Chapter 1

Musicality: Communicating the vitality and interests of life

Stephen Malloch and Colwyn Trevarthen

Music expresses that which cannot be put into words and cannot remain silent.

Victor Hugo

1.1 A brief history of discoveries

Four decades ago scientific interest began to focus on a new theory of how human will and emotion are immediately shareable with others through gestures of the body and voice. The handful of researchers who contributed to this new way of looking at human nature, paediatricians, child psychiatrists, ethologists, anthropologists and social linguists, independently making observations of mothers and infants in natural, mutually enjoyable communication, considered the vitality of the communicative gestures themselves to be sufficient for the creation of memorable stories. From these beginnings comes the account of communicative musicality explored in this book.

Until the late 1960s, however, mainstream medical and psychological science were not inclined to credit infants with complex skills or creative mental abilities, and certainly not with any active sympathy for other persons' thoughts or feelings. The role of a mother was seen to be that of a provider of basic physiological protection and nourishment. Some, however, in propitious circumstances and feeling free of the orthodox obligations of conventional medical and psychological research and publication, began to think differently. From close observation of infant behaviour, they started to question the prevailing view that thought first begins as solving practical problems of object use, and that human communication is governed essentially by formal generative principles and cognitive information processing of language.

When the infancy researchers reported discoveries of delicate expressions and sensitive responses passing between young infants and their mothers, they described it in terms of rhythmic patterns of engagement that could be represented as 'musical' or 'dance-like'. Rather than using terms to point to specific referents, they used metaphors for sympathetic movement such as 'protoconversation', 'attunement' and 'acts of meaning' to capture the dynamic and apparently intentional phenomena of non-verbal communication that they observed. The cultural anthropologist Mary Catherine Bateson described adult protoconversations with infants as performed with a 'delighted ritual courtesy' (1979, p. 65), and she drew attention to the shared rhythmic foundation for turn taking. Babies were found to be more aware of human presence and its activity and affections than they were of physical objects or events, and this strong curiosity for humans was expressed in responsive smiles, calls and gestures which excited their mothers and 'captured' them into the flow of the present moment of the exchange.

As the title of an historically important book that collected the new ideas of the 1970s put it, what was being observed was communication *Before Speech* (Bullowa 1979), and speechless infants and their mothers were extremely good at it. In her introductory chapter, Margaret Bullowa referred to the then new concept of a child's 'communicative competence', citing the ideas of the anthropologist, musician and photographer Paul Byers. Byers writes of envisaging 'a human and animal world that is communicationally related through the sharing of time forms in multiple levels of behavioural organization'. He goes on to say that

> The information carried by interpersonal rhythms does not move directly from one person to another. Thus information cannot easily be conceptualized as messages since the information is always simultaneously shared and always about the state of the relationship.
>
> Byers (1976, p. 160)

He is neatly describing what we call 'sympathy'. Bullowa describes Byers' method as 'detecting the beat in each communicant's speech or activity as one would in assigning the "signature" to a stretch of music' (Bullowa 1979, p. 16).

In the next two decades the picture grew, with more detailed analysis of infants' vocalizations and the particular style of speech mothers used to entrance and delight their infants. There were experiments on infants' and even foetuses' perception of the musical features of sounds resembling the prosody of the human speaking voice (for example, Stern 1974; Alegria and Noirot 1978; DeCasper and Fifer 1980; Fernald 1985, 1989; Papoušek 1987; Trehub 1987; Hepper 1988). All this activity led to a transformation of developmental science, challenging in fundamental ways both the accepted account of infancy and theories of the foundations of the adult mind. 'Unsophisticated' infants communicated with innate skill, compelling sympathetic responses from their parents and generating cooperative narratives of emotion. Within a few months of birth, infants were shown to begin to share a growing interest in the world of objects, and to enjoy shared games with them. The babies were evidently possessed of an 'innate intersubjectivity', one that led before the end of the first year to the learning of culturally conditioned meanings. They took part in shared consciousness regulated by emotions of affection and enjoyment, expressed and given meaningful form by rhythms of modulated movement. Colwyn illustrated this through acoustic analyses of recordings made in his laboratory in 1979 of a 6-week-old Scottish girl, Laura, and her mother. These revealed how the mother assisted her daughter with imitative sounds that were modulated emotionally to invite the infant's coos and to acknowledge them in shared time (Trevarthen 1984). With the help of gifted young collaborators entranced by the opportunity to make discoveries starting from the simple premise that mother–infant play is intelligent and creative, in Edinburgh Colwyn traced the growth of infants' motives for sharing intentions and feelings in human company (Trevarthen *et al.* 1981). All the while, whether in Scotland, Nigeria, Germany, Sweden or Japan, researchers found that mothers spoke to infants with similar rhythms and intonation, and infants moved in sympathy (e.g. Fernald *et al.* 1989; Kuhl *et al.* 1997; Masataka 1993; Mundy-Castle 1980; Papoušek 1992; Papoušek *et al.* 1991).

A new insight was then brought to the research. It began in 1996 with Stephen, sitting in a windowless office on the upper floor of Edinburgh University Psychology Department, at the very start of a post-doctoral research programme with Colwyn. He began by listening to tapes of mothers and their babies 'chatting' with each other, recorded by Colwyn many years earlier. One of the first tapes was of the vocal interactions of Laura and her mother (Figure 1.1).

> As I listened, intrigued by the fluid give and take of the communication, and the lilting speech of the mother as she chatted with her baby, I began to tap my foot. I am, by training, a musician, so I was very used to automatically feeling the beat as I listened to musical sounds. There was no doubt in my mind

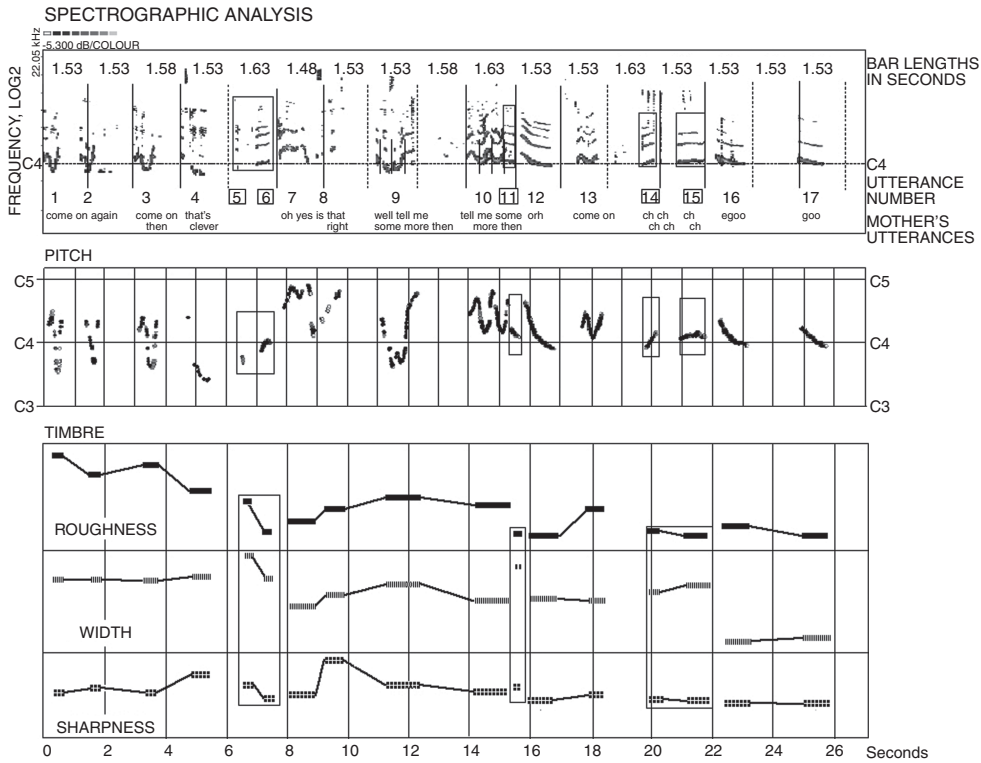

Fig. 1.1 Spectrograph, pitch and timbre plots of Laura, a six-week-old female infant, and her mother conversing together. The vocalizations are represented on the spectrograph by fundamental frequency and overtones. The mother's utterances are written below the spectrograph. Each utterance is numbered directly above the utterance text, and these numbers cross-reference with Figure 1.2. The pitch C4 (261.63 Hz) is indicated by a horizontal line that crosses the spectrograph, and C4 along with C3 and C5 are indicated on the pitch plot. A rectangle around an utterance number and around a vocalization on the spectrograph, and on pitches and timbre measures, indicates an utterance by the baby. Numbers at the top of the spectrograph indicate the duration of the 'bars'. Bars are determined by the occurrence of important acoustic events—vocalization onset or offset, top or bottom of a pitch 'bend', or word emphasis. A dashed bar-line indicates no vocal event marks its placement, but its duration is inferred from the duration of the surrounding bars.

The pitch plot is indicated by small circles. Whether the circles are black, grey or white indicates the strength of the pitch of the sound—in other words, how close the sound is to a pure harmonic spectrum. The darker the circle, the more 'pitched' the sound is.

As timbre is a multidimensional attribute of sound, the timbre plot shows three complementary timbre measures. Roughness is a measure of the degree of 'beating' between acoustic partials. Width is a measure of how 'expansive' or 'narrow' a sound is heard to be. Sharpness is related to the relative position of a sound's loudness centroid within its spectrum. Note how the timbre of the mother's voice changes after each of her infant's vocalizations. Immediately after all three infant vocalizations most of the timbre measures for the mother's voice drop. This may indicate the mother's wish to signal to her infant that she has heard her and make her voice more like her infant's. More detailed explanation and analysis will be found in Malloch 1999. (Figure adapted from Malloch 1999.)

> that the melodious speech of the mother had a certain musical quality to it. It suddenly dawned on me that I was tapping my foot to human speech—not something I had ever done before, or even thought possible. I replayed the tape, and again, I could sense a distinct rhythmicity and melodious give and take to the gentle promptings of Laura's mother and the pitched vocal replies from Laura.
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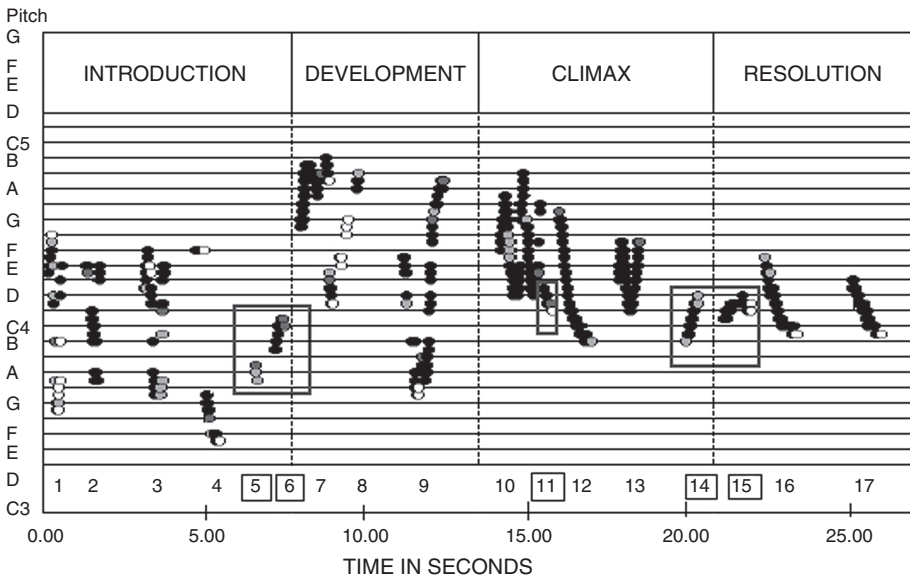
> This was at the very beginning of my post-doctoral research, and I was yet to read the work of such researchers as the Papoušeks, who years earlier had talked about the musical nature of mother–infant communication. A few weeks later, as I walked down the stairs to Colwyn's main lab, the words 'communicative musicality' came into my mind as a way of describing what I had heard.

To demonstrate this melodic and rhythmic co-creativity, spectrographs and pitch plots were generated of the interactions, and precise measurements taken of the onset and offset times of the vocalizations of both mother and baby (see Figure 1.1). From this work, reported in Malloch (1999), the theory of communicative musicality found precise formulation in terms of three parameters: *pulse*, *quality* and *narrative*.

'Pulse' is the regular succession of discrete behavioural events through time, vocal or gestural, the production and perception of these behaviours being the process through which two or more people may coordinate their communications, spend time together, and by which we may anticipate what might happen and when it might happen. 'Quality' refers to the modulated contours of expression moving through time. These contours can consist of psychoacoustic attributes of vocalizations—timbre, pitch, volume—or attributes of direction and intensity of the moving body. These attributes of quality will often co-occur multimodally, such that a wave of the hand will accompany a 'swoop' of the voice. Daniel Stern *et al.* (1985) have written on this in terms of 'vitality contours'. Pulse and quality combine to form 'narratives' of expression and intention. These 'musical' narratives allow adult and infant, and adult and adult, to share a sense of sympathy and situated meaning in a shared sense of passing time. The dramatic narrative structure of the exchange between Laura and her mother can be seen in the shape of the pitch contour of their exchange (Figure 1.2). From vocalizations centred on C4 at the start of the exchange, the mother takes her cue from Laura's upward moving vocalization by abruptly moving her pitch to C5. This sudden upwards movement is 'reprised' by the mother during the rising pitch 'swoop' of utterance number 9. From here till the end, the pitch level slowly descends back to C4, reflected in the downwards pitch movement of Laura (utterance 11). In Figure 1.2 it is also suggested that the narrative structure may be thought of in a 'classical' four-part evolution of a story, through Introduction, Development, Climax and Resolution. The 'poetic form' of protoconversation, its rhythmic and prosodic regulation, has been recognized by David Miall and Ellen Dissanayake (2003).

It will be clear that when discussing communicative musicality we are using the words 'musicality' and 'musical' in a very particular way. When we talk of the 'musicality' of mother–baby interaction, we are not talking of what we generally understand to be music, with its known composers and performers. Music is moulded by the forces of culture, such that a song from a rainforest tribe in Brazil will sound very different to a Beethoven symphony, which in turn will sound very different from the output of a composer such as Stockhausen. When we talk of musicality we are pointing to the innate human abilities that make music production and appreciation possible (Blacking 1969/1995). And not only music, also dance and any other human endeavour that could be considered one of the temporal arts, such as religious ceremonies or theatre—all instances of 'the human seriousness of play' (Turner 1982). We define musicality as expression of our human desire for cultural learning, our innate skill for moving, remembering and planning in sympathy with others that makes our appreciation and production of an endless variety of dramatic temporal narratives possible—whether those narratives consist of specific cultural forms of music, dance, poetry or ceremony; whether they are the universal narratives of



INTRODUCTION	DEVELOPMENT	CLIMAX	RESOLUTION
1 Come on 2 Again 3 Come on then 4 That's clever 5 INFANT 6 INFANT	7 Oh yes! 8 Is that right? 9 Well tell me some more then	10 Tell me some more then 11 INFANT 12 Ooorrh 13 Come on 14 Ch ch ch ch With INFANT	15 Ch ch With INFANT 16 Ahgoo 17 Goo

Fig. 1.2 Photos show the expressions of Laura and her mother in dialogue. The pitch plot is a compressed version of that shown in Figure 1.1 indicating how the narrative demonstrates four parts: Introduction, Development, Climax and Resolution. Utterance numbers appear immediately above the time axis and in the table (adapted from Malloch 1999).

a mother and her baby quietly conversing with one another; whether it is the wordless emotional and motivational narrative that sits beneath a conversation between two or more adults or between a teacher and a class. In the coordination of practical tasks, a shared, intuitively communicated understanding is necessary for success. It is our common musicality that makes it possible for us to share time meaningfully together, in its emotional richness and its structural holding, and for us to participate with anticipation and recollection of pleasure in the 'imitative arts' as explained by Adam Smith (1777/1982).

This is the sense in which communicative musicality is explored by the authors of this volume. It is also the sense in which the word 'musicality' was introduced into the literature on infant communication by Mechtild and Hanuš Papoušek (1981), who, with sensitive acoustic analysis of vocalizations shared with their infant daughters, described the 'intuitive musicality' of parenting, and its role in the development of cultural and linguistic awareness in infancy and early childhood. Through the 1980s they made a fine account of what it means for us to share melodies and controlled expressions of feeling in the voice. This inspired our work.

In the autumn of 1997, Irène Deliège, Editor of *Musicae Scientiae*, attended a meeting in the Music Department at the University of Edinburgh, and discussed with Colwyn questions pertaining to the psychology of music, with particular regard to the temporal and rhythmic features in vocal and gestural interactions of infants with their parents This led to collaboration with the URPM (Unité de Recherche en Psychologie de la Musique) of the University of Liège. In 1998 a symposium on 'Rhythm, Musical Narrative, and Origins of Human Communication' was offered by Irène and Colwyn at the URPM by invitation of the Second International CASYS Conference (Computing Anticipatory Systems) on the theme of 'Anticipation, Cognition and Music'. The papers of the symposium became the Special Issue of *Musicae Scientiae*, published by ERCAM (European Society for the Cognitive Sciences of Music) in 2000 (a special issue dated 1999/2000). Papers by Bjorn Merker, Ben Schögler, Maya Gratier, Stephen and Colwyn were included. Also represented were Marc Wittmann and Ernst Pöppel who reported their work on temporal mechanisms of the brain in communication, with special reference to music perception and performance, and Louise Robb who described application of acoustic analysis to study the changes in musicality of the voice of a depressed mother and the effects on her infant.

1.2 Musicality and the energies of the Self

The power of musicality to facilitate and energize meaning in communication is poignantly expressed in music and dance therapy—its ability to play a vital role in this nurturing of the Self points strongly to its intrinsic role in our biological–psychological make-up (Trevarthen and Malloch 2000; Sacks 2007). Music and dance, with their progressions from regularity and predictability to novelty and surprise and back again, can provide a safe, supportive environment in the 'present moment' (Stern 2004) for those for whom interactions with others are fraught with complexities and difficulties. For traumatized children and those whose development has taken them towards communicative isolation, such as those with autism and Rett syndrome, the engagement of their musicality by another can be a lifeline to human sociality. Our shared musicality can be harnessed to our intention to reach out to others, and in this we see the powerful healing nature of our desire for companioning others through time, even when those others may have no language and exceedingly limited communication abilities. Our musicality serves our need for companionship just as language serves our need for the sharing of facts and practical actions with things. Here Ian Cross's description of music's 'floating intentionality' comes in useful (Cross 1999; Chapter 5, this volume). Music, he says, complements language by providing us with a means for sharing coordinated, embodied space and time while lessening the potential for disagreements based on the particularity or 'discretising' of verbal meaning to which Per Aage Brandt refers (Chapter 3, this volume). We can 'agree' in the shared embodied space of music and dance, whereas we may disagree in the shared objective space of a verbal discussion because our version of 'reality' differs from that of another. Musicality's nature of engaging one with an other, or many with many, intersubjectively, is intrinsic to musicality's healing potential.

As discussed by Patricia Eckerdal and Bjorn Merker (Chapter 11, this volume), an infant is inducted into his or her culture through participation in games. In this environment of ritual

learning, babies practise the gestures of song and 'ceremonial' movements, and show them off with pride to people they trust (Trevarthen 2002). They appreciate musical jokes, making others laugh (Malloch 1999; Reddy 2003). At the same time as particular forms of others' actions begin to be salient in the infant's awareness, a baby fears misunderstanding in presence of strangers, and may withdraw in shame when communication fails (Trevarthen 2002). This shame or shyness is important—it acts to protect the growth of cultural meanings invented and shared with intimately known and constant companions. It limits misunderstanding. We also believe adult human relationships and negotiations, including those of creative art, are worked out along a pride–shame continuum, with dynamic balance between interacting wills and imaginations (Scheff 1988). Thus, healthy pride and shame, reacting to the appreciations, and misunderstandings or judgements of others, is an important dimension along which flows infant or adult ability for expressing the various cultural narratives of communicative musicality. Of course to become fixed for any length of time at either end of this continuum, ceasing to respond intuitively to the needs of the social environment, can severely impair our ability to share meaning with others, with potentially debilitating effects. We see this in cases of maternal postnatal depression and loneliness due to cultural dislocation where a mother's sense of Self moves towards what could be called 'stagnant shame' (Marwick and Murray Chapter 13, and Gratier and Apter-Danon Chapter 14, this volume). We see the repercussions of adult 'stagnant pride' in the emotional damage brought to children by war (Osborne, Chapter 15, this volume). And we also see in these examples the power of music and of our innate musicality to bring free flow once more to the human psyche. However, a pride–shame continuum is not sufficient to account for the wide range of human experiences that can be negotiated through communicative musicality.

Taking our cue from eastern philosophies such as Buddhism, the work of the western theologian Martin Buber (for example, Buber 1923/1958) and Chapter 16 of this volume by Mercédès Pavlicevic and Gary Ansdell, we believe that along with a pride–shame continuum, our experience of music and the temporal arts can also show us a separation–interconnection continuum. Through what Mercédès and Gary call 'collaborative musicing' people can move to awareness of their intrinsic interconnectedness. This is a state where our sense of separateness moves towards a sense of being an inseparable part of community. They describe an experience they call '"multi-subjective", in the sense that we both lose and retain our subjectivity within the collective "I"' (page 369). The ability of dance and music to contain paradoxical viewpoints, as described by Ian Cross and Iain Morley (Chapter 5, page 68) may well contribute to this process. Thus, we propose a model (necessarily a simplification of actual experience) where the human disposition for communicative musicality operates within the tension of two continua lying at right angles to each other. One is the pride–shame continuum (Scheff 1988), which holds our progress in cultural learning. The other is the separation–interconnection continuum, which holds our sense of degree of interrelationship or 'belonging' with other people (perhaps all people), of concordant actions in society, and of skilful uses of objects. Both engage an inherent consciousness of human relationship, 'the second person psychology' that gives meaning to the psychologies of individual (first person) and objective (third person) action and experience (Reddy 2008). We maintain that to become fixed or 'stagnant' at either end of either continuum provokes discord, both for the person and for those in their environment. A healthy human psyche will flow freely along these intersecting continua as the needs of a situation are perceived.

This 'floating' and energetic 'flow' of intentions with all their affective colour are lived by young children as a source of energy and inspiration for both play and learning, as an intrinsic part of their 'musical culture' (Bjørkvold 1989). Contributors to this volume who are teachers welcome this vitality of expression with its generous sharing; and recognizing that adults must participate in the rhythms and accents of two-way improvization of meaning for learning to flourish, the authors

consider how the musicality of both teacher and pupil helps their teaching practices throughout the curriculum. We believe education to be a collaborative task requiring intentional participation in actions, discoveries and feelings in the human time of shared movement.

1.3 A dichotomy and the way forward

The companionship in discovery of the musical impulses in human beings has been an enjoyable and encouraging one, but the story is far from finished. Our scientific curiosity has faced us with two mysterious dichotomies that were familiar to Aristotle and a long line of his predecessors—the mind–body question, and the problem of sympathy.

- How do our swift and ethereal thoughts move our heavy and intricately mobile bodies so our actions obey the spirit of our conscious, speaking Self?
- How do we appreciate mindfulness in one another and share what is in each other's personal and coherent consciousness when all we may perceive is the touch, the sight, the hearing, the taste and smell of one another's bodies and their moving?

The authors of this book all believe that progress to finding answers to these questions must acknowledge, as a first step, that we move with rhythm, and that this movement simultaneously makes the measure of time from 'inside us'; we tell one another measured stories with emotionally expressive grace—with what we call musicality. This musicality communicates because we meet as actors first who detect the source of human movements in their form, subjectively—before we debate, explain, reason the imaginative and hopeful stories that our minds make up as reconstructions of objective reality 'out there'.

We believe humans move under the coordinated and integrated control of a time keeping, energy regulating Intrinsic Motive Pulse (IMP) (Trevarthen 1999). The brain is a network of dynamic systems all obedient to a scale of rhythms that flow in unison, orchestrating their effective actions to fulfil the future-sensitive (motivated) desires and recollecting past experiences of being. There is no other way all these muscles of my body could work in collaborative efficiency, initiating and executing their forces in synchrony and succession in the present moment, modifying inclinations and desires for the future that are founded on experiences past. This is the way intentions come to be, and it is also the way they are perceived in others. We can only cooperate in relationships or social groups by sympathetic harmonization and synchronization with this time-creating IMP, dancing together 'in one time' with its rhythms and respecting the qualities of its tensions and future-oriented impulses and melodies which we share.

As David Lee shows us (Lee 2005; Chapter 6, this volume), scientific analysis of movement and of perception-in-action shows we are not just information processors. Rather are we, and all animal organisms, manufacturers of information in consciousness, generators of the prospects of our growth and movement in space and time, estimating our needs in a world of varied potentialities that have to be evaluated as imagined goals. The sharing of action enables these goals to have meaning, and the innate neurochemistry of emotions that Jaak Panksepp has explored (Panksepp 1998; Panksepp and Trevarthen, Chapter 7, this volume) enable us to give self-related values to life's experience, and to communicate them. What matters to us is what feels right in movement, and what makes common sense in action.

In short, this book explores a particular way of thinking about how the human mind and human body work together and are intimately interdependent; it investigates how we share life and make the meaning of our culture in communities. It presents many kinds of evidence to support the view that we are evolved to know, think, communicate, create new things and care for one another in movement—through a sense of being in rhythmic time with motives and in tune with feelings to share the energy and harmony of meaning and of relating. The authors, with

Whitehead (1926), Langer (1942, 1953), Gibson (1979) Lakoff and Johnson (1999) and the phenomenologists (Merleau-Ponty 1962; Husserl 1964), bring the creative experience of time in movement of our whole organism, and in the sensations of a moving body (Damasio 1999), back into the theory of the work of the mind and of conscious perception. They want to balance the attention paid in contemporary psychology to the input of structure and information that is perceived as objective food for thought and the subject matter of language. They develop ideas about the intuitive subjective processes that generate a moving consciousness, and about the artful and informative stories these motives tell, intersubjectively.

The way forward has been made clear by fine analysis with open curiosity of how an infant and mother or father share their purposes and feelings with touch, sight and sound, and by evidence from movement science of the primary dimensions of motor images generated in the brain. We live, think, imagine and remember in movement. To capture the essence of movement and its values we use the metaphor of 'musicality'. To recognize that our experience in movement is shared by a compelling sympathy we call this activity 'communicative'. We believe that our learning, anticipating and remembering, our infinite varieties of communication including spoken and written language, are all given life by our innate communicative musicality.

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