

## **Making Sense of Infants Making Sense**

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Research on natural and spontaneous communication with infants and toddlers - on the ways young humans act and interact to share experiences, feelings and intentions with other known persons before they can use language - proves the existence of talents for intersubjective sympathy for which the science of psychology has no ready explanation. The coordination from birth of information-seeking and object-using movements of head, body and limbs in one mind-time and one body-related space requires a new way of conceiving the formation and sequencing of intentions and conceptions of the world in the brain. The intimate sharing of intrinsic rhythms and expressions of emotion by vocalisation, gesture, facial expression and touch that comes so naturally between parent and infant; the 'narrative musicality' of the earliest protoconversations and interaction games; the transformation of these by joint and mutual attention into collaborative performance of tasks; elaboration of conventions and meanings in companionship -- all these lay the foundations for learning how to speak about what is already consciously shared. We see that human sense of things, with all its potential for cultural elaboration, is somehow born in us, seeking affirmation in human company. Its complex emotional regulations have an unexpected moral complexity from infancy.

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**Les théories courantes concernant l'état initial de l'esprit humain sont-elles adéquates ?** Il est largement accepté que la sympathie de l'intelligence interpersonnelle, à la base de toutes les capacités sociales et culturelles, doit être apprise. On admet que le nouveau-né, entièrement dépendant des soins parentaux, aura des mécanismes d'attachement maternel ; mais les psychologues de la petite enfance n'accordent pas aux nourrissons une sensibilité aux signes chez autrui des intentions, d'une conscience attentive ou de réponses communicationnelles. On ne s'y attend pas à ce que les bébés soient motivés par les "émotions relationnelles" plus complexes, telle que « l'orgueil », « l'approbation », « la honte » ou « la censure », qui régulent le partage des intentions et des significations. Cependant, il est difficile pour un biologiste d'accepter cette cécité de la science fondamentale à l'égard des alternatives qui sont évidentes pour le sens commun. N'est-il pas plus raisonnable de supposer

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que l'être humain est né avec des principes motivationnels qui guident l'expérience vers une conscience collaborative, et qui motivent l'apprentissage de significations culturellement créées?

*Mots-clés* : intelligence, sympathie, communication, apprentissage, principes motivationnels innés

## **INTRODUCTION : THE CHALLENGE OF INFANT SOCIAL INTELLIGENCE**

### ***Are Prevailing Theories of the Initial State of the Human Mind Adequate?***

All social animals are sensitive to movements of other individuals, to the impulses of their animacy. This is true when parenting behaviour engages with offspring behaviour, in courting and mating couples, in cooperative groups of individuals with their established roles and natures; and also between species, as, for example, when predators hunt their prey and the prey evade them. Why should humans be any less sensitive to animacy and its social potentialities? Why should even very young persons be indifferent to the underlying intentions and emotions implicit in the movements of other persons?

The axiom of the infant psychology that we see most widely accepted in the academic literature and most represented in textbooks appears to be that the crucial sympathy of intelligence between persons, on which all social and cultural achievement depends, must be learned. It is granted that the newborn infant, being wholly dependent on parental nurturance and protection, will have mechanisms of attachment to maternal care, possibly even more elaborate ones than those of a kitten or rat pup. But, in the main, infant psychologists appear not to expect a young infant to be sensitive to the signs in another person of their purpose, intelligent awareness or communicative responses. Babies are not expected to be moved by the more complex 'relational emotions', such as 'pride', 'approval', 'shame' and 'censure', that appraise cooperative impulses and that regulate the sharing of purposes and meanings.

Several months after birth, a baby has become efficient and cooperative in orientations of purposes. He or she is ready for the cognitive psychologist to make experimental tests of perceptual discriminations and learning of preferences and aversions. The researcher is delighted to find that the infant has a bright potential for understanding the physical world (Lacerda, von Hofsten and Heimann, 2001). The conclusion usually drawn from such tests is that, once the chaotic reflexivity of the newborn is knit together by learning of sensations excited in the body's parts, the infant is capable of being both a coherent agent and a smart pupil whose intrinsic intelligence is investigatory and absorbent, i.e. information-seeking. For some more daring, the infant's world is conceived in

terms of spatio-temporal properties by a kind of 'naïve physics' conforming to a Kantian description of how the dimensions of reality are perceived. At this point the researcher who has confidence in his rationalist/empiricist approach is somewhat baffled by demonstrations of neonatal imitation, by the finding that even newborns have special cognitive skills for hearing human speech sounds or music and interpreting the emotion in them, and by evidence that the baby can see and distinguish faces in the first days. But, these claims can be reconciled with the idea that social learning, especially learning how to speak, must require some 'environment expectant' processing. It is usually assumed that it is templates for *perception*<sub>2</sub> of speech or musical sounds or of faces, that provide specifications for recognising key environmental cues to the presence of persons. How neonates may move to seek some experiences, especially experiences of people, while ignoring other events or objects is not explained.

The belief that a baby is not by nature actively and selectively conscious of people, that a human sociability has to be formed by learning, receives a measure of scientific validation by new evidence offered by brain scientists who, with brilliant technical ingenuity (but with very narrow sampling of the brain's potential when freely in command of the body's field of action), demonstrate a great 'plasticity' of certain cerebral tissues in young animals. Obviously the human mind must begin very receptive, it has so much to learn. And yet, what the newborn *intends* to know remains mysterious, outside the range of the methods available for developmental cognitive neuroscience. The brain mechanisms of an infant's intrinsic motivation for conscious appraisal of the world and for engaging with other persons' motives remain unknown.

In these ways, for three decades, the cognitive psychology of infancy has been busily and confidently occupied with theorising how very young single human minds assimilate and organise information received from the environment. How they react to an objective (usually visible) world of physical events and objects; how they solve problems concerned with categorising and comparing the experiences of things. Verification of theories about how single infant heads think about forms and transformations of the material world is sought by experiments that, for both practical and logical reasons, must limit data collection to the counting of investigative choices or reactive movements of the subjects when they respond to predefined kinds of event, and to evidence of changes that demonstrate habituation or learning. Such experiments are approved as 'rigorous' and 'valid'. Emotions, usually inferred from photographs of faces, are described as categories of mind state that arise after rational appraisal of the threats or benefits of experiences to the individual. Emotional states are assumed to be first adapted to regulating the physiological or information-processing functions of that individual.

It is not difficult to see the historical reasons behind this restriction of interpretation, topic and method in infant psychology. But, it is difficult for a biologist to accept the stubborn blindness of this basic science of human nature to alternatives that are so obvious to common sense. Is it not more reasonable to expect the human being to be born with motivating principles that guide experience to a collaborative awareness and that motivate learning of culturally created meanings?

#### ***Evidence for a Different Primary Psychology of Infants***

A straightforward description of infants as whole and active beings in natural engagements with persons, not just observers of staged events, leads to a different picture. For the family of an infant, this baby is already a person, socially aware, and capable of considerable power in actions addressed to intimate engagement with the motives and feelings of any adult or child who comes close seeking sympathetic engagement. These are the evident facts that do not accord well with the assumed natal state of psychological incoherence and insentient defensiveness. I will later explain that all the following have supported by appropriate scientific research :

- (a) A healthy newborn infant can be a well-coordinated, purposeful agent -- may move the many parts of their whole body with smooth efficiency in one space and one time, of their own volition, often apparently without stimulus. They appear to explore the sensations of being alive, both from within and from outside their bodies, anticipating, choosing and registering the consequences of their moves.
- (b) Newborn infants deliberately communicate intentions and feelings to people, orienting selectively to them when displaying expressive movements, quickly learning preferences for particular persons, imitating marked expressions in a communicative way, noticing when they are imitated, seeking reciprocal engagement.
- (c) The movements of infants are not just intricately coordinated throughout the body, so all parts can be engaged in synchronous and harmoniously transforming goal directed forms, they are also rhythmic with intrinsic parameters of frequency and expressive modulation that match those that are intuitive in all adults.
- (d) When communicating, the expressive movements of infants show sensitive engagement with the rhythms and inflections or expressions of the other person's emotion. The efficiency of intersubjective coordination proves that even newborns have a fine sense of the contingent responsiveness of the other, and how it varies emotionally.

- (e) Within a few months infants are clearly motivated to attend to the knowledge and skills of familiar others, following their orienting to the world, noticing the objects they take and move. The infants get pleasure from showing what they have learned in company, by explicit non-verbal gestures, utterances and exchanges of mutual attention. They become involved in games in which objects are shared. They are clearly not just involved in private rational analysis of experience, even when they are increasingly taken up with tracking events and exploring objects.
- (f) Infants' emotions are subtle, complex and exceedingly effective in eliciting sympathetic reactions from others, in the broad sense of the word 'sympathetic', meaning responsive in matching or complementary emotional ways, not necessarily protective or generous. Most commonly the expressions of infants -- their smiles of affection, self-conscious humour, 'clowning' for the attention of others, pride, mistrust, or humiliation, as well as their eager and sometimes serious efforts to 'tell' what is on their mind -- are interpersonal or 'moral', not merely concerned with private conscious realisations and problem solving. Even the 'astonishment' that the highly rational René Descartes thought must be the primary emotion of an unschooled thinker, has a communicative potential, as is seen in world wide teasing games that play with surprising events. We are attracted by the curiosity, pleasure, anxiety or annoyance infants show for what they are doing, with us.

A baby is born 'knowing' nothing, and yet able to both express purposes and feeling, and to mirror the expressions of another person. For two years the baby will have no language, and yet will, if happy, not be at all daunted in communicating about interests and understanding in order to share in others' knowledge and skill. These phenomena require explanation. It is not sufficient to say that the infant 'learns' how to know things and people, and how to speak words, though the infant certainly learns some things with amazing speed, especially about the persons closest in his or her world and their habits and 'personalities'. Newborns see human faces as persons, and have preferential curiosity for their individual form and expressions. A baby can learn to recognise the mother's face within hours of birth. Her voice and intonation can be learned before the baby is born.

Merely charting the acquisition of effective skills of moving about with balance and power, or of reaching for and handling objects does not tell us how the infant, as one being, intends those complex biomechanical events. Nor is it enough to probe the levels of cognition and word mastery achieved or 'constructed' at different

ages, and by different children in different 'contexts'. And, to say that the infant and his or her environments constitute a 'complex dynamic system' of interacting elements both says too much, and too little. We need to make a more open investigation of what the newborn baby can and does do with a feeble yet coherently mobile body, to contact people and to learn. We need to see and hear how the infant and toddler will act to make their purposes and feelings so clear in deliberate engagement with the living human company of parents, siblings and other friends, or more cautiously with strangers, reacting with interest and emotion to what the others do, and to who they are.

#### **STAGES IN THE DEVELOPMENT OF MOTIVES FOR CULTURAL LEARNING BEFORE SPEECH**

##### ***0-6 Weeks : Newborns as Persons Expecting Intentional Company***

Neonatologists now know that the conscious intentionality of a human baby is well-prepared months before birth. Ultrasound films of foetuses in the mother's womb and observations of prematurely born infants in intensive care, measuring coordination of movements of all the parts of the body, expressions of perceptual seeking or of communication, confirm anatomical and physiological data on the integrated state of the brain through the last trimester of gestation and into the first postnatal month (Prechtl, 2001).

While some neonatal expressions are obviously adapted to elicit parental care for internal needs -- states of behavioral arousal and sleep, comfort, feeding and protection from environmental dangers -- the other expressions (smiling, gaze approach/avoidance, coo vocalisations and certain hand gestures) transmit affects that evaluate social contact (Trevvarthen and Aitken, 2001). Once we abandon reductive assumptions that the newborn must be a reactive sensory-motor system without coherence of intention, a different infant appears. Emotional expressions of newborns -- smiles and coos of recognition, frowns of annoyance, and hand movements that signal changing states of alertness, distress or interest, and readiness for making communication -- define for sympathetic others the infant's state of openness to the world, and his or her estimation of risks associated with changing intentions. In them a healthy and alert baby shows social initiative, and selective, self-regulating reaction to a partner's intimate responses (Brazelton and Nugent, 1995).

Neonatal imitation, long disbelieved, is now proven by studies in France, Greece, Sweden, the UK, the US, Hungary and rural Nepal (e. g. Heimann, 1991, 2001; Kugiumutzakis, 1998, 1999; Meltzoff and Moore, 1992; Reissland, 1988; Trevvarthen et al., 1999). Babies imitate face expressions, hand gestures, shifts of the head and looking or closing of the eyes and simple vocal sounds within hours of birth. In experimental demonstrations imitating is a rather puzzling activity, elicited by exaggerated 'modelling' behaviour of an

adult and interrupted by waiting for a reaction from the infant. Observed in more natural encounters, the infant's responses exhibit the cardinal features of conscious intentional behaviour -- intermodal sensory equivalence, and motor equivalence for matching gestures with different body parts. Imitation involves apprehension of the intrinsic motive that generates both the form of imitation, and expectation for its perceptual validation from the other person's reply. It is communication, made with emotions of pleasure, interest, surprise, etc. as the baby intently watches and listens. It can soon be used as a means of identifying a person as a familiar companion (Meltzoff and Moore, 1994).

A young Hungarian doctor, Emese Nagy (Nagy, E., and Molnár, 1994), has examined the purposefulness of this imitation with babies less than 2 days old. Having acted as the partner who has called for and received an imitation, she paused and watched the baby patiently. After sometimes 2 minutes of confrontation, the newborn worked hard at making the right movement and eventually generated the imitative response again. This was interpreted as a 'provocation', an invitation to continue the exchange. Heart-rate measures showed that the newborn was becoming excited and prepared for action just before imitating (the heart beat accelerated), but became attentive for the effect of an act provocation (the heart slowed before the gesture of request). This is an important demonstration of the human readiness for negotiation of expressive 'statements' and 'questioning', or 'assertion' and 'apprehension', in face-to-face dialogue. As Nagy and Molnar (2000) described it, "Searching for the mechanism of neonatal imitation resulted in the discovery of a *neonatal initiative capacity*, called "*provocation*". Newborns spontaneously produced previously imitated gestures while waiting for the experimenter's response."

#### ***6-12 Weeks : Protoconversations Share Timing and Narratives of Emotion***

At Harvard, in the 1960s, we developed the one-camera filming technique that uses a mirror to photograph the mother's face while the camera is aimed to see the whole baby clearly (Trevarthen, 1998). This enabled us to track exactly how the expressive behaviours of mother and baby were related. We demonstrated that the infant takes an active role sharing the mother's chat, which demonstrates an intuitive enhancement of rhythm and emotion. We made some surprising discoveries. For example, when two-month-olds are expressive, making their turn in the proto-conversational exchange, they most often move their right arm rather than the left. This asymmetry of gesture, already present at birth, can be related to the cerebral asymmetry for expressing and perceiving language (Trevarthen, 2001a).

Sound records from protoconversations have been subjected by Stephen Malloch to acoustic analysis, to expose the precise vocal

coordination in the dyad (Malloch, 1999). We find everything in a typical protoconversation to be interesting musically. There are these graceful fluctuations in pitch creating a melody. Melodic fluctuations of voicing are characteristic of motherese (Fernald, 1992; Papousek, 1996; Trehub, 1990). Mother and baby explore the space in the two octaves either side of middle C (C4), most of their sounds moving above C4. The mother's voice plays with large graceful gestures, sometimes rising or falling over most of an octave. Though smaller, the infant's coos are melodious too, usually rising a few notes above C4.

After analysing several protoconversations, Malloch found, in addition to a regulated beat and bar structure, that something close to a 30 second cycle is a consistent feature (Malloch, 1999; Trevarthen and Malloch, 2000). Similar cycles of excitement are common in music, and 20 to 30 seconds is the usual length of a verse or stanza in a baby song, the stanza being made up of four phrases each lasting about 5 seconds. Interestingly, this same period, around 30 seconds, is an autonomic cycle known by physiologists for over a century, a spontaneous change in the brain's regulation of internal processes in the body. If you measure heart rate and respiration in people when they are asleep there is a cycle of speeding up and slowing down over around 30 seconds. It is one manifestation of 'time in the mind'. We call the spontaneous fluctuations of energy or emphasis that mother and infant share 'emotional narratives' (Trevarthen, 1993; 1999). Music, with its changing mood or colour, does seem to be telling us something. We often get the impression that a piece of music without words is telling a story. You can hear the narrative of melody in the cyclic episodes of both folk songs and classical music.

Daniel Stern's 'dynamic narrative envelopes' of a mother's utterances, with their fluctuating urgency and intensity, and what he and his colleagues vividly describe as the 'intermodal fluency' of their mutual 'attunement', have been identified as training for the infant's self-awareness and consciousness of agency (Stern, 1985/2000, 1999; Stern et al., 1985). By supporting the infant's intentions in time and in relation to the shared vocal, tactile and motoric events, the adult helps the infant learn routines of behaviour that can be repeated many times with mutual recognition and enjoyment. On the other hand, the precision of the infant's mirroring of feelings with smiles and coos is evidence for the interpersonal nature of the communication. Newborns actively synchronise with salient moments in the adult's message of gesture or utterance -- tosses and turns of the head, hand gestures and touches given rhythmic emphasis, the extended vocalisations of Infant Directed Speech (IDS) or 'parentese' with its predictable rhyming and climaxes of affect, dancing limb and whole-body movements, etc. -- predicting what the parent will do, and 'coo' sounds can be matched in pitch and quality (timbre) between them (Malloch, 1999; Papousek and Papousek, 1981; Trevarthen, 1999). Adults speaking to infants tend to imitate, too, reflecting the melody, pitch and

quality of the infant's preceding utterance. There is a sensitive two-way mirroring of the emotional values of expression on a regulated time base that overrides the great difference in maturity of the baby and the adult.

Motherese projects the feelings, interests and intentions of the speaker clearly. As Mary Catherine Bateson, an anthropologist and linguist, discovered, protoconversation with a two-month-old relates to both education in language, and to the rhythms and melodies of religious ritual and communion, or traditional healing practices (Bateson, 1979). It engages human communicative motives in more than linguistic ways. Speech to infants in different languages has universal rhythmic and prosodic features, and everywhere rising contours elicit and maintain infant attention more than falling pitch (Papousek, 1996). Infants are more interactive, interested and emotionally positive to IDS speech, which engages attention, communicates affect, facilitates social interaction, and, presumably, helps language acquisition, all consequences of an infant's innate motives for communicating the primary impulses of a conscious agency (Trehub, 1990).

Another feature that merits much further attention is the form of the vocal gestures at different points in the 'story of feeling', and how they can be superimposed on the movements of hands (Trevarthen, 1999). The vocal curves have the same dynamic characteristics as spontaneous hand gestures we all make in conversation. We think that the two kinds of expression, with voice and with hands, are generated by the same dynamic process in the brain, that the 'language' of gesture, its moods and energy, should be seen as related to the kind of expression that has powerful communicative significance in therapeutic work. It can 'lift the spirit', because it engages with the driving process behind all kinds of movement.

*Animacy with Affect : Regulating Private and Social Concerns :* Infants demonstrate the subjective regulation of their changing communicative purposes with emotion. Even self-motivated 'instrumental' actions, aimed to control events in the outside world, give signs of emotional evaluation, the expressions of which can only affect another human being.

It has been claimed that infants under 2 months lack (have not yet 'constructed') a coherent, intentional 'self'. They respond to sensations of their own body, but do not anticipate their own agency and cannot appreciate agency in another person, with sensitivity for the contingency of the other's responses. But experiments by Edward Tronick (1989), Lynne Murray (Murray and Trevarthen, 1985) and Jacqueline Nadel (Nadel et al., 1999), testing how protoconversations are regulated prove conclusively that two-month-olds can predict the timing and emotion of a mother's expressions in communication. Indeed, awareness of the timing of other person's responses and anticipation of an appropriate response in time, has been demonstrated for a premature newborn by a film made by

Saskia van Rees in Amsterdam of the baby exchanging coos with her father (van Rees and de Leeuw, 1993; Malloch, 1999). The mental clock, by which another's sympathy can be judged, would appear to be innate after all, not implanted from experience of a moving body, the baby's own, or a mother's.

Both positive and negative emotions in regulation of protoconversation have been brought to light by interrupting communication. In the Still- or Blank-Face Test a mother who has been communicating happily stops on a signal from the experimenter, and simply looks at the infant for about one minute, trying to make no reaction. The infant first 'appeals' for communication by smiling, vocalising and gesturing, punctuated by sober staring at the mother, then shows avoidance of eye-contact, and distress. In an older person the expression of sad self-conscious confusion with gaze avoidance would be seen as embarrassment or 'shame'. It takes time for the infant to recover a happier state of mind when the mother resumes normal communication and is 'in contact' again.

A second experiment developed by Murray from an experimental idea of Hanus Papousek, using Video Interaction Replay, deals with the objection that the infant in the still face test was reacting to loss of stimulation, not perceiving loss of communication (Murray and Trevarthen, 1985; Trevarthen, 1993). A Double Video (DTV) or 'videophone' link enables infant and mother to communicate 'live' when they are in separate rooms, each hearing vocalisations and seeing the face expressions of the other on a television monitor directly in front. Immediately after happy communication was obtained with a 9-week-old, which was surprisingly easy, an animated and playful portion of the recording of the mother approximately 1 minute in length was replayed to the infant. The projection of the mother's behaviour is exactly as in the live situation, but the physical recording does not react to what the baby is expressing. By chance, infants show occasional interaction with the taped behaviour of the mother, by smiles, gestures or coos, but is confused when the display fails to respond in time and appropriately. After that, the baby shows distress and avoidance, as in the 'still face' experiment. In both tests, it takes a minute or so for the infant to recover when the mother resumes normal communication. The video replay experiment proves that two-month-olds can predict the timing and emotion of a mother's expressions in communication (Nadel et al., 1999). Indeed, as reported above, anticipation of an appropriate response in time, can be demonstrated for a premature newborn (Malloch, 1999; Trevarthen and Malloch, 2000). The sense of 'time in the mind', by which one detects the responsiveness of another's sympathy, is part of our constitution (Pöppel and Wittmann, 1999).

In a converse DTV experiment, surreptitious replay of the infant's behaviour to the mother makes her feel 'something is wrong'. Different mothers experience different emotions and make different

verbal evaluations when the infant appears not to 'connect', some criticising the baby, some blaming themselves. This finding clarifies the problems that depressed mothers have in meeting the sensitive needs of a baby, by bringing to light the complementary impulses that regulate the intimate self-with-other representations in a mother's feelings, and it has led to improved support for mothers who are distressed or worried about their responsibilities with such a critical human charge (Murray and Cooper, 1997).

Older infants' reactions to the still-face and DTV replay tests show that a capacity to withstand disengagement without distress increases with the infant's growing interest in the environment at large. Infants over 4 months can use actively investigate surroundings to escape an unresponsive mother. When they are older than six months, 'secure' infants often treat the still-face test as an entertaining game (Trevvarthen, 2001b; Trevvarthen and Aitken, 2001).

These very artificial experiments serve to convince the sceptical about how sensitive a young infant is to affectionate parenting, and they underline how failure of caregiver support is potentially harmful. It has been found that the first 3 months is a period of high susceptibility for lasting effects of maternal post-natal depression, especially in boys (Murray and Cooper, 1997; Tronick and Weinberg, 1997).

### ***12 Weeks and Beyond : 'Communicative Musicality', and Stories in Baby Songs***

Music communicates with the very young human being because it engages with a fundamental Intrinsic Motive Pulse (IMP) generated in the human brain (Trevvarthen, 1999). It depends on what Malloch (1999) has defined as 'communicative musicality'. This comprises : (1) a rhythmic time sense (that detects syllables, the beat, phrases and longer elements); (2) sensitivity for Manfred Clynes' 'sentic forms' (Clynes, 1980), the temporal variations in intensity, pitch and timbre of voices and in instrumental sounds that mimic the human voice; and (3) a perception of 'narrative' in the emotional development of the melodic line, which supports anticipation of repeating harmonies, phrases and emotional forms in a vocal or musical performance. Music, as it changes, evokes motive universals in the human experience of moving, the unfolding of purposeful projects and their dramatic cycles of emotional expectation and consummation. It has the capacity to give emotional companionship, and to heal (Trevvarthen and Malloch, 2000), because it supports intrinsic, neurobiologically founded needs for qualities of human communication that are organised with musicality, 'in time' with the mind (Pöppel and Wittmann, 1999).

The IMP of musicality is active when infants respond to musical sound by bouncing in rhythm and sharing interest and happiness with companions. Rhythmic movements of infants' limbs synchronise

with adult speech, and hand gestures of the baby may lift and fall with the rhythm and melodic line of a mother's singing, or with recorded music. Protoconversations with six-week-olds are on a slow adagio (70/minute). In animated games, the beat accelerates to andante (90/minute) or moderato (120/minute). Sandra Trehub (1990) concludes that, "infants' representation of melodies is abstract and adult-like", and that, "the design features of infant music should embody pitch levels in the vicinity of the octave beginning with middle C (262 Hz), simple contours that are unidirectional or that have few changes in pitch direction (e. g., rise-fall), slow tempos (approximately 2.5 notes/sec), and simple rhythms." These predictions match baby songs and the prosodic patterns parents use to excite or calm their infants. Stephen Malloch's computer-assisted acoustic analysis of mother-infant vocal play confirms his musician's perception that parameters of timing (rhythm), quality (pitch, and vocal spectrum or timbre) and narrative (the melodic/emotional development over time) are delicately controlled in speech or song shared with an infant.

Research on the structure of songs for infants in different languages has taught us a great deal about how we share states of mind, moods and rituals of story-telling underneath the spoken word. The infant's cheekiness, attentiveness, sleepiness or distress can be mirrored and modified by song and instrumental music. Responses to music prove that by 4 months music easily catches a baby's attention and moves him or her to dancing in time with hands and legs, and songs are quickly learned, becoming favourite messages for companionship (Trevvarthen, 1999; 2002).

We have collected and analysed baby songs in many languages. Examples from Greek, Italian and Scottish English are typically made up of stanzas each with simple 4 phrases, with the exception that the Greek ones often have a characteristic double phrase line, so that the stanzas are twice as long as English or Italian ones. There is very characteristic pattern of rhyming vowels at the end of the second and fourth lines. For example, in the Scottish song, 'well' and 'bell' rhyme.

Clappa, clappa handies,  
Mummy's at the **well**,  
Daddy is away to London,  
To buy Leanne a **bell**.

Babies become very expert by 4 to 6 months at predicting the timing and rhyming features of the baby songs. For example, when a mother was singing "Round and round the garden like a teddy bear", to her 5 month old Leanne, eagerly watched by her daughter, the baby vocalised exactly on top of the long vowel of 'bear', and matched the sound of the vowel (Trevvarthen et al., 1999).

It is highly significant that a nursery song, once attended to with appreciation, is virtually unforgettable as pure music, and that the music makes the words of an appealing narrative both richer and

more memorable. The link between melody and memory must explain one key function of musicality, or poetics -- they make sharable and retrievable dynamic meanings.

A remarkable film, made by Gunilla Preisler in Stockholm, of a blind 5-month-old girl's reaction to her mother singing two familiar songs teaches us more (Trevorthen, 1999). The infant is lying on her back on a mattress while the mother is bottle-feeding her and singing. She was born totally and permanently blind, has never seen her hands or the hands of any other person, and yet she can accompany portions of the song her mother sings with expressive hand gestures that display intelligent precision and even some anticipation of the melody. The infant is moving both hands, touching her clothes or the bottle, and moving them about in the air. The left hand is more active, and at several points in both songs, she makes with it intricate and delicate gestures that match variations of both the pulse and melodic line with appropriate forms of arm waving and extensions and turns of the fingers. Her gesturing is recounting the message in non-verbal mimesis. She is dancing dramatic moments and the progress of the adventure in these little 'myths'. We see that she does so with the 'right' moves, even as a trained conductor might. She accentuates the flow of feeling in the 'story', pointing up high notes, spreading to the side to follow the surges of energy, closing her fingers and/or dropping her hand eloquently at the close of a phrase. Her sense of pitch space seem to be aligned with the axis of her body while she lies on her back, higher pitch being accompanied by a move headwards, lowest pitch being below the waist. Even more remarkably, her gestures occasionally anticipate the mother's melodic and rhythmic change by a fraction of a second. It is clear that the infant is recognising the songs and performing them, at least partly, from memory -- immediately after the start of the second song the infant stirs and smiles in recognition, and both mother and baby chuckle.

It is clear that mother and infant are, at one level, equally competent (and confident) performers, that the infant is deeply attentive and perceptive of subtle musical features of the singing, which are not fully represented in either printed version, poem or score. The mother's song is not perfectly rendered by the musical score, but she sings well and is faithful to the intended music. She speaks a proficient and correct Swedish, but it is the rhythm and melody of her expression rather than the words that influence her baby. Spectrographs show subtleties of 'interpretation' that are missing from either the musical notation or the written text of the poems.

The idea of looking at the choreography and music of communication together is turning out to be very helpful in unravelling how infant and mother can coordinate their expressions so precisely, and with such ease. We find that a young baby may be expressing itself more with delicate hand movements than with its

voice. So we have to pay attention to the baby's dance while the mother is speaking or singing. This may be related to the work on the development of signed language in deaf children. A deaf baby under one year, especially one with deaf signing parents, may begin 'sign babble' around six months, just like hearing babies do sound babble. Goldin-Meadow and McNeill (1999) observe that while hands can learn language as well as the voice, they are better than the voice at metaphoric or mimetic expression. That is why we naturally elaborate our conversation with hand movements, adding meaning. The two systems appear to have evolved as complementary ways of getting meaning across.

***24-40 Weeks : Playfulness and the Humour of a Clown  
Conscious of an Audience***

Riccardo Draghi-Lorenz, Vasudevi Reddy and Alan Costall (2001) concur with Antonio Damasio (1999) that academic psychology has too readily accepted the Cartesian distinction between emotions and thinking. In the constructivist theory of social development, emotions are assumed to begin as 'biological' regulations of the body, and to be elaborated in memory by thought or reason, which requires the acquisition of representations and logical operations describing and explaining the outside world. The self-consciousness of these representations is verbal and reflective rather than intuitive and enactive, instilled by parental rewards and sanctions, or persuaded by rational arguments overheard, and by imitating actions customary in society.

The evidence from early infancy suggests the contrary, that emotions shape reasons. What Stern (1985/2000; 1999) identified as the 'relational emotions', which are specifically adapted to real-time regulation of the balance of initiatives and reactions between persons, and which determine relationships of affectionate attachment, trust and companionship, and defend against abuse, mistrust and disregard, are fundamental to the ecology of emerging human consciousness. It follows that emotions described as 'complex', 'non-basic' and 'acquired' are, in fact, *primary and necessary* to the child's entry into the social/cultural world. As Stein Bråten (1992) argues, such feelings, and their expressions, have foundations in dynamic reactions of even young infants to the feel of 'being present' with an 'other', receptive to their changing appraisal.

Infants are adapted to live emotionally by what Barry Barnes (2000) calls 'understanding agency' in human society, the dynamic balance of pride against shame that regulates negotiations and that gives value to all contractual obligations. Barnes adopts the same approach to human sentiments as did Adam Smith (1759), who, drawing on a rich Scottish philosophical belief in human nature, identified in each of us the capacity for sympathy and to have a conscience who will appraise disinterestedly what we do or think about doing. Cognitive abilities, categories of thought, declarative

memories are all motivated by the human need for sympathy in agency.

Growth of muscles and increasing power of activity generates new senses in the infant's body, and the 6-month-old expresses increasing joy in moving, looking about, waving arms, kicking legs with exuberant rhythm. Rhythmic games develop, in which patterned and repeating expressions and body movements are negotiated between infant and parent with humour and teasing (Reddy, 1991). The infant, while attending critically to the consequences of his or her investigative moves to objects, also shows a new 'self-other awareness', 'showing off' with exaggerated emotions to an observer's attention, not only in games, but also to a mirror, as Vasudevi Reddy has demonstrated (Reddy, 2000). The mirror person offers a strange social engagement, because it always moves with oneself. Testing this paradox, even a 3-month-old shares with the mother 'self-conscious' expressions of mixed pleasure and surprise, a coy look-away and smile, when she holds the baby in front of the mirror. Responses to rhythms in human body movement and the polyrhythms of music, become stronger, too, and more robustly emotional. The 6-month-old appreciates 'peek-a-boo' or 'fake' sadness as fun. The baby has become a clever clown, using all sorts of exhibitionist behaviours to share jokes and make others laugh, or react in other emotional ways (Reddy, 2001; Trevarthen, 2001).

*Basic Complex Emotions of Companionship Frame Pride in Identity* : Participation in baby songs is a matter of intense pride. A picture of 6-month-old Emma sitting on her father's knee in her home at Edinburgh shows her smiling, absolutely thrilled she is to show a stranger "clap-a-handies". She has spent the last weeks visiting my lab. with her mother and they often played this game with great enjoyment. In contrast, with a stranger in the lab, she tries to show "clap-a-handies" but it does not work. He hasn't a clue what she is trying bravely to show him, he seems so 'stupid', and she is extremely worried and unhappy. She stares, then avoids looking at him and her expression seems humiliated or 'ashamed' (Trevarthen, 2002).

We have many examples of this kind of behaviour with 6 month olds and we are convinced we are right to call the infants' feelings 'pride' and 'shame'. We agree with Draghi-Lorenz et al. (2001) that these are primary, intuitive emotions that have important social power. We do not think that they are constructed out of simpler reactions by social experience. We think that pride and shame, and other 'moral sentiments' (Smith, 1759), are absolutely foundational in developing human relations, and in the growth of a sense of individuality or identity in society (Trevarthen, 2002).

I am sure that the main motivation for cultural learning is something that is quite separate from what is described by attachment theory as the motivation for seeking proximity to a mother. That is why we have developed what we call the Theory of

Companionship (Trevvarthen, 2001b). We are not suggesting that attachment theory is wrong, it is just that is certainly not an adequate account of the emotions that normally operate in development of a baby's self confident possession of knowledge. The emotions of attachment have to do with regulating the needs of one's own body by communication with another person, soliciting their help and support. Cognitive learning and so forth relates one's own body to objects. Cultural learning and everything to do with education and shared artificial knowledge and skills involves communication in relation to a joint experience of the world of objects, and that is where you get these very powerful emotions of pride -- pride in knowledge and pride in skill, and shame in not being thought master of such things, to be thought unskilled or ignorant. These emotions of companionship are very important in the development of happy self-confidence, at any age. I believe they should be attended to in therapy, especially for children.

***40 Weeks to Two Years : Grasping Meaning : Sharing Knowledge and Skills Leads to Talking With Sense***

Our evidence shows that the baby has a well-integrated self at birth, an effective self. But it has to work out what to do with this motivated life it has, and one of the first things to learn is the meaning of the world as other's know it. A child must learn the meaning of other older persons' actions, first in protoconversation and imitation games, then in action games and baby songs, and later in use of objects that have been conceived as tools. The meaning of the world can only be acquired in communication and collaboration with other people. There is no such thing as meaning found entirely by a single self. Meaning has to be communicated, or communicable. As we observe the development of infants over the first year, we see a steady progression towards integration in a joint understanding of objects and actions. By the end of the first year the baby has achieved this understanding and can share in the world's meaning. With luck and affectionate support, this becomes a source of great pleasure and pride.

Around 40 weeks after birth a remarkable change appears in the attentiveness and emotions of a baby (Trevvarthen and Huble, 1978; Trevvarthen, 1998, Trevvarthen and Aitken, 2002). In previous months, the baby's evident focus on manipulation, on seeing, hearing and feeling the effects of handling objects, on oral or visual inspection of them, and tracking of events at a distance from the body has led the mother to play games with objects where she acts as assistant and sometimes playful tease to the baby's efforts to capture things. Then, within a few days, the games are transformed by the infant starting to show curiosity about what the mother is doing, what *she* intends. This change affects the ways mothers talk to their infants and play with them. Mothers become teachers, showing, explaining, giving instructions (Trevvarthen and Marwick, 1978). The fact that babies everywhere become interested in acting with intentions like those of

other persons at the same age is clear evidence that the crucial change in motives is something generated within their developing brains at this time (Trevvarthen, 1988). Adults react collaboratively, but they do not initiate the change.

By one year a baby can, without language, share arbitrary experiences with familiar persons, displaying an individual socially-adapted personality, pointing to objects of joint interest and responding to pointing, using a 'protolanguage' combining vocalizations and gestures, and attending to and imitating conventional expressions and actions. These behaviors may be described as manifestations of a core human need for companionship in understanding and the creation of meaning (Trevvarthen, 1998, 2001b). Step by step though the first year the infant masters first intimate negotiations of expressions in protoconversational dialogue, then person-person and person-person-object games, and finally, in the last trimester, cooperation in a joint task with both mutual and joint attention. Cooperative manipulation of objects, with orientation to cooperate with the probable intentions of companions in a task, appear months before the first word. Thus cultural learning does not come from language. It is the other way about. The developments are truly intersubjective and cannot be explained as the consequences of socialisation of developments in the child's individual general cognitive capacities.

Some linguists, and philosophers of language, protested long ago that language is used to 'do' things, in shared intentionality. It grows in communication between conversing persons with known personalities, and in societies with customary ways of using the world, not just for representing or telling facts. Nor is the capacity to make and understand sentences derived from the grammatical formalities of text. In the second year a baby expertly shares arbitrary experiences and meanings without speech, displaying to familiar persons an individual, socially-adapted personality, while attending to and imitating conventional vocalisations and gestures, as well as noticing objects that other persons use, imitating actions and understanding purposes.

Lev Vygotsky (1896-1934, see Vygotsky, 1978), Jerome Bruner (1983) and John Locke (1993) all emphasise that a child picks up language purposefully and intersubjectively, by noticing what other persons do with it. Acts negotiating social participation with emotion come earlier in development than intention-directing 'proto-imperatives', just as 'person-person games' came before 'person-person-object games' in the middle of the first year. The early stages of grammar learning is not simply a matter of coordinating vocalisations with temporo-spatial aspects of intentions and attentions -- requests, pointing, showing, giving. It has concern for human feelings and sensitivities which form the backing texture of all live communication and 'experiencing together'. 'Joint attention', which Michael Tomasello (1988) found is strongly associated with

the picking up words, is not just a convergence of lines of sight and directions of instrumental action. It involves 'mutual attention' as well (Reddy, in press; Trevarthen and Hubley, 1978; Trevarthen, 1998), and subtle awareness of moods and purposes, of instantaneous shifts of interest and emotional reactions that the infant has practised with familiar playful company through the first year. Meaning grows in personal relationships of shared pleasure and trust. Jacqueline Nadel shows how this quickly transfers to communication between toddlers (Nadel and Pezé, 1993). She has recorded how immediate imitation of actions and utterances is used by 18-month-olds for non-verbal negotiation of purposes and for sharing meaning, and she underlines the pleasure and humour of sharing signalled by exuberant gesture and vocal prosody. Children and adults alike are easily caught in dramatic make-believe, identifying the roles of 'characters'. Infants play with emotional narratives long before they talk, and toddlers create dramas together before they have any demonstrable 'theory of mind'.

An 'experience expectant' speech awareness helps a newborn learn phonological and prosodic features of the mother tongue. The affectionate tone and intonation of parental speech claims the infant's attention and gives meaning to their engagement. Peter Jusczyk (in Lacerda, von Hofsten and Heimann, 2001) demonstrates that a baby can know the sound and meaning of his or her name before 6 months. The acquisition of skills for hearing a language starts well before the first year, but the production of words comes much later. The first 'telegraphic' two- or three-word sentences do not prove that the child has grasped awareness of phonological, grammatical and syntactic rules before about 30 months. But then a rapid 'explosion' of vocabulary starts as the child tries to share items and narratives of experience, and to identify categories that 'need' to be named. There are large individual differences in talkativeness, as there are in temperament, at this so-called 'difficult' age, which may be an exciting but somewhat anxious leap forward in making what Margaret Donaldson (1978) calls 'human sense' of the world.

#### THE NEUROBIOLOGY OF AN INFANT'S INTERMENTAL LIFE

##### *Workings of a Brain that Needs Imaginative Company and Seeks Collaborative Invention*

To understand how animals or persons perceive, remember and think, we have to observe how movements arise -- from their beginnings in the embryo, through all the stages of development and in individual acts of behaviour (Trevarthen, 1999, 2001a). We will have to ask what gives the movements of a complex jointed body intricately varied but coherent, purposeful form. It is not enough to study how sensory information is processed. Minds are not collections of modules of information processing, like a set of bureaucratic government departments who cogitate and legislate policies remote from where they will take effect. Nor can the biology

of consciousness be made clear by research that acknowledges only the phenomenal 'plasticity' of neural systems, and how 'excitable' the stored representations are. Tissues are not only 'lit up' in the brain by what comes in, and pushed into representing shapes. Different stimuli from each object and event are not 'associated' to get the object identified. They conspire to affirm that identification which was already implied in the intention to notice them. The forms of intention that are adaptively 'determined', and that already 'know' the body and what it can do, have also to be acknowledged and explained. Then may we begin to understand the ambitions of even the simplest and most ignorant of beasts.

We do not seem to have an adequate theory of how movements arise in the newborn human brain. For example, Mark Johnson's 'cognitive neuroscience' of growing visual systems (Johnson, 1997), which identifies the expanding cortex as a complexly architected processor that is 'plastic' in response to experience, with no 'protomaps' of the body or its shape, actions and vital needs, ignores a wealth of knowledge of the comparative functional neurology of vertebrate brains. It does not take account of the coherent and purposeful subcortical motive processes that represent time and space for an active body and that 'constrain' both embryogenesis of neocortical circuits and postnatal functioning of the human mind. It cannot explain how infants inspire their own visual discovery, or how they communicate what they find to other persons.

During gestation, there are nine busy months of brain development. A new-born brain may be only one third the size of an adult brain, but it has all the nerve cell nuclei and fibre tracts, that a neuro-anatomist could want to find. True, some of its tissues, cells and connections are immature, and the proportions of the cerebral hemispheres are different. The temporal lobes are proportionally very short, the frontal lobes are flat rather than bulging as they are in a toddler or adult, the parietal cortex is smaller, too. But those are changes in cortical volume and complexity that are on top of a very elaborate subcortical brain which is well-formed before birth. We have to trace developments in this core brain back down to the embryo stage, the first 2 months of life, because many of the structures that later become important in early communication are active in the brain, guiding its development long before the cerebral cortex is even beginning to be formed (Trevarthen, 2001a).

The classical way of diagramming the human cerebral cortex indicates that it processes sensory information coming in at the back and sends it forward to the 'pre-central' motor system. In fact, all information that is perceived is anticipated or '*expected*' by the brain. There is a process of seeking that flows through the cortex in the other direction, first setting up a motor plan, then looking for the sensory information needed. The motor or 'executive' action is leading to the cognitive experience, so the initiative is actually frontal in origin. It has got to do with initiating voluntary activity and

then the experience comes about. We should remember that the proper meaning of the word 'ex-perience', from its Latin derivation, is 'from *trying* to do something'. It refers to the *intention* to know something, like the French 'une expérience' which means 'an experiment'. In the English language this original meaning has been almost lost. 'Experience' generally refers just to the information that comes in.

Parts of the brain beneath the cortex integrate with the inner state of the body, and with the impulses to move the body. Inevitably they also have to do with communication. The nuclei in the brain stem that motivate voluntary action and attention project up into the cerebral cortex and they modulate the activity of the cortical cells, changing their communication with each other and with the rest of the brain. The structures that make the signals of communication, that is the muscle systems that are moved in vocalisation and speech, or in facial expression are all innovated from nerves that come from the cranial nerves and those nerves originally evolved for self-regulation of visceral functions like circulation of the blood, breathing, eating and digestion. In social animals the same cranial efferent nerves have more and more components that serve in communication and the regulation of relationships.

Stephen Porges (1997) describes how visceral muscle activity activated by cranial nerves to control the vital state and condition of health in that animal's body -- how it breathes, the circulation of its blood, what it seeks to eat, where it is orienting its tasting, smelling, hearing and looking movements of exploration -- have evolved in social species into muscle actions, excited via the same cranial nerves, that advise other intelligences about the drift of purposes and the energy-husbanding preparations of the animal's future-sensing self. Brains make motor futures possible and efficient, and they also offer signals of what they are planning for the benefit of social partners. Motives of mind, and sympathy for such motives, not 'theories of mind', are the natural basis for cooperation in animal society.

The cranial nerve system is well-formed in a 7-week-old embryo human, long before the cerebral cortex has even begun to form neurones. The neurons of the brain stem core project up into the forebrain and their products regulate the migration and development of cortical cells and the connections that form between them. The evidence from brain embryology is that the emotional system or the brain stem motivating mechanism has the role of morpho-genetic regulator of cortical growth. The same neuronal systems continue to be regulators of cortical function throughout life. They motivate attention, selective awareness and the shaping of motor actions. This finding fits with evidence coming from neuropsychology, or the effects of brain damage, that emotional systems have a formative influence on cognitions, rather than the other way about.

### ***Time and Information in the Brain and Mind***

Cognitive Psychology, in so far as it attempts to explain psychological processes as the processing of sensory information, may now really be at a dead-end. There are two fundamental principles of mental life that it does not deal with : it leaves intentions and emotions unexplained, and it forgets time. In the recently published MIT Encyclopaedia of Cognitive Science, there are 473 entries, and only one mentions time. This one is an entry on 'time in the mind' by Ernst Pöppel (Pöppel and Wittmann, 1999). We know from the way infants behave that temporal co-ordination of brain activity and temporal co-ordination of body movements, both generated from inside the brain, are absolutely fundamental to everything that we do psychologically, whether it the perceptual guidance of our own intentional movements, or internal self-regulation of the body, or communication with another body and mind. All coherent psychological actions depend upon regulation of time, on neural generation of time.

My colleague David Lee, an expert on human perceptuo-motor performance, argues from mathematical analysis of movements and of the neural activity that accompanies or precedes a movement that the brain does not 'process' information it 'makes' it, or 'generates' it. He makes one further argument. We know that the brain loses many cells, that cell death is going on throughout the development of neural circuits. If the brain were an information-processing network, processing information in a linear way, stage by stage, loss of neurones would be a serious threat to its function. Every now and again something would be lost at a crucial point, and a function would be impaired. But the mathematical evidence for motor images generated in the brain as time-space functions in populations of neurones suggests how the brain can be very resistant to damaging effects of cell death. It keeps its sense of the essential information for action even when parts are shut down. This may explain why the brains of even senile old people and very severely mentally handicapped children can have temporal coherence and can respond to music therapy for example, even when their pick-up of perceptual information is confused and their attention is weak (Trevarthen and Malloch, 2000).

I believe we are still searching for a good theory of how the brain works. I think the evidence is that we are about to find out how little we know, and I am not as optimistic as some people are about the benefits of findings in the 'decade of the brain' just finished. I have been reviewing books on cognitive neuroscience recently, especially the newer 'developmental cognitive neuroscience', and the picture does not quite hang together, at least that is my impression. I am sure we will still have to pay sensitive and sympathetic attention to ordinary everyday expressions of pleasure and displeasure, curiosity and doubt, comradeship and mistrust between people meeting in their community life, especially those people who are too young to

speak, but who seem to understand us, and what our impulses and feelings are, so well.

#### **CONCLUSIONS : INTIMACY OF MOTIVES IN THE EVOLUTION OF ART AND CULTURE**

Every new parent or grandparent can find the 'human' in human nature. The adult responds instinctively to the infant's spirit. The science of mother-infant play is a basic one, carrying implications for every level of analysis of the living human organism. It needs to be exact, with hypotheses that measure up to the complexity of essential human nature. It is strange that psychological science has stubbornly failed to acknowledge the uniqueness of these moments of inquisitive social consciousness -- the intent listening and looking for conversation, and the astounding capacity to reflect an other person's subtle impulses to move, signs of conscious interest and expressions of affection and a sense of humour. Beyond needs for parental care of vital animal functions or comfort, a human baby seeks to engage with the mind of a human companion.

The 'initial state' of the human organism at birth, while more immature than other primate newborns, is already more complex. The brain develops its motive principles months before birth. The foetus has coherent movements and feelings and sensitivity for the expressions of the mother's voice heard through her body. Its consciousness will grow strong in the interpenetrating affections of companionship, meeting others' interests and experience, willingly learning their ways. In a few years it will imitate the fantastic ideas of an ancient culture, learning how to use words and tools invented by unknown ancestors.

Human nature is culture -- its motivation, its making and its products. Cultures are the ways and makings of human communities, with dramatic power and transcendent utility. They are motivated from the investigative and convivial impulses causing communication and the collective accumulation of experience. They give found or created objects significance, making them 'special' in the potential intimacy of feeling that Ellen Dissanayake (2000) takes as the source of all art. Artifacts are both art and fact -- they may be made with reverence and displayed with pride, and their creation intends to have lasting effects. Their purposes have intimate value and social importance. They are both educated and instructive, the product of learning/teaching kinds of collaboration that educational psychologists such as Jerome Bruner (1996) and Barbara Rogoff (1990), and Vygotsky (1978) describe.

Two talents, evolved from the rich and agile social intelligence of apes, transformed primate intelligence, making it human and cultural, and both are evident in their innate, generative form in the mobile bodies and playful pretensions of infants and toddlers everywhere. These are a peculiar polyrhythmic restlessness of gesture of a bipedal actor, and a new conversational intimacy of

expression in communication. The first frees the mind to spin extravagant imaginary projects of action and emotion without the call to carry them to consummation. The second invites shared imagining and the creation of an infinite array of knowledge and skills through collaborative story-telling and the building of artifacts. A transgenerational fabric of culture with elaborate beliefs, celebrations and constructions sets out different social roles for human individuals in a community, giving rise to identities and personalities that are owned with pride and lost with shame. A new morality and a new sense of group affinity arises within families and communities. The collective narrative first told in myths and legends grows in societies into artificial systems of practical duty, religious belief and obedience to laws. The young become educated because they want to understand what culture means, and because their elders wish to teach what they know and can do.

Merlin Donald (1999, 2000), with his theory of the priority of communication by 'mimesis' in evolution of the human mind, has made us aware that language and all it represents was only possible with this new flexibility of the hyperactive body and its metaphorical mind, and because the intrinsic pulse of human movement is so faithfully and instantaneously mirrored between persons of all ages. Human minds mirror one another's motives and feelings in ideal form before they know how to speak, and from this talent symbols are created in many spoken and unspoken forms that can specify shared ideas with precision and combine them in infinitely varied ways. Literature is an artifact that exhibits the vitality of imagination and urge to tell tales of moral and practical adventure, that can explore fate in imagination and with the music of poetry. Mark Turner believes that the 'literary mind' is designed to spin stories, verbally and non-verbally, blending fascinating metaphors to 'save its life', as Shahrazad did (Turner, 1996).

All the inherent and acquired attributes that are unique to humans, and that have stronger anticipation in all children than in young animals of other species, relate to the making and living of an intermental existence. It is the motive for cooperation in culture that makes us different, and, as A. N. Whitehead said in "Science and the Modern World" (Whitehead, 1925) this changes our moral status entirely.

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