
RELATIONSHIP CHEMISTRY

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Chemistry is about the communication interaction two people have. It reflects their patterns of communicating with the world and themselves. Chemistry is thus an interaction between two ways of communicating, which also mirrors the needs, values and aspirations of each individual.

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Introduction

Chemistry is about the communication interaction two people have. It reflects their patterns of communicating with the world and themselves. Chemistry is thus an interaction between two ways of communicating, which also mirrors the needs, values and aspirations of each individual.(Haverkamp, 2010a) Other people can observe chemistry because it is active communication, as long as the observer can decode the messages at least partially.

Humans are social animals, and virtually all of their actions are directed toward or are produced in response to others (Batson, 1990). Humans rely on others for survival and are endowed with a motivation to form and maintain strong interpersonal relationships, what Baumeister and Leary (1995) have termed “the need to belong.” If there is chemistry, there is an understanding of being understood. This can make people become closer, but it does not need to do so. It is possible that people have chemistry but do not deepen their relationship. This is because relationships depend on much more than just chemistry, but chemistry makes it easier to find out whether the other person has what is needed for a deeper relationship.

The openness to and sharing of negative emotions can also induce a greater sense of chemistry. Openness to communication is a basic requirement for chemistry to develop. The free flow of meaningful information is what allows for chemistry and which keeps it going. However, since most of the communication that is being exchanged is outside conscious awareness, the situational ability to communicate with the other person may be at least as important as a concrete wish to do so.

Chemistry requires the ability to understand the other person’s messages. The sharing of emotions and an ecological sense of self seem to be present in the first days of life, suggesting a neurobiologically based predisposition for humans to be connected to others (Rochat, 2002). These processes prepare the individual for later empathic connections through affective interaction with others. Thus chemistry is a product of nature as well as nurture.

The Internal meets the External

Since external communication is also a reflection of internal communication, the ability to experience chemistry requires a good inner sense of self. In the intersection between internal and external communication where one also experiences an important part of the sense of self chemistry is consciously experienced. The flows of internal and external communication are what gives rise to the sense of self. (Haverkamp, 2010a, 2010b, 2017b, 2017a) It is, for example, through the interactions we have with other

people and ourselves that we build a sense of self in respect to our capabilities to interact, and since interactions are what gives a sense of agency and mastery in the world, this builds greater self-confidence and a greater sense of efficacy in bringing about changes in ourselves and in the world around us.

Past communication experiences with others and oneself thus bring about an understanding of the world and the self in both partners, which determines the level of chemistry that can exist between both. Feeling oneself as unique and distinct as an individual requires connected, both on the outside and on the inside. Chemistry is a

connectedness which may not have to be obvious to the partners to an interaction, but the exchange of meaningful messages has a distinct dynamic. The rapid exchange of messages on the outside is mirrored in dynamic information exchange and processing on the inside.

Chemistry and Relationship

Interpersonal chemistry does not make a relationship. Actors can have amazing chemistry but most of the time they do not end up in a 'real' relationship. Mutual understanding and automatic resonance can make their lives easier, but too much insight into someone else's emotions can also be a disturbing factor if these emotions are different from the emotions their portrayed character might experience. Resonance is important not only in relationships but also in many other important interactions in life. A therapeutic setting should also enough space for resonance that it can be identified, reflected upon and worked with. More awareness and insight into this exchange of meaningful message which underlies chemistry can also help to get more insight into oneself and into one's interactions with the world, which though practice can increase the own sense of agency and efficacy in the world.

Intersubjectivity

Intersubjectivity is the ability to share the subjective states of others and resonate with their perspective. It strongly relies on the ability to read others' emotions to determine their psychological state. Empathy is probably a primary source of intersubjectivity, as the sense of shared experience is a prerequisite for understanding what drives other people's

intentions, emotions, and motivations (Gallagher, 2001; Meltzoff & Decety, 2003; Trevarthen & Aitken, 2001). In the context of chemistry, intersubjectivity means recognizing that there is another distinct individual with whom I feel good exchanging meaningful messages. In other words, we create a sense of 'us' which requires first an adequate sense of 'I'.

Empathy

Recent data from cognitive neuroscience also offer new insights regarding the neural mechanisms and brain areas that underpin empathy (Decety & Jackson, 2004, 2006; Decety & Lamm, 2006; Leiberg & Anders, 2006). Shared neural circuits, self-awareness, mental flexibility, and emotion regulation constitute the basic macrocomponents of empathy, which are mediated by specific and interacting neural circuits, including aspects of the PFC, insula, limbic system, and frontoparietal networks. Dysfunctions in each of these macrocomponents may lead to an alteration of the experience of empathy and correspond with selective social cognitive disorders depending on which aspect is disrupted (Decety & Moriguchi, 2007).

Empathy, which is derived from the German *Einfühlung* via a Greek neologism, simply means the ability to read and understand another person's feeling. Both the identification and the understanding of a feeling are required parts, which requires a minimum level of resonance with the other's feeling. It does not require feeling the same ('sympathy'), but an understanding of the other's feeling as fully as possible.

Biology, Psychology, Situation

The understanding for the messages of the other has a biological, a psychological and a situational component. Part of our personality is determined by how our neural networks are built, which is to a significant extent, though not wholly, determined by our genes. The psychological aspect is the information that has been stored in the system of neural networks, comprising our life experiences and the information we have heard, read, felt, and so on. The situational aspect is how we decode the messages from other people depending on the situation we are in. Whether your partner winks at you or a police officer might mean two very different things depending on the situation, even if the police officer happens to be your partner.

Chemistry is not enough for a relationship. Just because people are emotionally on the same wavelength, this does not mean that they share the same values. And in the end, it is about the fundamental parameters of one's personality, basic values, interests and preferences, that determine whether a relationship can work. The more we are emotionally invested in a relationship, the more important these fundamental parameters become. The more we know about our own fundamental parameters the easier it is to select relationships and, ultimately, have faith in a relationship. Since we do not feel good if we have to compromise on the fundamental parameters of our personality, such as the values that define who we are, knowing them helps to avoid 'toxic' relationships and enter the ones that benefit us in the long-run. Also, not being aware of them can distort our preferences and lead us to break up relationships that are good for us and maintain those that are hurtful.

Is chemistry something that can be learned or are we born with it? Chemistry has to do with emotional understanding and the willingness to engage in emotional play. Any meaningful communication means there must be an exchange of a message that means something new to the recipient. Something in the message must trigger something in us that wants us to continue with the interaction. Even if we just feel good about the smile of another person, it means that this smile was not initiated by us but by someone else, that there was something new in our world.

The Future

How much one focuss on an exchange with another is related to one's views and aspirations of the future. This does not have to be entirely conscious, but every vommunication activity requires the use of resources that could br spent elsewhere. Attraction depends on the presence of something meaningful in the communication with the other. A message is meaningfdul if it resonates with one's needs, values, basic interests and aspirations, and at the same time can bring about a change in the recipient. Thus there has to be a change in what the other person knows or feels to make the message meaningful. Experiencing chemistry leads to changes of feeling states in both partners to the interaction if it is to be maintained. One chemistry becomes conscious it can raise the attraction to deepen the relationship together with the expecation whether deepening the relationship furthers one's own needs, values, basic interests and aspirations. =

Empathy

The psychological construct of empathy refers to an intersubjective induction process by which positive and negative emotions are shared,

without losing sight of whose feelings belong to whom. This is different from chemistry in that means there is a meaningful exchange, while empathy is a one-way street. One person can have empathy, while it is impossible for only one person have chemistry. It takes two for the latter. Social psychologists regard empathy as a proximate factor motivating prosocial behavior (Batson, 1991; Davis, 1994). Empathy may also play a crucial role in moral development, motivating prosocial behavior and inhibiting aggression toward others (e.g., Hoffman, 2001; Miller & Eisenberg, 1988). Empathy develops from infancy, and by 2 years of age most children manifest prosocial helping responses' to others' distress (Zahn-Waxler & Radke-Yarrow, 1990).

Empathy related responses are essential for children's developing abilities to respond to their social partners in an altruistic manner (Eisenberg, Guthrie, Murphy, Shepard, Cumberland, & Carlo, 1999). Once developed, these abilities tend to be manifested with consistency across time (Knafo, Zahn-Waxler, Van Hulle, Robinson, & Rhee, 2008). Empathy as an emotional response stems from the comprehension of another's emotional state or condition, similar to what the other person is feeling or would be expected to feel (Eisenberg, Shea, Carlo, & Knight, 1991). It is associated with at least minimal awareness that the source of one's own affect is the emotion observed in the other person (Decety & Jackson, 2004; Hoffman, 2000). The "functional architecture" of human empathy encompasses several components, including affect sharing, self-other awareness, regulatory processes, and perspective taking (Decety & Jackson, 2004). Among these, affect sharing or the ability to emotionally resonate to other's emotions seems to represent the core element of empathy (de Waal, 2006).

Emotional Contagion

Emotional contagion is the tendency to automatically mimic and synchronize facial expressions, vocalizations, postures, and movements with those of another person and, consequently, converge emotionally with the other (Hatfield, Cacioppo, & Rapson, 1994). It is a social phenomenon of shared emotional expression that given its automaticity occurs at a basic level outside of conscious awareness.

From infancy, complex facial motor patterns permit infants to match facial emotion expressions with others (e.g., Field, Woodson, Greenberg, & Cohen, 1982; Haviland & Lelwica, 1987). Very young infants are able to send emotional signals and to receive and detect the emotional signals sent by others. Shortly after birth, healthy infants convey facial expressions of interest, sadness, and disgust (Field, 1989).

The automatic mapping between self and other is supported by considerable empirical literature in the domain of perception and action, which has been marshaled under the prominent commoncoding theory. This theory claims that somewhere in the chain of operation that leads from perception to action, the system generates certain derivatives of stimulation and certain antecedents of action that are commensurate in the sense that they share the same system of representational dimensions (Prinz, 1997). The core assumption of the common coding theory is that actions are coded in terms of the perceivable effects (i.e., 1058 J. Decety and M. Meyer the distal perceptual events) they should generate.

Motor Patterns and Sensory Effects

Performing a movement leaves behind a bidirectional association between the motor pattern it was generated by and the sensory effects that it produces. Such an association can

then be used backward to retrieve a movement by anticipating its effects (Hommel, Musseler, Aschersleben, & Prinz, 2001). These perception–action codes are also accessible during action observation, and perception activates action representations to the degree that the perceived and the represented actions are similar. Such a mechanism has also been proposed to account for emotion sharing and its contribution to the experience of empathy (Decety, 2002; Decety & Jackson, 2004; Preston & de Waal, 2002). In the context of emotion processing, it is posited that perception of emotion activates in the observer the neural mechanisms that are responsible for the generation of similar emotion. It should be noted that a similar mechanism was previously proposed to account for emotion contagion. Indeed, Hatfield et al. (1994) argued that people catch the emotions of others as a result of afferent feedback generated by elementary motor mimicry of others' expressive behavior, which produces a simultaneous matching emotional experience.

Neurophysiological evidence for this perception–action coupling comes from electrophysiological recordings in monkeys in which a unique class of visuomotor neurons have been found in the ventral premotor and posterior parietal cortices. These neurons, called mirror neurons, are active during a specific motor action and the perception of the same action made by another individual (Rizzolatti, Fogassi, & Gallese, 2001). Evidence for the existence of mirror neurons in humans is more indirect, and principally relies on functional neuroimaging studies that indicate that the neural circuits involved in action execution overlap with those activated when actions are observed (Blakemore & Decety, 2001; Decety & Grezes, 2006), as well as transcranial magnetic stimulation (TMS) and motor-evoked potentials (MEP) studies that show changes in the excitability of the observer's brain regions that encode the execution of observed actions (Fadiga & Craighero, 2004). This shared neural network

for action production and observation includes the premotor cortex, the inferior frontal gyrus, the parietal lobule, the supplementary motor area, and the cerebellum. Recent neuroimaging experiments demonstrate that the mirror–neuron system is flexible, and that experience and motivation modulate its functioning.

For instance, regions that belong to the mirror–neuron system showed greater hemodynamic response when hungry participants were presented with videos of people grasping food. In contrast, decreased activity was detected in these regions when participants were in a satiated state (Cheng, Meltzoff, & Decety, 2007). In addition, a number of neuroimaging studies have shown that similar brain areas, pertaining to the same network are reliably activated during imagining one's own action, imagining another's action, and imitating actions performed by a model (Decety & Chaminade, 2003; Decety & Grezes, 2006). For instance, a similar neural network is engaged when individuals observe or imitate emotional facial expressions (Carr, Iacoboni, Dubeau, Mazziotta, & Lenzi, 2003). Within this network, there is greater activity during imitation, compared with observation of emotions, in premotor areas including the inferior frontal cortex, as well as in the superior temporal cortex, insula, and amygdala. Such shared neural circuits reflect an automatic transformation of other people's behaviour (actions or emotions) into the neural representation of one's own behavior, and provides a functional bridge between first and third person perspectives, culminating in empathic experience (Decety & Sommerville, 2003; Sommerville & Decety, 2006).

Resonance

Chemistry is how people resonate, how they respond to one message from their partners with

another. It implies an understanding for a sequence of messages, but it does not necessarily mean an understanding for the other person as a whole. Resonance means one meaningful message, which can be about a thought, feeling or any other information, causes the creation of another meaningful message in return. However, this pro

Emotional Resonance in Development

Emotional resonance is the first element of empathy to appear during ontogeny. It can be seen in the newborns' contagious crying reactions to the cry of another newborn (Field, Diego, HernandezReif, & Fernandez, 2007; Sagi & Hoffman, 1985; Simner, 1971). It has been hypothesized that later in development, this initial pure emotional contagion becomes associated with a growing differentiation between self and other, allowing for reactions that are more tuned into the other's state than one's own. Also, the infant is increasingly able to use regulatory strategies for modulating this emotional response to an adaptive level for both the self and conspecifics (Hoffman, 2000). In general, it is considered that only around the age of 18-24 months children manifest such mature empathic reactions (Hoffman, 2000). One of the main arguments is that at this age children pass the classic test of mirror self-recognition which may index the existence of a self-concept. In support of this argument, Zahn-Waxler, Radke-Yarrow, and Wagner (1992) provide some indirect evidence by showing that 23- to 25-month-olds who have higher levels of mirror self-recognition manifest more prosocial behaviors. In the same vein, Kärtner, Keller, Kleis, and Lamm (2004) show that a large percent of those 19-month-old children who manifest helping behaviors toward a distressed adult also recognize themselves in the mirror.

However, the perception of other's emotions induces in the observer a matching affective state as early as few days after birth, with newborns manifesting increased facial and vocal distress in response to the cry sound of another infant (Field et al., 2007; Martin & Clark, 1982; Simner, 1971). Later in infancy, these affective resonance responses to others' emotions seem to persist. Haviland and Lelwica (1987) have shown that the perception of mother's expressions of joy and anger induces in 10- week-old matching affect states. Importantly, in this study, the perception of persistent anger, but not positive emotion, resulted in increased affect sharing in half of the sample. Other's negative emotions (e.g., the pain cry of another infant) induce facial anger and sadness in 1-, 3-, 6-, and 9-month-old infants (Geangu, Benga, Stahl, & Striano, 2010), and toddlers (Spinrad & Stifter, 2006). Similarly, this type of stimulus triggers negative emotional reactions evident in both facial expressions and cardiac reactivity in kindergarten and school age children as well (Fabes, Eisenberg, Karbon, Troyer, & Switzer, 1994; Zahn-Waxler, Friedman, & Cummings, 1983). Independent of empathy research, investigations concerning the ontogenesis of a sense of self suggest that well before the age of 2, children develop a perceptual protorepresentation of the body which allows them to differentiate between self and others (Rochat & Striano, 2000). Infancy is also the time for important developments of regulatory mechanisms (Calkins & Hill, 2007; Kopp, 1982).

One might thus reasonably think that the emotional resonance to another's distress as it is documented in infants might be interconnected with these other abilities. Scattered evidence supports this line of thought. Newborns discriminate between their own cry and the cry of another (Dondi, Simion, & Caltran, 1999), and express more emotional contagion in response to the cry sound of a peer than in response to their own cry (Simner, 1971). Further, infants who better regulate their emotional arousal at the age

of 4-months, show reduced affect sharing in response to a peer's distress at the age of 12 months (Ungerer, Dolby, Waters, Barnett, Kelk, & Lewin, 1990). It thus seems that early emotional arousal is not pure contagion, rather it is associated with an awareness of the source of distress, and it might be regulated. The present study is designed to further investigate possible relations between emotional resonance to another's distress, self-other differentiation, and emotion regulation during infancy.

Around the age of 5-months there are signs of intermodal matching between proprioceptive and visual determinants of limb movements. At this age infants prefer to watch a video display of their own or of another infant non-contingent hand or leg movements, but not a video display of their own contingent hand or leg movement (Bahrick & Watson, 1985; Rochat & Morgan, 1995). Seven- and 9- month-old infants seem to require less information about motion (Schmuckler & Fairhall, 2001), and less perfect timing (Zmyj, Hauf, & Striano, 2009) for establishing such a contingency, and they manifest a propensity for social initiatives towards others compared to their own image in the mirror. In conjunction, these data suggest that infants at this age do show a perceptual discrimination between self and others, even if they don't necessarily construe a representation of their own image (Rochat & Striano, 2002). It is also around the age of 9-months, that children begin to understand others as having different intentional states than their own and to act upon them (Tomasello, 1995).

Observing Chemistry

What we mean by 'chemistry' is something that can be observed and empirically observed. The agreement among different people on whether there is chemistry in an interaction is quite

remarkable, as any discussion on chemistry between celebrities will attest to. We just know it when we see it. Humans are very good at observing the quality of an interaction, even if they cannot explain why. This is one reason why children who are exposed to unhealthy or even destructive communication between their parents do remember that the interaction was unhealthy or destructive. Since they are more likely to remember their own emotional reaction to the interaction than the details, what might get stored in the brain is that interactions between adult men and women can be scary and unhealthy. It then requires additional information to clarify that while this might be true in some cases, it is not the case in general. Reflecting on the details and the differences in interactions, can make the world more predictable again. Over time we learn that easy mutual understanding and enjoyable engagement on one level, 'chemistry', is only part of the story of relationships.

Positive Feeling

Chemistry is an enjoyable engagement in communication in one area, very much like a game of tennis, an emotional back and forth between two people. There may be losers, when they become conscious of their chemistry or get lost in the emotionally charged exchange. The partners respond to minute details, mostly in the realms of nonverbal communication, that may never be expressed in words. The exchange itself is largely unconscious, unlike the emotions it may trigger in each of them. People can have amazing chemistry to the eyes of an observer, without realizing it consciously. Chemistry is largely an automatic process, and the inherent spontaneity would get lost if people were to try to do it consciously.

Awareness

Becoming aware of one's chemistry with someone else can reveal important information about oneself and the other person. Asking what makes for the special chemistry often reveals shared parameters of who we are as persons. This can be valuable insight, but it needs to be made conscious. If this is possible, chemistry can be a stabilizing and maintaining factor in a relationship and can give it a more specific future.

Basic Parameters

Seeing one's values, needs and aspirations fulfilled in the relationship with another will generate a better feeling, and since these basic parameters change little in the long run, they can also make a relationship more sustainable. The Basic Parameters influence the emotions and also thought processes. If one engages in a task one likes, one feels more satisfied and happy than if one does not.

The resonance in chemistry means there is some alignment between the basic parameters of each person, at least on an unconscious level as they determine much about our communication with others. Communication styles, patterns, and the willingness to communicate depend on these basic parameters. Since communication today evolved from yesterday's interactions with others how an individual 'decided' to communicate in the past influences today's communication patterns and styles. Chemistry is thus influenced by the basic parameters.

The Self

A better sense of self can make chemistry. The better the sense of self is the easier it is to connect with others. If one has a better opinion

of oneself, the readings of another person are better. If one is suffering from depression or anxiety, the interpretation will be distorted by feelings that are associated with depression or anxiety.

Chemistry is an alignment of information processing systems. The self plays a role because it is where the high information density gives rise to a feeling of centre. The development of a sense of self is a very dynamic process that starts early in infancy, and encompasses several aspects related to forming a primary representation of the bodily self and having a sense of self as a physical agent, as well as differentiating between self and others as intentional agents (Gergely, 2002; Rochat & Striano, 2000). The early ability to discriminate the bodily self from others is based on an implicit intermodal body schema (Rochat & Striano, 2000) that integrates information related to bodily space (Bahrick & Watson, 1985; Schmuckler & Fairhall, 2001), intermodal timing (Rochat, 1998; Rochat & Morgan, 1995), and intermodal forms of action (Rochat & Striano, 1999a). Newborns are successful in discriminating between self and other produced tactile stimulation (Rochat & Hespos, 1997), and in altering self-produced action in order to obtain a certain outcome (i.e., to hear or see their mother) (DeCasper & Fifer, 1980). By the age of 2 months, infants become sensitive to the relative matching of proprioception with other perceptual modalities, and seem to detect links between their sucking actions and the auditory consequences of this action, based on spatial and temporal matching (Rochat & Striano, 1999b).

The discrimination between the self and others is important for the experience of chemistry because it requires a sense of self to also recognize another person as another self, which shares the same basic communication processing machinery but is different in how these processes have evolved over time. It is the combination of this

sameness as well as the differences which gives rise to attraction.

Metacognition

Metacognition refers to the ability to think about thinking, a capacity which clearly is a precondition for the ability to tell a coherent and reflective story about oneself in the world. Of note, it shares a considerable amount in common with terms such as “mindreading,” (Dimaggio et al., 2008) “theory of mind,” (Brune, 2005) and “mentalizing” (Fonagy, Gergely, Jurist & Target, 2002) all of which refer to a person’s general capacity to think about thinking. We therefore consider it an umbrella term that describes a wide range of internal and socially driven cognitive acts which contain primarily reflexive qualities (Semerari et al., 2003).

Since much of the dynamics in chemistry are outside the momentary reaches of conscious awareness, it is primarily the past engagement in metacognition which plays a role in present dynamics of interpersonal chemistry.

Metacommunication

Metacommunication is how one communicates about communication. This can play a role in the moment when there is a dynamic of chemistry. It is how one communicates internally and externally about the own communication flows. This is also where an important sense of the self arises.

Happiness

Emotional understanding can make us happier because we feel understood while noting the effect we have on the other person, and thereby

the effect we have in the world. It reaffirms the sense we had as children of a magical world, in which we have a secret key to its mysteries. It brings us back to a time when the world only consisted of us and our parents. Chemistry can bring about a joy of mastery of emotional communication and connection with the world around us, which we felt as children, but have learned to disassociate ourselves from since. It is the little world of connectedness in the bigger world which makes us content and happy. Acknowledging this means realizing that we can ‘make chemistry’ if we would like to get emotionally closer to another person. We just have to tear down the walls that make it difficult to receive and decode messages from other people, to be interested with an inquisitive mind and a feeling heart. Then, in every closer interaction we can relive this sense of connectedness from our childhood, expand it into the world of adults and make it part of our expectations about the future.

Into the Future

Even though chemistry does not make a relationship, openness in communication is something that helps a relationship prosper. Chemistry can be seen as a signal that an important requirement in a relationship is fulfilled. However, this means that there are still other factors that need to be fulfilled for a relationship.

A relationship requires a benefit for both partners. This benefit may consist of positive feelings when the relationship comes to mind, for example. This emotion can be brought about by good chemistry as the latter allows for a more optimal communication.



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