Univ. of Chicago Press.
- Bowlby J. 1988. Developmental psychiatry comes of age. *Am. J. Psychiatry* **145**:1–10.
- Bradley, B.S. 1989. *Visions of Infancy*. Cambridge: Polity.
- Bruner, J.S. 1996. *The Culture of Education*. Cambridge, MA: Harvard Univ. Press.
- Butterworth, G.E. 1991. The ontogeny and phylogeny of joint visual attention. In: *Natural Theories of Mind*, ed. A. Whiten, pp. 223–232. Oxford: Blackwell.
- Damasio, A.R. 1999. *The Feeling of What Happens: Body, Emotion and the Making of Consciousness*. London: Heinemann.
- Decety, J., and T. Chaminade. 2003. Neural correlates of feeling sympathy. *Neuropsychologia* **41**:127–138.
- Dissanayake, E. 2000. *Art and Intimacy: How the Arts Began*. Seattle: Univ. of Washington Press.
- Donald, M. 2001. *A Mind So Rare: The Evolution of Human Consciousness*. New York: Norton.
- Donaldson, M. 1992. *Human Minds: An Exploration*. London: Allen Lane/Penguin.
- Draghi-Lorenz, R., V. Reddy, and A. Costall. 2000. Rethinking the development of “non-basic” emotions: A critical review of existing theories. *Dev. Rev.* **21**:263–304.
- Fivaz-Depeursinge, E., and A. Corboz-Warnery. 1999. *The Primary Triangle: A Developmental Systems View of Mothers, Fathers and Infants*. New York: Basic.
- Freeman, W.J. 1999. *How Brains Make up Their Minds*. London: Weidenfeld and Nicolson.

- Gallup, G.G., and S.D. Suarez. 1986. Self-awareness and the emergence of mind in humans and other primates. In: *Psychological Perspectives on the Self*, ed. J. Suls and A.G. Greenwald, vol. 3, pp. 3–26. Hillsdale, NJ: Erlbaum.
- Gibson, J.J. 1979. *The Ecological Approach to Visual Perception*. Boston: Houghton Mifflin.
- Goldin-Meadow, S., and D. McNeill. 1999. The role of gesture and mimetic representation in making language. In: *The Descent of Mind: Psychological Perspectives on Hominid Evolution*, ed. M.C. Corballis and E.G. Lea, pp. 155–172. Oxford: Oxford Univ. Press.
- Hess, W.R. 1954. *Diencephalon: Autonomic and Extrapyrmidal Functions*. Orlando, FL: Grune and Stratton.
- Holstege, G., R. Bandler, and C.B. Saper, eds. 1996. *The Emotional Motor System*. *Progress in Brain Research* 107. Amsterdam: Elsevier.
- Jeannerod, M. 1994. The representing brain: Neural correlates of motor intention and imagery. *Behav. Brain Sci.* 17:187–245.
- Kobayashi, H., and S. Kohshima. 2001. Evolution of the human eye as a device for communication. In: *Primate Origins of Human Communication and Behavior*, ed. T. Matsuzawa, pp. 383–401. Tokyo: Springer.
- Kugiumutzakis, G. 1999. Genesis and development of early infant mimesis to facial and vocal models. In: *Imitation in Infancy*, ed. J. Nadel and G. Butterworth, pp. 36–59. Cambridge: Cambridge Univ. Press.
- Lecanuet, J.-P., W.P. Fifer, N.A. Krasnegor, and W.P. Smotherman, eds. 1995. *Fetal Development: A Psychobiological Perspective*. Hillsdale, NJ: Erlbaum.
- Lee, D.N. 1998. Guiding movement by coupling taus. *Ecol. Psychol.* 10: 221–250.
- Lewis, M. 1995. Embarrassment: The emotion of self-exposure and evaluation. In: *Self-conscious Emotions: The Psychology of Shame, Guilt, Pride and Embarrassment*, ed. J.P. Tangney and K.W. Fischer, pp.199–218. New York: Guilford.
- Luciana, M. 2001. Dopamine-opiate modulations of reward-seeking behavior: Implications for the functional assessment of prefrontal development. In: *Handbook of Developmental Cognitive Neuroscience*, ed. C.A. Nelson and M. Luciana, pp. 647–662. Cambridge, MA: MIT Press.
- MacNeilage, P.F. 1999. Whatever happened to articulate speech? In: *The Descent of Mind: Psychological Perspectives on Hominid Evolution*, ed. M.C. Corballis and E.G. Lea, pp. 116–137. Oxford: Oxford Univ. Press.
- Main, M., and R. Goldwyn 1984. Predicting rejection of her infants from mother's representation of her own experience: Implications for the abused-abusing intergenerational cycle. *Intl. J. Child Abuse Negl.* 8:203–217.
- Main, M., and D.R. Weston. 1982. Avoidance of attachment figure in infancy. In: *The Place of Attachment in Human Behaviour*, ed. C.M. Parkes and J. Stevenson-Hinde, pp. 31–59. London: Tavistock.
- Malloch, S. 1999. Mother and infants and communicative musicality. In: *Rhythms, Musical Narrative, and the Origins of Human Communication*, ed. I. Deliège, pp. 29–57. *Musicae Scientiae*, spec. iss. 1999–2000. Liège: Eur. Soc. Cognitive Sci. Music.
- Merker, B. 2003. The liabilities of mobility: A selection pressure for the transition to consciousness in animal evolution. *Consciousness Cogn.*, in press.
- Nagy, E., and P. Molnár. 2003. Homo imitans or Homo provocans? Human imprinting model of neonatal imitation. *Infant Behav. Dev.*, in press.
- Neisser, U. 1993. The self perceived. In: *The Perceived Self: Ecological and Interpersonal Sources of Self-Knowledge*, ed. U. Neisser, pp. 3–21. New York: Cambridge Univ. Press.

- Panksepp, J. 1998. *Affective Neuroscience: The Foundations of Human and Animal Emotions*. New York: Oxford Univ. Press.
- Panksepp, J. 2000. The neuro-evolutionary cusp between emotions and cognitions, implications for understand consciousness and the emergence of a unified mind science. *Consciousness Emot.* **1**:17–56.
- Panksepp, J., and J. Burgdorf. 2003. “Laughing” rats and the evolutionary antecedents of human joy? *Physiol. Behav.* **79**:533–547.
- Papousek, H., and M. Papousek. 1987. Intuitive parenting: A dialectic counterpart to the infant’s integrative competence. In: *Handbook of Infant Development*, 2d ed., ed. J.D. Osofsky, pp. 669–720. New York: Wiley.
- Papousek, M. 1996. Intuitive parenting: A hidden source of musical stimulation in infancy. In: *Musical Beginnings: Origins and Development of Musical Competence*, ed. I. Deliège and J. Sloboda, pp. 88–112. Oxford: Oxford Univ. Press.
- Pavlicevic, M. 1997. *Music Therapy in Context: Music Meaning and Relationship*. London: Kingsley.
- Piaget, J. 1954. *The Construction of Reality in the Child* (trans. M. Cook) New York: Basic.
- Porges, S.W. 1997. Emotion: An evolutionary by-product of the neural regulation of the autonomic nervous system. In: *The Integrative Neurobiology of Affiliation*, ed. C.S. Carter, I.I. Lederhendler, and B. Kirkpatrick, pp. 62–78. New York: New York Academy of Sciences.
- Reddy, V. 2000. Coyness in early infancy. *Dev. Sci.* **3**:186–192.
- Reddy, V. 2001a. Infant clowns: The interpersonal creation of humour in infancy. *Enfance* **3**:247–256.
- Reddy, V. 2001b. Mind knowledge in infancy: Understanding attention and intention in the first year. In: *Blackwell Handbook of Infancy Research*, ed. G.J. Bremner and A. Fogel, pp. 241–264. Oxford: Blackwell.
- Reddy, V. 2001c. Positively shy: Developmental continuities in the expression of shyness, coyness and embarrassment. In: *International Handbook of Social Anxiety: Concepts, Research and Interventions Relating to the Self and Shyness*, ed. W.R. Crozier and L.E., Alden, pp. 77–99. New York: Wiley.
- Reddy, V. 2003. On being the object of attention: implications for self–other consciousness. *Trends Cogn. Sci.* **7**:397–402.
- Rizzolatti, G., L. Fogassi, and V. Gallese. 2001. Neurophysiological mechanisms underlying the understanding and imitation of action. *Nat. Rev. Neurosci.* **2**:661–670.
- Rogoff, B. 1998. Cognition as a collaborative process. In: *Handbook of Child Psychology*, vol. 2, *Cognition, Perception and Language*, ed. D. Kuhn and R.S. Siegler, pp. 679–744. New York: Wiley.
- Rogoff, B., R. Paradise, R.M. Arauz, M., Correa-Chávez, and C. Angelillo. 2003. First-hand learning through intent participation. *Ann. Rev. Psychol.* **54**:175–203.
- Scaife, M., and J.S. Bruner. 1975. The capacity for joint visual attention in the infant. *Nature* **253**:265–266.
- Scherer, K.R. 1986. Vocal affect expression: A review and a model for future research. *Psychol. Bull.* **99**:143–165.
- Schore, A.N. 1994. *Affect Regulation and the Origin of the Self: The Neurobiology of Emotional Development*. Hillsdale, NJ: Erlbaum.
- Schore, A.N. 2003a. *Affect Regulation and Disorders of the Self*. New York: Norton.
- Schore, A.N. 2003b. *Affect Regulation and the Repair of the Self*. New York: Norton.
- Selby, J.M., and B.S. Bradley. 2003. Infants in groups: A paradigm for study of early social experience. *Hum. Dev.* **46**:197–221.

- Smith, A. 1759/1976. *Theory of Moral Sentiments*. Edinburgh. (Modern ed.: D.D. Raphael and A.L. Macfie, eds., Glasgow ed. Oxford: Clarendon. Reprint, Indianapolis: Liberty Fund, 1984).
- Stanghellini, G. 2001. Psychopathology of common sense. *Philos. Psychiat. Psychol.* **8**:201–218.
- Stanghellini, G., and M. Ballerini. 2002. Dis-sociality: The phenomenological approach to social dysfunction in schizophrenia: WPA Section Report. *World Psychiatry* **1**:102–106.
- Stern, D.N. 1993. The role of feelings for an interpersonal self. In: *The Perceived Self: Ecological and Interpersonal Sources of Self-Knowledge*, ed. U. Neisser, pp. 205–215. New York: Cambridge Univ. Press.
- Stern, D.N. 1999. Vitality contours: The temporal contour of feelings as a basic unit for constructing the infant's social experience. In: *Early Social Cognition: Understanding Others in the First Months of Life*, ed. P. Rochat, pp. 67–90. Mahwah, NJ: Erlbaum.
- Stern, D.N. 2000. *The Interpersonal World of the Infant: A View from Psychoanalysis and Development Psychology*. 2d ed. New York: Basic.
- Tomasello, M. 1988. The role of joint attentional processes in early language development. *Lang. Sci.* **10**:69–88.
- Tomasello, M. 1999. *The Cultural Origins of Human Cognition*. Cambridge, MA: Harvard Univ. Press.
- Tønsgberg, G.H., and T.S. Hauge. 1996. The musical nature of prelinguistic interaction: The temporal structure and organisation in co-created interaction with congenital deaf-blinds. *Nord. J. Music Ther.* **5**:63–75.
- Trevarthen, C. 1979a. Communication and cooperation in early infancy: A description of primary intersubjectivity. In: *Before Speech: The Beginning of Human Communication*, ed. M. Bullowa, pp. 321–347. London: Cambridge Univ. Press.
- Trevarthen, C. 1979b. Instincts for human understanding and for cultural cooperation: Their development in infancy. In: *Human Ethology: Claims and Limits of a New Discipline*, ed. M. von Cranach, K. Foppa, W. Lepenies, and D. Ploog, pp. 530–571. Cambridge: Cambridge Univ. Press.
- Trevarthen, C. 1982. The primary motives for cooperative understanding. In: *Social Cognition: Studies of the Development of Understanding*, ed. G. Butterworth and P. Light, pp. 77–109. Brighton: Harvester.
- Trevarthen, C. 1985. Neuroembryology and the development of perceptual mechanisms. In: *Human Growth*, 2d ed., ed. F. Falkner and J.M. Tanner, pp. 301–383. New York: Plenum.
- Trevarthen, C. 1986a. Development of intersubjective motor control in infants. In: *Motor Development in Children: Aspects of Coordination and Control*, ed. M.G. Wade and H.T.A. Whiting, pp. 209–261. Dordrecht: Nijhof.
- Trevarthen, C. 1986b. Form, significance and psychological potential of hand gestures of infants. In: *The Biological Foundation of Gestures: Motor and Semiotic Aspects*, ed. J-L. Nespoulous, P. Perron, and A.R. Lecours, pp. 149–202. Hillsdale, NJ: Erlbaum.
- Trevarthen, C. 1988. Universal cooperative motives: How infants begin to know language and skills of culture. In: *Acquiring Culture: Ethnographic Perspectives on Cognitive Development*, ed. G. Jahoda and I.M. Lewis, pp. 37–90. London: Croom Helm.
- Trevarthen, C. 1990. Signs before speech. In: *The Semiotic Web, 1989*, ed. T.A. Sebeok and J. Umiker-Sebeok, pp. 689–755. Amsterdam: de Gruyter.

- Trevarthen, C. 1993. The function of emotions in early infant communication and development. In: *New Perspectives in Early Communicative Development*, ed. J. Nadel and L. Camioni, pp. 48–81. London: Routledge.
- Trevarthen, C. 1997a. Foetal and neonatal psychology: Intrinsic motives and learning behaviour. In: *Advances in Perinatal Medicine*, ed. F. Cockburn, pp. 282–291. New York: Parthenon.
- Trevarthen, C. 1997b. The nature of motives for human consciousness. *Psychol. J. Hell. Psychol. Soc.* 4:187–221.
- Trevarthen, C. 1998. The concept and foundations of infant intersubjectivity. In: *Intersubjective Communication and Emotion in Early Ontogeny*, ed. S. Bråten, pp. 15–46. Cambridge: Cambridge Univ. Press.
- Trevarthen, C. 1999. Musicality and the Intrinsic Motive Pulse: Evidence from human psychobiology and infant communication In: *Rhythms, Musical Narrative, and the Origins of Human Communication*, pp. 157–213. *Musicae Scientiae*, spec. iss. 1999–2000. Liège: Eur. Soc. Cognitive Sci. Music.
- Trevarthen, C. 2001a. Intrinsic motives for companionship in understanding: Their origin, development and significance for infant mental health. *Infant Mental Hlth. J.* 22: 95–131.
- Trevarthen, C. 2001b. The neurobiology of early communication: Intersubjective regulations in human brain development. In: *Handbook on Brain and Behavior in Human Development*, ed. A.F. Kalverboer and A. Gramsbergen, pp. 841–882. Dordrecht: Kluwer.
- Trevarthen, C. 2003. Language development: Mechanisms in the brain. In: *Encyclopedia of Neuroscience*, 3d ed. with CD-ROM, ed. G. Adelman and B.H. Smith. Amsterdam: Elsevier.
- Trevarthen, C. 2004a. Action and emotion in development of the human self, its sociability and cultural intelligence: Why infants have feelings like ours. In: *Emotional Development*, ed. J. Nadel and D. Muir. Oxford: Oxford Univ. Press, **in press.**
- Trevarthen, C. 2004b. Brain development. In: *Oxford Companion to the Mind*, ed. R. Gregory, 2d ed. Oxford: Oxford Univ. Press, **in press.**
- Trevarthen, C. 2004c. Making common sense: Creative learning and teaching in infancy. In: *A Learning Zone of One's Own*, ed. M. Tokoro and L. Steels. SONY Future of Learning Series. Amsterdam: IOS Press, **in press.**
- Trevarthen, C., and K.J. Aitken. 1994. Brain development, infant communication, and empathy disorders: Intrinsic factors in child mental health. *Dev. Psychopathol.* 6:599–635.
- Trevarthen, C., and K.J. Aitken. 2001. Infant intersubjectivity: Research, theory, and clinical applications: Annual Research Review. *J. Child Psychol. Psychiatry* 42:3–48.
- Trevarthen, C., and K.J. Aitken. 2003. Regulation of brain development and age-related changes in infants' motives: The developmental function of "regressive" periods. In: *Regression Periods in Human Infancy*, ed. M. Heimann and F. Plooij, pp. 107–184. Mahwah, NJ: Erlbaum.
- Trevarthen, C., and P. Hubley. 1978. Secondary intersubjectivity: Confidence, confiding and acts of meaning in the first year. In: *Action, Gesture and Symbol: The Emergence of Language*, ed. A. Lock, pp. 183–229. London: Academic.
- Trevarthen, C., T. Kokkinaki, and G.A. Fiamenghi, Jr. 1999. What infants' imitations communicate: With mothers, with fathers and with peers. In: *Imitation in Infancy*, ed. J. Nadel and G. Butterworth, pp. 127–185. Cambridge: Cambridge Univ. Press.
- Turner, V. 1974. *Dramas, Fields and Metaphors*. Ithaca, NY: Cornell Univ. Press.

- Tzourio-Mazoyer, N., S. De Schonen, F. Crivello et al. 2002. Neural correlates of woman face processing by 2-month-old infants. *NeuroImage* **15**:454–461.
- Wemelsfelder, F. 1993. The concept of animal boredom and its relationship to stereotyped behaviour. In: *Stereotypic Animal Behaviour*, ed. A.B. Lawrence and J. Rushen, pp. 65–95. Wallingford, U.K.: CAB Intl.
- Winnicott, D.W. 1960. The theory of the parent-infant relationship. *Intl. J. Psychoanal.* **41**:585–595. (Republished 1990 in: Winnicott, D.W., *The Maturation Process and the Facilitating Environment*. London: Inst. of Psychoanalysis/Karnak).
- Zei Pollermann B. 2002. A place for prosody in a unified model of cognition and emotion. In: *Proc. of Speech Prosody 2002*, Laboratoire Parole et Langage, CNRS. Aix-en-Provence: Université de Provence. [www.lpl.univ-aix.fr/sp2002/oral.htm](http://www.lpl.univ-aix.fr/sp2002/oral.htm).