

Introduction: why and how we mimic emotions

Agneta H. Fischer and Ursula Hess

Mimicry and its presumed neurological underpinnings in the form of mirror neurons have become a trending topic in the social, behavioural, and neurosciences during the past decades (e.g. Hess & Fischer, 2013). The notion that minds can be shared by subtly imitating others is a challenging idea that sparks our imagination. For ages, philosophers and scientists have been intrigued by the question of how we come to understand what others think. How can we read the minds of others, how can we know what they feel and predict how they will react, and how can we relate to their pain and suffering or join in their victories and pride? Understanding of and empathizing with others appear to form the basis for human bonding and positive social interaction. Whereas shared goals or interests may lead to temporary coalitions and cooperation, understanding others' feelings and perspectives provides the basis for long-term and enduring social bonds.

One crucial aspect of the sharing of minds is the communication of emotions. We cannot be involved in relationships without emotions. We feel and express emotions towards the people we care about, and if people do not elicit any emotions in us, this implies that we feel indifferent towards them. Thus we get angry, irritated, worried, sad, or proud with the people to whom we feel connected; the stronger our concerns, the stronger the emotions, whether negative or positive. Not only do people express their emotions, they also tend to share them with their friends, family and colleagues. The communication of emotions is thus part of many daily interactions as well. A cashier smiles when handing back change, nurses express sympathy to patients, and managers show enthusiasm to motivate employees. The study of emotional expressions has a long tradition in psychology, starting with Darwin and then the seminal work by Paul Ekman; yet, for many years the question mainly focused on observers' ability to recognize the facial signals of emotion sent by an expresser. In this line of research the perceiver remained passive.

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[More information](#)2 *Agneta H. Fischer and Ursula Hess*

Hatfield, Cacioppo, and Rapson (1994) were among the first to put the relationship between the perceiver and the perceived on the scientific agenda with the publication of their book *Emotional Contagion*. Emotional contagion is the sharing of emotional minds, and refers to the idea that we easily catch others' emotions. To illustrate the pervasiveness of this phenomenon, we only need to think about emotional crowds in panic, fright, or anger, or the pain we ourselves experience when watching the suffering of war victims and refugees on television. In their book Hatfield and colleagues identified several mechanisms that may lead to emotional contagion, of which mimicry has to date received most attention. Mimicry has been defined as the tendency to automatically imitate and synchronize facial expressions, vocalizations, postures, and movements with those of another person (see Hatfield et al., 1992). In other words, perceivers actively react to the emotional expressions of others and respond by showing matching – or sometimes contrasting – expressions. The tendency to mimic the expressions perceived in others can already be observed in small children and is assumed to have the important social functions of signalling affiliative intent and fostering rapport. For this reason, mimicry has been considered one of the cornerstones of successful and warm interactions.

Since then, an abundance of empirical research has been published on mimicry, investigating the determinants, boundaries, and effects of this phenomenon. We roughly distinguish between behavioural and emotional mimicry, the latter focusing on the mimicry of others' non-verbal behaviours that signal emotional meaning, such as a smile. The topic of the present volume is *emotional* mimicry. Several experts in this field reviewed the underlying processes and contextual boundaries of mimicry in order to better understand its functions in realizing the sharing of emotional perspectives. To date there is no clear picture regarding the conditions under which emotional mimicry is shown, or the situations in which it may be inappropriate. This is partly due to the fact that the literature on emotional mimicry is distributed over various subdisciplines in psychology and neuroscience. Thus, relevant studies have been published in diverse outlets across the domains of social psychology, emotions, neuroscience, biological psychology and psychophysiology, and even psycho-endocrinology. As a consequence the literature on this topic tends to be theoretically disjointed.

The aim of the present volume is to review and evaluate the state of the art in this research domain and to set out future directions. The only previous book addressing these issues, *Emotional Contagion* by Hatfield et al. (1994), was published more than 20 years ago, and since then many studies have been published and theoretical perspectives have been proposed. The present volume aims to reflect the state of the art on

different aspects of mimicry, ranging from different factors and contexts affecting mimicry, different forms of mimicry (e.g. cross-channel mimicry), to the different functions of mimicry. The common thread in this volume is that emotional mimicry is a complex phenomenon influenced by context, usually a social exchange, which is crucial for when mimicry occurs and how it affects people.

Overview

Mimicry, empathy, and the sharing of mind

Mimicry is closely related to empathy, but there have been different ways in which this relation has been conceptualized. Mimicry can be seen as one of the causal paths to empathy (e.g. Hatfield et al., 1992), or as an early stage of empathy. In Chapter 1 Oatley refers to Donald (1991), who describes the mimetic stage as a crucial stage in the development of the mind, and as a preadaptation for language. This is also apparent in young children who mimic adults' facial expressions, signalling that they share the other's mind, before they are able to talk. Mimicry can thus be seen as an early stage in the development of empathy, preceding shared attention, shared intentions, and perspective taking. These are different paths all leading to the sharing of minds. Empathy is the sharing of emotions, which forms the building blocks of social life. Sharing of emotions is important for social coordination of plans in everyday life, but also for the appreciation of art, more specifically literature. Through art we identify with the protagonist and share life stories in films or novels.

Schuler, Mohnke, and Walter (Chapter 9) further differentiate between different forms of empathy, namely affective and cognitive empathy. Both forms of empathy differ from mimicry, although the neurological underpinnings are very similar. The core empathy regions comprise the AI (Anterior Insula) and ACC/MCC (Anterior and Medial Cingulate Cortex, XE "ACC/MCC"), which integrate information across various domains and allow selection of prospective responses. Two brain circuits, involving the mirror neuron system and the mentalizing system, have been associated with two routes to empathy, namely top-down and bottom-up. The first route involves more cognitive perspective taking, and the second route involves the mirror neuron system, eliciting automatic (mimicry) responses to affective stimuli. Although these routes can be distinguished, it should be clear that they are not independent of each other.

Not only do empathy and mimicry seem to have similar neurological underpinnings but individual differences in empathy can also be seen as determinant of individual differences in mimicry. In Chapter 7, Sonnyby-Borgström reports evidence that individual differences in empathic

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ability, as measured with self-reports, are related to individual differences in the tendency to engage in facial mimicry. Studies of individuals with empathic disorders, such as ASD (Autistic Spectrum Disorder) or DBD (Disruptive Behaviour Disorder) also showed less mimicry when confronted with angry and sad faces. Mimicry has also been related to attachment behaviours, showing that insecurely attached children mimic positive emotions less often than securely attached children. The relation between empathy and mimicry is most likely bidirectional, however, because a variety of studies have also shown that mimicry affects liking, and bonding with the other person. Stel (Chapter 2) and Hess and colleagues (Chapter 5) describe studies showing that a priori attitudes influence mimicry, such that a positive attitude enhances mimicry, whereas a negative attitude decreases mimicry, but also that mimicking in turns increases positive attitudes, and thus may reinforce an empathic stance.

The relation between mimicry and empathy is therefore a close one. Most authors define empathy as a broad state of mind aimed at feeling or sharing with others, whereas mimicry is a more specific tendency to copy others' behaviour. We think it is important to differentiate the two concepts, while at the same time to acknowledge that they mutually influence each other.

Functions of emotional mimicry

Two functions of mimicry have traditionally been proposed and examined. The first is improving the understanding of others, which is discussed elaborately by Stel in Chapter 2. Several theories have provided explanations of this function, such as the Facial Feedback Hypothesis, the Perception-Behaviour link, and Embodiment theories, all suggesting that mimicry helps us to identify others' feelings. This seems particularly to be the case when others' feelings are not straightforward, and therefore difficult to unravel. In such cases differences between people who do or do not mimic are found. This is also evident from Chapter 3 by Niedenthal and colleagues who focus on smile mimicry. Their research on the role of smile mimicry has shown that participants whose mimicry is blocked are worse in detecting the distinction between true and false smiles. However, in general the results with regard to this function seem to be inconclusive. Whereas some studies found support for the facilitation or improvement of accuracy in recognizing others' emotions, other studies found no effects. Explanations for this inconsistency are discussed by Stel in Chapter 2.

A second function that has received much empirical support is the affiliation function: mimicry is assumed to lead to stronger and more

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Excerpt

[More information](#)*Introduction: why and how we mimic emotions*

5

positive social bonds. This is not only the case for smiling but also for negative emotions. Hess and colleagues review the evidence for social context effects of facial mimicry in Chapter 5 and show that mimicry is modulated by the social relational context in which it occurs. Individuals are more likely to mimic friends or people they like and less likely to mimic people they do not like or who are dissimilar to them. In addition, when individuals have the goal to cooperate, they are more likely to mimic others than when they are in competition. Indeed, Winkielman and colleagues (Chapter 8) further extend these social context effects of mimicry using human-like androids. This research shows that androids are mimicked but only in a cooperative and not in a competitive context. This research also emphasizes the human-bonding function, showing that the more human-like the android appears to be and the closer its presence, the more it was mimicked.

The nature of mimicry: underlying processes

Different theoretical approaches to explaining mimicry are reviewed in the various chapters. Most theories, such as the Matched Motor hypothesis, the Perception Action Model, and other variants of embodiment theory and simulation theory, assume that the observation of a facial expression elicits some form of internal simulation that is reflected in the activation of motor areas in the brain similar to the ones that are activated when one experiences the emotion oneself. Differences between these theoretical accounts relate to how the emotional signal is interpreted, what type of information needs to be processed, and at what level, in order for mimicry to occur. In Chapter 6 Hawk and Fischer discuss these different theoretical accounts extensively in order to explain the phenomenon of cross-channel mimicry, that is, the facial mimicry in response to auditory signals.

In contrast to views that assume an internal simulation of the perceived emotion, emphasizing self–other similarities, Schilbach (Chapter 4) proposes a second view that does not emphasize similarity with and matching of others' minds but instead an interactionist or enactive view of mimicry. In this account, knowledge of others' minds is required to support interpersonal coordination. He argues, in line with others in the volume, that mimicry based on the mirror neuron network (MNN) reflects the tight association between perception and premotor and motor areas in the brain, whereas mimicry based on the mentalizing network (MENT) is activated when socially relevant stimuli are processed more explicitly. Such a view is in line with our proposed Emotional Mimicry in Social Context model (see also Chapter 10, this book), which argues that emotional mimicry is not based on mere

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[More information](#)

6 *Agneta H. Fischer and Ursula Hess*

objective features of the face or the body but rather on the meaning and interpretation of these movements in a particular context.

In sum

These are just some of the many issues that are discussed in this volume. We hope that the volume will be useful and stimulate new research on the intriguing questions of how, why, and when we mimic others' emotions. Finally, we would like to thank all the authors for their enthusiasm to contribute to this volume, and we hope that they will enjoy the outcomes of this joint endeavour as much as we do.

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CHAPTER 1

On the sharing of mind

Keith Oatley

Sociality is central to being human and it depends on our ability to understand others, but not just in the way that we might understand something physical, like how to pick an apple from a tree. In this chapter, I draw together some threads of other chapters in the book and develop the idea that human sociality is based on emotions and that it involves sharing pieces of mind.

Empathy offers a clear example of emotion-based sharing of mind. As explained in Chapter 9 by Schuler and colleagues, it enables us to experience in our selves something of an emotion of another person. Singer et al. (2004) studied the phenomenon by monitoring the brains of respondents when they were themselves experiencing pain and when they were signalled that a loved one in another room was experiencing the same kind of pain. The anterior insula and the anterior cingulate cortex were activated in both cases. A piece of brain activation and a piece of mind were shared. De Vignemont and Singer (2006) explain that empathy, of this kind, occurs when someone has an emotion that is similar to that of another person, when one sees or imagines the other person having that emotion, and when one knows that the other is the source of one's own emotion.

In this chapter, I first discuss the sharing of mind in the emotions of day-to-day life, and then the sharing of pieces of mind in the form of works of art. In both cases, emotional mimicry, or emotional mirroring, can be involved: one person can share something of the emotions of others.

Evolution and everyday life

De Waal proposed what he calls the "Russian Doll" model of empathy in everyday life (De Waal & de Waal, 2007). Except for the one at the centre, Russian dolls are hollow and each contains another doll or dolls. In de Waal's model of empathy, each surrounding layer is built on and derives properties from the one inside it. The centre doll, the core, is emotional contagion: one individual matches an emotional state of another. This ability is ancient. It emerged with the evolution of mammals, perhaps

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Excerpt

[More information](#)8 *Keith Oatley*

earlier. Around this core, and based on it, is another doll, a layer of ability to feel concern for others, and hence to be able to care for them because of feeling something like their emotion. De Waal describes how this is frequently shown by our primate cousins, chimpanzees, both in attachment relationships and in friendships. The next doll, the next layer, he calls perspective taking. It enables people to adopt others' viewpoints, so that, for instance, they can help them in ways that they might need. This third layer is distinctively human, but it is based on the older abilities. Evolution does not usually discard pieces of structure it has installed. Instead, says de Waal, it builds on them, and this is what has happened in the series from state matching, to concern, to perspective taking.

The evolutionary line that led to humans is thought to have split off from the line that led to chimpanzees and bonobos about six million years ago. According to Lovejoy (1981), an important development for the human species was a modification of the usual primate arrangements in which sex was promiscuous and care for infants was provided by females. The change occurred among human forebears when sexual intercourse came to occur primarily in long-lasting couples, and when each male came to contribute economically to a single female and family. A human female and a male could come to share pieces of their minds in their ongoing cooperative relationship, as these pieces concerned sex and care for their joint offspring.

A mimetic stage

Donald (1991) pointed out a critical stage in the evolution of the human mind and called it "mimetic": the ability to copy what others are doing. It was associated with *homo erectus*, a hominid species that emerged about two million years ago. Donald sees this ability as primarily motor. He stresses, as an example, the culturally widespread imitative activity of dance. Nowadays, in the movies, dance is an icon of doing something that is active, enjoyable, and social. Donald also argues that mimetic ability is a preadaptation for language.

An important component of mimetic ability is the imitation of facial expressions. It emerges early in infancy, as shown by Meltzoff and Moore (1977), and it seems to occur only in humans. Meltzoff (1993) has argued that mimicry is a bridge to the shared mind. For him it means that the infant is able to understand that others are "like me". In turn, this leads to being able to share intentions and to the understanding of others that now, in cognitive developmental psychology, is called "Theory of Mind". In this book Stel, in Chapter 2, discusses how mimicry provides a basis for understanding others' emotions, and Hawk and Fischer, in Chapter 6, show how mimicry in one perceptual channel, for instance visual or

On the sharing of mind

9

auditory, can be the basis for more complete experiences of emotion that can also be expressed in broader ways.

The happiness that comes from smiling back at someone who smiles may be affected by proprioceptive aspects. Evidence for this comes from Strack, Martin, and Stepper (1988) who asked people to hold a pen in their mouth, and in this way to make an expression that was like smiling, though participants did not know that this was the effect they were having on themselves. The manoeuvre increased happiness. When they held a pen in their mouths, participants saw cartoons as more amusing. In the current book, Chapter 3 by Niedenthal and colleagues and Chapter 8 by Winkielman and colleagues offer discussions of embodiments of emotions and how they may be shared.

Shared intention

Beyond mimicry come the processes of shared attention (see e.g. Chapter 4 of this book, by Schilbach) and of shared intention. For instance, one person can learn to use a tool purposefully when he or she has seen it being used by someone else. On the whole, chimpanzees can neither demonstrate to others an activity that is a step towards a shared goal nor learn from such demonstrations (Povinelli & O'Neill, 2000). Important work on this issue has been done by Tomasello and his colleagues, who have compared the physical and social abilities of young human children and of apes. Herrmann, Call, Hernandez-Lloreda, Hare, and Tomasello (2007) and Tomasello and Herrmann (2010) have shown that human two-and-a-half-year-olds and their primate cousins of any age are about the same in their physical understanding, for instance of spatial layouts and transpositions, or of causality. The human children, however, were found to be far better than apes at social understanding. They can learn from a demonstration of how to solve a simple but non-obvious problem, they can understand communications of others, and they can follow the communicator's attention. They can also watch an intended action that miscarries and understand what the actor had intended to do.

Tomasello and Vaish (2012) argue that by the age of about one-and-a-half years, humans know that both they and others are agents, that is to say capable of acting in the world, and that they and the other are the same in this way. Tomasello and Rakoczy (2003) have called this "the real thing". They mean it's the most basic component of human sociality, and that it needs to be in place before children can acquire Theory of Mind. Consider how remarkable this kind of understanding is. To an eighteen-month-old child one can say: "See this crayon, you can draw a circle, like this. See?" And the child can use the crayon to produce a comparable result. Imagine you are a computer programmer working in artificial intelligence. Imagine

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Excerpt

[More information](#)10 *Keith Oatley*

what would it be to write a program to do this. It's not just a matter of producing a pattern of behaviour. It means being able to recognize the circle as the goal of an action intended to produce this result, and to generate a motor program capable first of conceptualizing the goal and then of achieving it. The actions to be programmed will include not only the concept of goal-directedness but grasping the crayon, guiding the hand, and then monitoring progress towards the goal, so that deviations from the conceptual goal-state are minimized.

One reason why the discovery of mirror neurons by Rizzolatti et al. (e.g. Rizzolatti, Fogassi, & Gallese, 2001) is regarded as so significant is that it offers a means that helps solve this problem. The discovery implies that our ability to perceive intended actions is based on knowing how to carry them out ourselves. A difficulty with this conception, as yet unsolved, is that although the initial discovery of mirror neurons was in monkeys, monkeys cannot themselves learn from being shown how to use a tool, or copy the behaviour of using a tool to achieve a goal.

Shifting, now, to pathology, Hobson, Lee, and Hobson (2007) have argued that people with autism are handicapped in the specific form of subjective interconnectedness in which they are able to identify with others, and to put themselves in the position of these others when they learn or demonstrate an action. They report a study in which, in the absence of a person called "Pete", 12 autistic and 12 non-autistic male adolescents were shown a series of actions by a person whom we can call Jim. Jim demonstrated each action to each participant and asked that when Pete came back into the room, the adolescent should show him what to do. Over six such actions, videotapes were made and analysed in terms of four indices: participants' emotional engagement in the tasks, their sharing of experience in joint attention, their communication of the style in which the action was originally demonstrated, and their ability to shift role to being the teacher. On this composite, except for one boy in the autistic group who scored the same as the lowest three participants in the non-autistic group, there was a complete separation between the two groups: the autistic boys were emotionally less involved, and far less able to engage with Pete, or to show him what to do.

We might say, then, that autism is a condition that involves emotions and mimicry, in which the complex bases of being able to learn intended actions from others, and of being able to enter others' minds to teach them about such actions, are only imperfectly available.

The social brain

A second stream of work relevant here is that of Dunbar (2004), who has found a strong correlation between the size of social groups in which