

Chapter 1

Contemporary theories and concepts in psychology of emotions

Is emotion more than a chapter heading?
Bentley, 1928

*Everyone knows what an emotion is,
until asked to give a definition.
Then, it seems, no one knows.*
Fehr & Russell, 1984

1.1. Introduction

Following the decisive change of the 1980s which was marked by a veritable explosion of scientific study of emotion, emotion is now considered to be a determining explanatory factor in human behavior. In this context, it seems important for any area of research into the functioning of psychological processes and their modeling, as is the case in informatics, to consider current theories and concepts in psychology of emotions [SAN 09a, SAN 09b]. The central role of emotion in the cognitive system is illustrated by the fact that emotion occupies a “privileged status” in the human brain [DAV 04]; the majority of psychological mechanisms are either necessary for emotion as such, or influenced by emotion or involved in regulating emotions. However, as these above quotations suggest, conceptual precision of emotion remains a problem [ALV 02], so much so that there are almost as many definitions of emotion as there are theories or researchers working on this topic [KLE 81, STR 96]. In this introductory chapter, we will present the main contemporary theories and concepts of emotion touching on the notions established towards the end of the nineteenth century in which modern approaches are rooted. For each major current theory, we will present its premise, its main assumptions, and its characteristics, as well as the criticisms which have been aimed at it. As we will see, there is huge variation in the contribution to discovering the functional architecture of emotional mechanisms which consists in characterizing the functional sub systems responsible for the different stages of processing needed to produce emotions and specifying the organization and interaction of these sub-systems [FEL 2005, KOR forthcoming, SAN 02].

1.2. Emergence of a scientific approach to emotions

1.2.1. *The emotional sequence: James-Lange versus Cannon-Bard*

The first ‘scientific’ emotional theory was proposed by William James in 1884 [JAM 84] and Carl Lange in 1885 [LAN 85], who each separately proposed a revolutionary “peripheralist” approach to emotion. This first theoretical conception was the focus of great controversy concerning the mechanisms responsible for triggering emotional feeling (the “sequence problem” [CAN 77]). According to James and Lange, what had previously been considered as the consequence of an emotion, they now considered to be the cause. According to them, the elicitation of a particular emotion is determined by the perception of a specific *peripheral* arousal pattern, i.e. we experience fear because we are trembling. It should be underlined that, according to James, this definition of emotion is only applicable to emotions which accompany a “specific physical reaction” and not all emotions, resulting in misinterpretations of this theory in later years. In 1885, Lange [LAN 85], summarized the problem of their theory in the following way: “If I begin to tremble because I am threatened by a loaded pistol, does first a physical process occur within me, does terror arise, is that what causes my trembling, palpitation of the heart, and confusion of thought; or are these bodily phenomena produced directly by the terrifying cause, so that the emotion consists exclusively of the functional disturbances in my body?” Clearly, the second position is the one supported by James and Lange. However, whilst their proposition was in complete conflict with the general consensus and traditional concepts of emotion, these authors recaptured the time-honored idea that each emotion has its own *pattern* of physiological changes [RIM 86]. It should be noted however that James’ opinions were much more nuanced than this with regard to emotion appraisal theories as we will see later in the chapter [ELL 94].

In contrast to this, the so-called “centralist” approach to emotion, supported by Cannon [CAN 27] and Bard [BAR 28], sees the triggering of a specific emotion as being determined by processing a stimulus in the “central” nervous system with the peripheral arousal *pattern* being neither specific nor causal. This theory therefore highlights the importance of the central nervous system, specifically the thalamus, in triggering a given emotion. As such, the physiological changes are not considered to be a cause, but rather a consequence of emotion. Cannon raised numerous objections to the James-Lange theory and carried out a number of empirical studies which aimed to disprove it; for example, he observed that similar diffuse visceral reactions occur with a number of emotions as well as in non-emotional states (i.e. digestion or fever); he also reported that suppressing visceral afferents did not suppress emotions [CAN 27]. However, as Fraise [FRA 63] has notably found, the criticisms raised by Cannon were not without fault and therefore did not warrant an outright rejection of the James-Lange theory [FEH 70].

The theories of James-Lange and Cannon-Bard, both based on a physiological approach but radically opposed with regard to their conception of the temporal sequence of emotion, have had a considerable impact on research on emotion, by initiating on the one hand research into the causal relationship between physiological changes and emotion and on the other, studies into the importance of “cognition” in emotion. The James-Lange theory has had a revolutionary effect due to the originality of the concepts that it proposed as well as for the fact that it was empirically testable and therefore, refutable. Their theory has also strongly influenced current researchers into emotion. Today, Damasio’s theory of somatic markers [DAM 94] revives the James-Lange idea of the causal role of physical changes in emotion by hypothesizing that there are “somatic markers”, i.e. physiological reactions associated with past emotional events. These markers are supposed to be activated when a new event is processed and would influence decisions in relation to their potential consequences. On the other hand, James’ theory could be considered to be the basis of the facial feedback theories of emotion, which assume that facial movements regulate emotional feeling. As James himself wrote in 1892 [JAM 92], “every voluntary and dispassionate display of what we believe between the manifestation of a specific emotion should produce this emotion in us”. Embodiment Theories of Emotion [NIE 07] have also been influenced by the James-Lange theory since they propose that cerebral representations of a given emotion involve retesting perceptive, motor and somato-sensory components in relation with this emotion.

The importance of the James-Lange/Cannon-Bard debate surrounding awareness of the role of cognition in emotion is illustrated by the work undertaken by Shachter who is among one of the most influential pioneering contributors in the field of affective sciences.

1.2.2. *Schachter's two-factor theory*

According to Schachter's bi-factorial theory [SCH 64], an emotion is determined by an interaction between two components: a physiological arousal and a cognition regarding the recognition to the situation triggering this physiological arousal. As such, physical arousal is considered to be undifferentiated by nature, diffuse and non-specific to an emotion in determining the intensity but not the quality of the emotion. The interpretation of the situation would lead to the identification of the emotion felt. Schachter and Singer [SCH 62] wrote that "it is cognition which determines whether the physiological state of arousal will be labeled as "anger", "joy", "fear" or "other". Schachter and Singer therefore share James-Lange's idea that a physiological arousal is necessary in order for an emotion to be produced whilst also agreeing with Cannon-Bard that physiological changes are not specific to a particular emotion (whilst they do not exclude the possibility of physiological changes differing according to the emotion, they believe that these differences would be too subtle to have a psychological effect). Note that the temporal coincidence between the two components is not a sufficient condition for triggering an emotion: the person needs to establish a link between the physiological arousal and a relevant explanation for the latter. Schachter and Singer's famous experiment [SCH 62] is typically cited as fundamental experimental proof of this theory. This has essentially suggested that when a person does not have information likely to explain why he/she is physically stimulated, he/she rely on information available from the situation and context in order to make sense of their physiological arousal (which in this experiment was triggered by an injection of Epinephrine). However, when the person is not in a particular state of physiological arousal (without an injection of Epinephrine), or where he/she has an adequate explanation for it (information on the consequences of the injection of Epinephrine), they will not look for factors in the environment which explain this arousal. The effects predicted by Schachter and Singer's proposition are not however systematically observed (see [REI 83] for a review of experiments in the same vein as Schachter and Singer). On the other hand, the component determining which stimuli trigger the physiological arousal in the first place is not specified; this theory therefore does not explain the emotion triggering process.

Schachter, by introducing the existence of a cognitive component associated with physiological arousal as a determinant of emotion quality, is clearly one of the forerunners of a cognitive approach to emotions. Furthermore, his theory has the advantage of considering the social dimension of emotion since emotion stems in part from the use of information taken from the social environment. Another theoretical trend, falling within the evolutionary perspective, has also highlighted the social dimension of emotion by focusing specifically on the communicative function of emotions through their expressions.

1.3. Basic emotions theories

1.3.1. *Premises of basic emotions theories*

Some theoreticians with an evolutionary perspective, who believe that evolution has played a central role in shaping the emotions' characteristics and functions, have stressed the notion of emotions adaptation. These characteristics and functions appeal to programs which govern the body's major systems such as physiology, the motor system as well as numerous cognitive mechanisms such as attention, learning or even memory; emotion is therefore a high level organizing process [COS 00]. Matsumoto and Ekman [MAT 09] define emotions as "transient, bio-psychological reactions designated to aid individuals in adapting to and coping with events that have implications for survival and well-being". Within the framework of Izard's theory of differential emotions, emotions constitute the primary motivational system of human behavior [IZA 09]. Following attention on the adaptive character of emotions, some researchers have suggested the existence of a limited number of fundamental universal emotions, each having an evolutionary function: "basic emotions", or alternatively "primary", "fundamental" or occasionally "discrete" emotions [EKM 82, IZA 77, TOM 80]. The majority of authors who adopt this approach consider anger, fear, joy, sadness and disgust to be basic emotions, although this is a contentious subject, in particular with regard to surprise. More complex emotions would originate as a mixture of these basic emotions [ORT 90]. This theoretical approach is based on the key discoveries of Darwin in terms of the facial expression of emotions [DAR 72]. In his book, *The Expression of Emotions in Man and Animals*, Darwin describes emotional facial expressions as innate and universal and emphasized not only their communicative function but also their evolution in relation to the direct environment. However, note that this notion of basic emotions had already been suggested by Descartes [DES31] who distinguished six primary

emotions including admiration, love, hatred, desire, joy and sadness, with all other emotions being composed of these six or other forms of them.

1.3.2. *Characteristics of basic emotions*

Basic emotions, according to Ekman [EKM 92], the current most important proponent of this view, are characterized by a set of properties. Above all, basic emotions are different from other types of emotions such as, for example, pro-social or moral emotions [MAT 09]. However, basic emotions would share common properties. As such, a basic emotion would be present in non-human species, be triggered rapidly and automatically, and appear spontaneously and for a short duration. Furthermore, it has specific trigger conditions. As previously mentioned, if, according to this approach, emotions are considered to have evolved to respond to fundamental tasks for survival which present a phylogenetic adaptive advantage, then it is logical to believe that there are distinct universal trigger events for basic emotions (e.g. the loss of a loved one would be a universal condition triggering grief).

Moreover, a basic emotion would have specific autonomous *patterns* [see EKM 83 for a view on how emotions can be differentiated on the basis of the activity of the autonomic nervous system). However, empirical studies in this area suffer from a major methodological flaw; inducing strong emotions in a laboratory is almost impossible for both ethical and practical reasons. Consequently, specific and systematic differences for different emotions have rarely been possible to demonstrate. Stemmler, Heldmann, Pauls and Scherer [STE 01] who have studied the psychophysiological responses induced by fear and anger in an ecologically-valid framework, avoiding this difficulty, report that patterns of emotional responses studied did not overlap. Even if the empirical arguments remain limited overall, it seems justifiable to argue in favour of the existence of typical emotional *patterns* linked to action tendencies characterizing major emotions such as fear and anger. This reaction of the autonomic nervous system, which may originate in appraisal, is particularly functional if we consider the role of emotion in preparing for actions adapted to a particular situation.

Furthermore, basic emotions would have specific neural patterns. Today, the majority of research on emotion in cognitive neuroscience is focused on researching the specific cerebral regions which elicit basic emotions. There is, as such, a corpus of data suggesting that signals linked to fear are processed by the amygdala (see Öhman and Mineka's suggestion of the existence of a "module of fear" [OHM 01]), while the signals linked to disgust are processed by the insular cortex [CAL 01]. As such, a major writer in the field of affective neuroscience, Joseph LeDoux, has written that "different classes of emotions are underpinned by separate neural systems" [LED 96]. Equally, reinforcing this modular approach, Öhman [OHM 99], concludes that the "different emotional systems have different evolutionary histories and deserve to be seen as independent rather than parts of a general area of emotion".

Finally, basic emotions would have specific expressive patterns, perhaps their most important characteristic, since neo-Darwinian theories are essentially focused on determining basic emotions by studying emotional facial expressions (see figure 1.1). Facial expressions are considered by Ekman as the pivot in communication between human beings [EKM 89]. Nevertheless, it seems that, as Darwin proposed, emotional facial expressions are also formed through interaction with our physical environment. As such, Susskind and colleagues [SUS 08] have shown that the facial expression of fear allows, in direct opposition to the facial expression of disgust, to increase sensory acquisition (through opening the eyes, the nose and mouth). Again, the adaptive value of such configurations seems clear. For Izard and King [IZA 09], expressive behavior is also fundamental in child development because it contributes to the emergence of interpersonal skills and encourages appropriate social behavior. Ekman et al are however focused on demonstrating, in the majority of their work, the universality of emotional facial expressions. They have notably been able to demonstrate that western facial expressions were well recognized in a preliterate New-Guinea culture, which had had very little contact with the outside world, therefore excluding the possibility that the people of this culture had learnt to recognize the expressions of other populations [EKM 71].

Figure 1.1. Representation of the facial expressions considered to be characteristic of basic emotions. Figure taken from Matsumoto and Ekman [MAT 09].

The seven basic emotions and their universal expressions



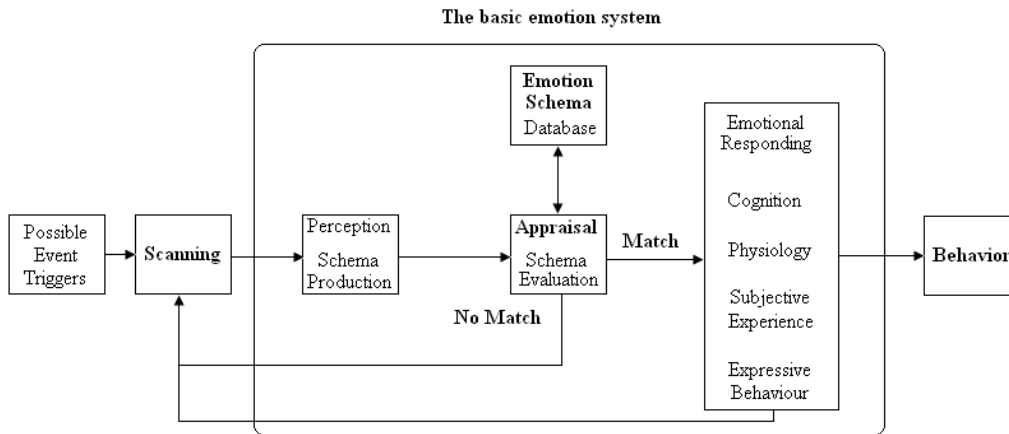
1.3.3. Criticisms of basic emotions theories

The notion of basic emotions is a concept which has given way to important discussion in the field of affective sciences and has been the object of rigorous criticism. According to Mandler [MAN 84], restricting the numerous possibilities which can result from the appraisal of events, a mechanism supposed to be responsible for emotional genesis, to a limited number of emotions makes little sense. Some academics even deny the existence of the categories making up these basic emotions [ORT 90, WIE 92]. Scherer [SCH 93b] adopts a much more nuanced position in his view that the structure of emotions is not only more flexible, but also much more varied, as is proposed within the basic emotions theories framework. He also suggests the term ‘modal emotions’ to designate frequently triggered emotions following other similar views of appraisal, a process again considered to be an emotional trigger. Nevertheless, as will be made clear in the rest of this chapter, the depth of emotional states that his model proposes is much vaster.

Furthermore, basic emotion theoreticians typically maintain that emotional facial expressions result from neuromotor programs which trigger the emotional facial expressions in their entirety, with the different facial muscles employed for this expression having their apex simultaneously. However, in contrast with this view, some supporters of appraisal theories of emotion believe that the results of appraisals can be linked to specific facial movements [SCH 92, SMI 97]. As such, evaluating an event as an obstacle to our goals would be linked to activity in the *corrugator supercilii* muscle which allows frowning. Thus, it would be possible to predict which facial changes will be produced as a result of specific types of evaluations. These changes would be added to the appraisal process as and when they happen and could produce a final configuration similar to the prototypical configurations proposed by basic emotions (see figure 1.1). The conceptualization of the expressive process proposed by Scherer and Smith emphasizes the dynamic nature of emotional facial expressions and enables experiments to better understand the underlying mechanisms in the expression and the recognition of emotional facial expressions [SAN 07, WEH 00].

Besides facial expression, the premise of functionally independent modular systems specific to each emotion has also been criticized. The amygdala could be thought of as a “relevance detector”, not specific to fear [SAN 03]. Furthermore, an increasing amount of empirical evidence suggests that the insular cortex would not be specifically linked to disgust [SCH 02] but would be involved in a number of processes based on interoceptive information (for further details concerning cerebral bases, refer to chapter 2).

Let us note finally that even if it seems reasonable to think that peripheral psycho-physiological responses differ, this does not constitute an argument in favour of basic emotions theories. This physiological reaction could come from the appraisal of a situation and not a reflex-like program. However, that basic emotions theoreticians have integrated a version of the idea of appraisal by proposing the existence of an *autoappraiser*. This refers to an automated appraisal system, integrated in a “basic emotion system” (see figure 1.2), proposed



as a mechanism triggering emotions [EKM 04b, MAT 09].

Figure 1.2. Representation of the basic emotion system.
Figure taken from Matsumoto and Ekman [MAT 09].

1.4. Bi-dimensional theories of emotion

1.4.1. Premises of bi-dimensional theories of emotion

Scientific literature, as is often the case in everyday life, frequently refers to categories such as joy and fear. However, according to Feldman-Barrett [FEL 06], establishing emotional categories such as fear or anger “now presents a major obstacle to understanding what emotions are and how they work”. Feldman-Barrett suggests that emotional responses do exist, that they may be functional and are very likely the result of evolution. However, this does not necessarily mean that *anger*, *sadness* and *fear* are useful categories. In order to support this critique, Feldman-Barrett in adopting a different research tradition, a dimensional approach, in which the affect is described in relation to independent elementary dimension which are core phenomenological properties in affective experience [RUS 99], dimensions which can be combined. Current dimensional theories are based on the general idea of Wundt’s theory [WUN 97] about emotional experience, which identifies three basic dimensions to describe the emotional feeling (pleasure/displeasure, excitement/inhibition and tension/relaxation). The emotional feeling may be permanently represented on a more or less important level on each of these three dimensions. According to the model proposed by Russell [RUS 80], it is possible to represent emotions using a circle in which two axes alone are necessary: the dimension of valence indicating pleasure/ displeasure and the arousal dimension (weak/ strong) which represent the affect as a subjective experience on a continuum [FEL 99] (see figure 1.3). This circular model is called circumplex and corresponds to a mathematical formalism to represent the current structure of a group of stimuli around a circle [FEL 09]. Currently, this approach is probably the most commonly used for measuring subjective emotional experience [FON 09]. This representation is found in different cultures and would potentially be universal, although this is not always confirmed by empirical data. [TER 03].

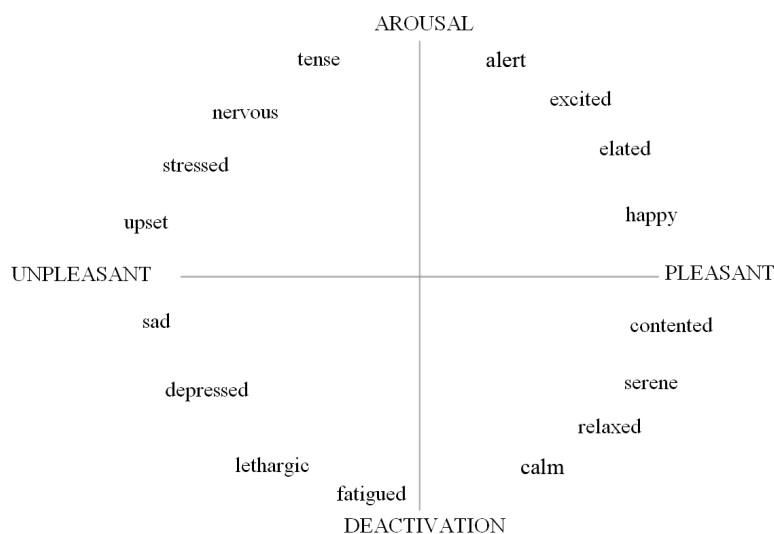


Figure 1.3. Representation of the circumplex model with the horizontal dimension indicating valence and the vertical dimension indicating arousal. Figure taken from Feldman-Barrett et Russell [FEL 09]

1.4.2. Criticisms of bi-dimensional theories of emotion

Some have criticized the ability of this model to differentiate between emotions; for example, fear and anger are found in the same place in the circle because both of these emotions are particularly negative and intense. However, on a subjective, expressive and behavioral level, these two emotions are very different. Being based on verbal reports, this breakdown considers that the affect's structuring overlaps the structure generally underlying language. This model, which seeks to distance itself from common language categories such as fear or anger, therefore displays a paradox.

On the other hand, there is no real consensus on the elementary dimensions proposed in different dimensional models, and some authors include, in addition to the dimensions of valence and arousal, a dimension of control [OSG 62]. For others, it is the dominance dimension, conceptually very close to that of 'control' or 'coping', which should be included [MEH 96]. Others, such as Duffy [DUF 41] propose that emotions can be reduced to the notion of 'energy level'. Fontaine, Scherer, Roesch and Ellsworth [FON 07] have however demonstrated that for English, French and German, four dimensions are necessary to satisfactorily represent the similarities and differences in meaning of emotional words when the different emotional components are accounted for and not simply verbal accounts. The majority of authors who currently adopt this reduced set of complex data representing the emotional experience in elementary dimensions focus on the two dimensions of valence and arousal. According to Russell [RUS 03], "the finding of two broad dimensions is so ubiquitous, and current descriptive models so similar, that the word consensus is now appearing in writings on this topic (Watson et Tellegen, 1985)".

Furthermore, Cacioppo, Gardner and Berntson [CAC 97], propose that the evaluative processing of stimuli with regard to their valence is not bipolar (and therefore not a continuum), but that distinct evaluative and motivational systems would underlie the evaluation of the positive or negative character of a stimulus. Beyond these alternative approaches, researchers such as Watson and Tellegen [WAT 99] call into question the validity of the bi-dimensional approach of emotion since "Russell's own data indicated significant problems with the model". Russell and Carroll [RUS 99] responded to this criticism by admitting that their model was only an approximation but still a "convenient and heuristic one, the best we know of". The heuristic character is however also debatable, this approach being centered on a specific aspect of emotion, namely subjective feeling, and only makes brief reference to other, no less trivial, emotional components, such as elicitation mechanisms.

However, “emotions are adaptive responses to the world, not simply abstract sensations, as dimensional theories insinuate” [ELL 03].

One of the major problems with this approach is probably the lack of agreement on a clear definition of the concepts used. Reisenzein [REI 94] highlights that there are at least four different theoretical viewpoints with regard to emotional intensity within bi-dimensional theories of valence/ arousal which assume the independency of these two dimensions. The most common position argues that emotional quality is determined by a combination of specific values of pleasure/displeasure and arousal/calm; this however does not explain emotion intensity nor does it account for emotions characterized by the same combination valence/arousal but with different intensities. The second position, which could be seen as an attempt to compensate for this problem, adds the dimension of intensity to that of valence and arousal; nevertheless, this does not prove more satisfactory because the intensity dimension is unspecified (is it the intensity of pleasantness, arousal or both?). A third conceptualization suggests that emotional quality is determined by the valence dimension whilst emotional intensity is determined by the arousal dimension. Finally, a fourth proposition, which could itself be further divided into two sub-propositions, hypothesizes that both emotion quality and intensity will be determined by the valence and arousal dimensions. Beyond this conceptual ambiguity, the significance given to some concepts is neither justified theoretically nor empirically. For example, the *core affect*, defined by Russell [RUS 03] as a neurophysiologic state, which can be unconsciously accessed, as a feeling reflecting an integral mixture between the feelings of valence (pleasure/displeasure) and arousal (asleep-activity), is conceptualized as “primitive” by Russell and Feldman-Barrett although no empirical study has proven this proposition.

1.5. Appraisal theories of emotions

1.5.1. Premises of appraisal theories of emotion

The appraisal approach of emotions was developed along two lines: the first conceptualizes emotion as an information processing system just like any other mechanism [OAT 87, THA 02]; the second approach supposes that an evaluative type of cognitive processing (appraisal) is at the root of emotion elicitation. It is this second approach that we will examine further.

Despite the popularity of Ekman’s view of basic emotions, appraisal theories of emotion dominate the field of study in terms of how emotions are generated and differentiated from one another. These theories propose in effect that the evaluation that the individual makes about a stimulus, event or situation determines the elicitation of an emotion [SAN 05, SIE 07]. These models propose that organisms constantly explore their environment, reacting to relevant stimuli. The major contribution of these theories has been the specification of a set of standard criteria which are presumed to underpin the emotional appraisal process. When an event occurs, an individual would evaluate the relevance of this event based on a specific number of criteria. Most theoreticians agree on the evaluation criteria of novelty, intrinsic pleasantness, predictability, goal-relevance, the possibility of managing consequences of the event (or coping potential) and the compatibility with personal or social norms (or normative significance) [ELL 03]. The combinations of these evaluations, which are often automatic and unconscious, [KAP 01, MOO 07, MOO 09, MOO 10], would lead to different emotions. The idea that each different evaluation structure corresponds to a different emotion was originally proposed by Arnold [ARN 60], considered to be the pioneer of appraisal models [ARN 60]. Her idea has since been adopted and elaborated by other scholars [ROS 84, SCH 84b, SMI 85, FRI 86]. The work of Arnold [ARN 60] has contributed much to the significance attached to the “appraisal” mechanism in affective sciences today. It currently seems well established that different emotions can be described in terms of different *patterns* of appraisal with various experiments corroborating this idea [FRI 87, SCH 93b, WEI 85]. Note that in 1894, William James declared that “as soon as an object has become thus familiar and suggestive, its emotional consequences, *on any theory of emotion*, must start rather from the total situation which it suggests than from its own naked presence”.

Appraisal [ARN 60, LAZ 66, LAZ 84], is the most commonly used term to describe the cognitive process which elicits emotion. Lazarus equally talks of “transaction” [LAZ 84] because he proposes that emotions stem from the mutual influence of a person and their environment [LAS 78]. Lazarus [LAZ 68] conducted a series of studies aiming at discovering the determinants of the appraisal process, following which he identified primary appraisal, secondary appraisal and re-appraisal. Primary evaluation involves recognizing a stimulus and its

significance for the individual's well-being whilst secondary appraisal is related to analyzing the resources that individual can use to respond to the situation. Re-appraisal is a process allowing modifications to the primary and/ or secondary appraisal while the interaction between the individual and their environment occurs. Lazarus' proposition that there is significant variability in environment interpretation according to individuals, resulting in emotions being characterized by a large degree of variability, is found in modern appraisal theories. His idea that emotion is a continual process is also widespread today.

1.5.2. *Specific models of this theoretical trend*

Frijda [FRI 06] considers emotions to be triggered by significant events which are defined as occurrences which "touch on one or more of the subject's concerns". Note that the word "concern" is here used to mean the mindset of someone "who is particularly interested in someone or something, engaged in something or wants to reach a specific goal".

One of Frijda's contributions to the study of emotion is precisely this notion of "concern", defined as a disposition to desire the occurrence or not of a given type of situation. As such, Frijda considers that emotions are based on evaluating the relevance of events [FRI 86]. According to Frijda, the emotional process is made up of different processing stages which lead to an action tendency – the main component of emotion to his eyes. Action tendency would then allow to respond to the situation [FRI 86]. Frijda considers that emotion involves states of preparation for action which are induced by evaluating events as important to the individual.

For Scherer [SCH 89] who elaborated the component processes model, the appraisal process is a rapid succession of stimuli processing stages (also known as *Stimulus Evaluation Checks* or *SEC*, see figure 1.4) which are at the root of emotion genesis. Emotion is defined as "an episode of interrelated, synchronized changes in the states of all or most of the five organismic subsystems in response to the evaluation of an external or internal stimulus event as relevant to major concerns of the organism" [SCH 01a]. In this context, we will favour the term "emotional episode" rather than "emotional state" to emphasize the dynamic nature of emotion [SAN 09]. Scherer's definition, which emphasizes the notion of synchronized changes in an organism's various sub-systems, allows us to rethink about the emotional sequence (discussed earlier in this chapter) as a question of dynamic interaction between the five components of emotion. This definition also has the benefit of not referring to only one aspect of emotion, which has been a recurrent problem in previous descriptions of emotion. Scherer [SCH 84] proposes that emotion is multidimensional and comprises five components: a) a stimulus or situation appraising component enabling the elicitation and differentiation of emotions, an integral part of the emotional process [CLO 00]. However, as Lazarus has indicated [LAZ 91], there are other components of emotion, such as b) a physiological component (bodily changes); c) a motor expression component both in terms of facial and vocal expression as well as posture and gestures; d) a motivational component including action tendencies (e.g. approaching or avoiding) and finally e) a subjective feeling component reflecting felt emotional experience [SCH 93a, SCH 01]. It seems important to stress this last component because the terms 'emotion' and 'feeling' have often been used interchangeably in the past. Wundt [WUN 97], for example, wrote that "there is no clear demarcating line between feeling and emotion". The majority of researchers in affective sciences agree that feeling is one component of emotion and not emotion as such.

One of the most current and influential approaches in psychology of emotions today is encapsulated by appraisal theories of emotion. As with all basic emotion theories, this approach underlines the adaptive function of emotions. If we compare these two theoretical trends, it seems that basic emotion theories have, in recent years, been influenced by notions from appraisal theories. For example, the significance attached by Scherer to the synchronization of emotional components is also found in the work of Matsumoto and Ekman [MAT 09] and their notion of coordination. They hypothesized that because emotions have developed to help humans to prepare for action, the responses associated with emotion (physiology, expressive behavior, cognitions and feeling) need to be *organized* and *coordinated*. Equally, Ekman [EKM 04a] talks about *auto-appraiser* mechanisms which he explains as follows: "we need to have automatic appraising mechanisms which continually scan the world around us, detecting when something important for our well-being or survival occurs". Whilst Ekman's acceptance of the existence of an *appraisal* process, whether voluntary or automatic, is not new [EKM 77] the formalization of this process within basic emotions theories has never achieved the kind of precision proposed by appraisal theories. The notions that 1) an event needs to be important to the individual

to induce an emotion and 2) the speed of the evaluative process (which can occur rapidly and unconsciously) are two key concepts in appraisal theories of emotions [GRA 09] that seem to be accepted in recent versions of the basic emotion theories.

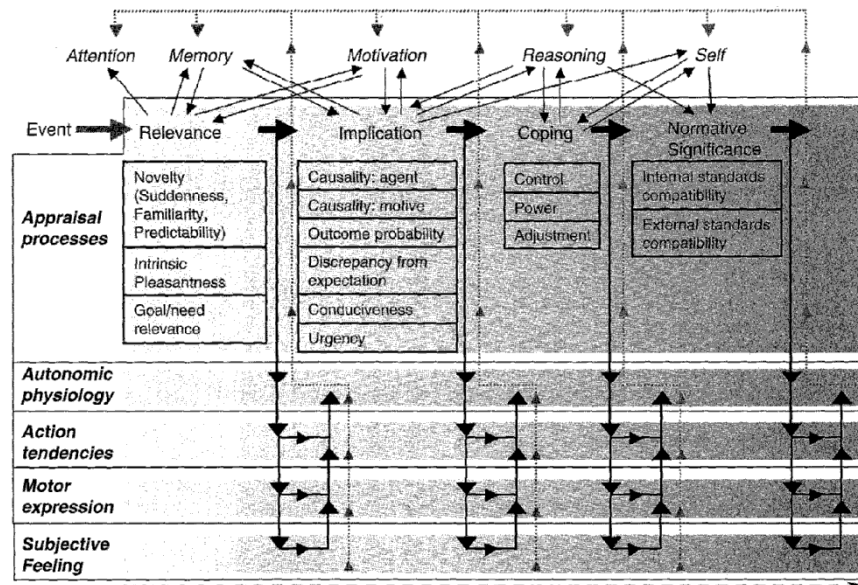


Figure 1.4. The component processes model

However, in contrast to basic emotions and bi-dimensional theories which have say little about emotional trigger mechanisms, emotion appraisal theories have contributed greatly to our understanding of genesis governing mechanisms and differentiating between emotions. These theories have also been highly useful for understanding intra and interpersonal choices, notably cultural and social, in the triggering and differentiation of emotions.

1.5.3. Criticisms of appraisal theories of emotion

The main criticism of these theories is their potentially excessive cognitivism. As such, whilst researchers opposed to this approach accept that appraisal theories explain specific types of emotional reactions, they deny the necessity of this process and propose that in a number of cases, emotions are produced by non cognitive factors [BER 93, LED 93, OHM 78, ZAJ 84]. A key question concerning the "emotion/cognition" debate lies in the definition of the term "cognition" (see glossary). If we accept that appraisal can occur rapidly on several cognitive levels, including automatic and unconscious processes, then the criticism of excessive cognitivism no longer holds up (see [LEV 87] for their proposition of levels of processing in the appraisal process; [MOO 09, MOO 10, ROB 09]).

Another criticism of these theories concerns emotional disorders. For example, for a sufferer of arachnophobia, acquiring the *explicit knowledge* that a spider is harmless, does not stop them from being scared [GRI 04]. The notion of levels of processing therefore seems equally important for responding to this criticism. However, it should be noted that this "multi-level" approach to the appraisal process has also been criticized because the levels proposed could be seen as being too diverse to cover the general concept of appraisal [GRI 04]. One route to explore, which may allow us to understand the different levels of processing in phobias, is perhaps that of divergences (or similarities) in appraising the same experienced, remembered or imagined event without specific information or an imagined event when informed that this situation is extremely likely to make us fearful. Olsson, Nearing and Phelps [OLS 07a] and Olsson and Phelps [OLS 07b] have underlined the

importance of social learning. According to them, witnessing someone being frightened by a given stimulus could trigger a fear response just as strongly than if we had ourselves experienced this stimulus. Today and to our knowledge, no study has systematically compared these four conditions. The experimental studies which have taken place have focused on the appraisal process as an emotional trigger by remembering past emotional events or imagining them (for further information on the methods used, see [SCH 01b]). For both ethical and practical reasons in experimental psychology (for further information on this question, see part one of the *Handbook of Emotion Elicitation and Assessment*, [COA 07,KUP 07a]), methods of inducing natural emotions are not systematically used in psychology of emotions. However, the combination of experimental techniques for manipulating and measuring responses enables precise hypotheses regarding the appraisal process to be empirically tested [GRA 08, LAN 07, SIE 07].

1.6. Conclusion

In 1885, Lange wrote that “we can affirm, without exaggeration that, scientifically, we understand absolutely nothing about emotions, that we do not have a shadow of a theory on the nature of emotions in general, nor of each emotion in particular”. A century later, Frijda [FRI 89] wrote that “there is therefore not a real theory of emotions. By “real theory” of emotions, I mean a theory of the human body or biological systems in general, in which emotion has its own place, among other components such as information processing and adaptation”. However, it should not be mistaken that, during the century which separated these two authors, the study of emotional phenomena was far from abandoned. The same also applies to the conceptual precision of the term “emotion”. As Plutchik remarked in 1980 that the progress made to find a good definition of emotion was not encouraging, a crucial point in the contemporary approach to emotions therefore consists of defining emotion by breaking it into several components. Scherer has therefore proposed a working definition which restricts the use of the term ‘emotion’ only to short periods of time during which the body’s sub-systems are synchronized to produce an adaptive reaction to an event or situation which is relevant for that person (See Scherer [SCH 87, SCH 93b] for a more detailed discussion of this definition). This definition, by its specificity, allows to distinguish emotion from other affective phenomena such as desire, humor, preferences, attitudes or even emotional styles, which represents a major conceptual advance.

Emotions have traditionally been analyzed using a limited list of categories. Basic emotion theories assume that there are a limited number of emotions with an evolutionary status and are in this sense ‘fundamental’. In terms of the bi-dimensional approach, emotions are not seen as forming different categories, rather in terms of the elementary dimensions of emotions such as valence or arousal, which help explain and describe them. Finally, within the framework of appraisal theories, the evaluation of a situation or stimulus according to different criteria is the cause of the elicitation and differentiation of emotions. Consequently, basic emotion and bi-dimensional theories are not suitable for modeling the elicitation of emotional processes.

An area where such progress has had interesting repercussions has been that of emotional modeling [CAN 09, KOR forthcoming, PEL 09, PET 09 PIC 09, TAY 09], currently highly studied, even if this trend has not always existed. For example, as Sander, Grandjean and Scherer [SAN 05] have remarked, modeling neural networks, whilst having been very important in terms of its development in the last thirty years, has neglected the study of emotions (however, see [TAY 09]). However, an advantage of emotional computational analysis is that it encourages academics in affective sciences to develop explicit functional architecture [SAN 02, SAN 05, CLO 09, GRA 09, MAR 09]. The aim remains to develop emotional models which are sufficiently explicit to be tested using computational, neuroscientific and psychological methods.

1.7. Glossary

Arousal: according to Duffy [DUF 62], arousal refers to “a condition conceived to vary in continuum from a low point in sleep to a high point during extreme effort or intense excitement”. Note that arousal is not synonymous with intensity of affect although this mistake is often made in academic writing [BAR 99]. Furthermore, its link with peripheral nervous system activity is neither direct nor linear [BAR 04]. Arousal is proposed as a fundamental dimension of emotional experience (with valence) in Russell’s *circumplex* model which belongs to dimensional emotional models and is probably the most influential of them.

Cognition: whilst the definition of cognition has been a matter of fierce debate (for further details, see Lazarus [LAZ 84] and Zajonc [ZAJ 84]), it seems possible with some consensus to define it as a cognitive process which, either natural or artificial, processes (not necessarily symbolically) information used for acquisition, the organisation and use of knowledge in an explicit or implicit way. This definition is broader than that of Neisser [NEI 67] for whom, the term cognition refers to all processes by which the sensory input is transformed, reduced, elaborated, stored, recovered and used. Neisser's definition appears to be flawed because it excludes the sensorial processes from the field of cognitive sciences, which is a subject of debate.

Emotion: the definitions of this term are so numerous that it seems impossible to cover them all. Here, we will consider emotion to be "a an episode of interrelated, synchronized changes in the states of all or most of the five organismic subsystems in response to the evaluation of an external or internal stimulus event as relevant to major concerns of the organism" [SCH 01a]. The five components which this definition sets out are: appraisal, psycho-physiological changes, motor expression, action tendencies and subjective feeling.

Appraisal: Process proposed as being the initiator of the elicitation and the differentiation emotions by emotion appraisal theories. It consists of the rapid and often unconscious evaluation of a stimulus or specific event on a set of cognitive criteria. This process will determine and differentiate the emotion or mixture of emotions felt subjectively.

Subjective feeling: subjective feeling, one of the components of emotions, for a long time confused with 'emotion' itself, is currently theorized notably as a reflection of the changes occurring in the four other components of the emotional process [SCH 05].

Action tendency: Frijda [FRI 86] has defined action tendency as a state of preparation "with the aim of executing a specific type of action". Action tendencies (e.g. the desire to flee when scared) are one of the components in the emotional process, as opposed to actions, considered more as behavioral consequences of emotion. Note that there can be predictive action tendency (i.e. with anger for example, towards a superior) where the effective behavior is a retreat (e.g. leaving a conflict with a superior rather than becoming aggressive towards him).

Valence: a key dimension of emotion (see, for example, Titchener [TIT 09]) already proposed by philosophers such as Aristotle referring to hedonism, i.e. the agreeable versus disagreeable character of an event or situation. Valence is proposed as one of the elementary dimensions of the emotional experience for the quasi-totality of emotional dimensional theories. In appraisal theories, two types of valence are distinguished for a given event: 1) intrinsic pleasantness (pleasant or unpleasant) of the event itself and 2) the goal-conduciveness (conductive or obstructive) of this event for the individual. For example, a bar of chocolate can have an intrinsic pleasant character but may be goal-obstructive for the individual if he/she likes chocolate but is on a diet.

1.8. References

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