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The functional role of emotions in aesthetic judgment

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A B S T R A C T

Exploring emotions, in terms of their evolutionary origin; their basic neurobiological substratum, and their functional significance in autonomous agents, we propose a model of minimal functionality of emotions. Our aim is to provide a naturalized explanation – mostly based on an interactivist model of emergent representation and appraisal theory of emotions – concerning basic aesthetic emotions in the formation of aesthetic judgment. We suggest two processes the Cognitive Variables Subsystem (CVS) which is fundamental for the accomplishment of the function of heuristic learning; and Aesthetic Appraisal Subsystem (AAS) which primarily affects the elicitation of aesthetic emotional meanings. These two subsystems (CVS and AAS) are organizationally connected and affect the action readiness of the autonomous agent. More specifically, we consider the emotional outcome of these two subsystems as a functional indication that strengthens or weakens the anticipation for the resolution of the dynamic uncertainty that emerges in the particular interaction.

1. Emotion as a fundamental aspect of any cognitive function

Most theories on emotions attribute a central place to their functional role in cognitive processes and their affect on behavior. A cognitive agent, in an attempt to increase its autonomy, tries always to advance the complexity of the functions it uses in order to be able to serve its final decisions. According to those theories, emotional activity functions as a monitoring mechanism or a feedback system that regulates the effectiveness of the potential or chosen interaction. As such, emotions are bound by agent's goals and the respective biological needs, but they are also highly related to the behavior of an agent (Brehm, Miron, & Miller, 2009; Cupchik, 2001; Nelissen, Dijker, & de Vries, 2007; Rasmussen, Wrosch, Scheier, & Carver, 2006; Schwarz, 2000). In this paper our aim is to defend a model of minimal functionality of emotions, where the latter are also related to minimal aesthetic decisions and judgments. It should be noted that the whole development of aesthetic judgment is much more complex than this minimal relation of a primary function of emotions that directly affect agent's behavior. Although emotions can occasionally have such direct effects, in a higher level of the conscious, emotions operate mainly and most efficiently by means of their influence on cognitive processes, which in turn function as input into decision and behavior regulation processes (Baumeister, Vohs, DeWall, & Zhang, 2007; Damasio, 2000b). However, in this paper, we do not stay in the debate between affect and emotion and their qualitative differentiations, but we consider emotions as a reached outcome of an appraisal process that also benefits from the range and variety of the conscious, providing much more qualitative information than a simple feeling that something is probably good or bad, that should be approached or avoided, etc.

Emotions play a major role in decision making and thus they serve important cognitive functions (Bagozzi, Baumgartner, & Pieters, 1998; Frijda & Swagerman, 1987; Johnson-Laird & Oatley, 1987; Leone, Perugini, & Bagozzi, 2005; Schwarz, 2000). Emotions are functions that detect opportunities and threats, the existence or not of a solution

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and, roughly, they answer to what the system should do in a given interaction. Additionally, they signal the outcomes of the respective appraisal processes to the other functions that control the actions and plans of the cognitive agent. Emotions are implicitly associated to the representations and, in general, to the transformation of the factual knowledge of a cognitive agent. According to Bagozzi et al. (1998), "emotions function to produce action in a way promoting the achievement of goals" (Bagozzi et al., 1998, p. 2). The relationship between emotions and goals are neither automatic nor direct. Emotions emerge from the prospects for goal success or failure and their intensity is a crucial aspect that influences the potential motivation to pursue that goal. According to Johnson-Laird and Oatley (1987), emotions are a "part of a management system to co-ordinate each individual's multiple plans and goals under constraints of time and other limited resources" (Johnson-Laird & Oatley, 1987, p. 31). Carver (2001) suggests that positive and negative emotions provide the system with information that is functionally useful for the evaluation of the current condition according to the system's motives and goals.

Hence, emotional activity plays two major roles; firstly, it notifies the agent to move towards the incentives and away from threats and secondly, through the feedback system, it compares and rates signals that correspond to the progress that the cognitive agent is making against a reference rate. It is the error signal of these processes that is manifested as an emotion. If the rate of the signal is either too low or too high, it produces correspondingly a negative or positive affect. In the case of an acceptable rate, no value occurs as an immediate result of the evaluation of the signal. In other words, emotions with a positive value (euphoric) are associated with the attainment of a goal, leading to decisions that allow a cognitive agent to continue with its current plan. In contrast, emotions with negative value (dysphoric) emerge when the cognitive agent has problems with the ongoing plans and fails to achieve the desired goals. Those positive and negative values lead to problem-solving mechanisms which reconsider the existing goal structures in order to reconstruct new plans (Bagozzi et al., 1998). In general, the cognitive agent evokes or/and adopts an emotion at a significant juncture of its action plan, when there is a change in the conscious or/and the unconscious evaluation of the possible success of a plan (Johnson-Laird & Oatley, 1987). According to Pugh (1979) and from a theoretical decision-theory perspective, emotions must be classified as values. Specifically, Pugh states that "They are valuative (i.e., scalar) quantities that are associated with "outcomes" for the purpose of guiding a decision process" (Pugh, 1979, p. 61).

Moreover, it seems that there is a strong relation between memory and emotions. Memories from past emotional experiences allow the cognitive agent to navigate between complex webs of choices. Whether an agent seeks out or avoids specific experiences is partly determined by its memories, and specifically, by how pleasant or unpleasant have similar experiences affected the agent in the past. They generally tend to recall emotional states that are congruent rather than incongruent with their current feelings. Moreover, a cognitive agent is motivated to anticipate positive versus negative stimuli. All decisions of an agent involve predictions of future emotions that are anticipated to be more positively valued than those that the agent is already experiencing (Lench & Levine, 2010; Schwarz, 2000). According to Baumeister et al. (2007), cognitive agents learn to anticipate emotional outcomes and behave so as to pursue the emotions they prefer. Additionally, according to Schmidt, Patnaik, and Kensinger (2011), although it is evident that emotion can enhance the ability to remember that a specific event has occurred, the memory of that event often involves more than simply remembering its occurrence. This memory includes not only the "*what*" but also the "*where*" and the "*when*" of the respective experience (Clayton & Dickinson, 1998).

Agents respond to objects and make judgments about them, according to their emotional states which arise from their interaction with them (Schwarz, 2000). Generally, a positive or a negative emotion, such as pleasure or pain, plays a major role in the survival of an agent. Pleasure and pain are not properties of the environment. Our brain generates pleasant or unpleasant emotions in response to those aspects of the environment that were respectively a consistent benefit or threat to gene survival (Johnston, 2003). Emotional functions lead individuals to avoid situations that will be harmful to their stability. Johnston (2003) suggests an alternative context that will help us understand the functional role of emotions. He actually states that: "… if sensations are considered to be properties that exist in the external world then conscious experiences are reduced to nonfunctional epiphenomena. But if the external world is viewed as pitch dark, silent, tasteless, and odorless, then our evolved sensations acquire a whole new function" (Johnston, 2003, p. 174). In other words, the results of an observation do not refer directly to objects in the external world, but instead, they are the results of recurrent cognitive functions in the structural coupling between the cognitive agent and the environment (Arnellos, Spyrou, & Darzentas, 2010).

In this evolutionary perspective, the relation between the emergent conscious experiences and gene survival has already been established by natural selection. In the naturalized perspective of the interactivist model, as introduced by Bickhard (2000a, 2009a), the cognitive agent, in its interactive flow, is continuously prepared for further interactive processes, and at the same time, he has the ability to detect when those preparations will fail to be prepared for the actual course of interaction. Learning introduces variation, when things are not going well or stability, when they are proceeding according to the anticipation of the preparation process. Although these preparations constitute the indications of interactive potentiality they would not support clear and dynamically well-organized anticipations of such potentiality. Learning is the only process that could probably regulate the effectiveness of such uncertainty.

However, the cognitive agent could develop ways of dealing with several uncertain situations, which are not always identical to situations that the system usually interacts with. In such cases, and according to Bickhard, positive and negative emotions are aroused when the cognitive agent tries to resolve this interactive uncertainty. A positive emotion is elicited from a simple mode of successful interaction, when there is a strong anticipation for the resolution of a particular uncertainty, and where the respective interaction results in the elimination of that uncertainty. Correspondingly, the interaction that results in greater

uncertainty regarding the way of dealing with a particular uncertain situation will yield a negative emotion. Thus, for Bickhard, dynamic uncertainty with a graded anticipation of resolution is the model for emotions.

1.1. Emotions of pleasure and aesthetic judgment

From another perspective, aesthetic theory has proposed that basic emotional states of pleasure and pain play a main functional role in the formation of agent's aesthetic judgment (Guyer, 2003, 2008; Matravers & Levinson, 2005a, 2005b; Ginsborg, 2003; Iseminger, 2003; Matravers, 2003; Cupchik, 1995; Kant, 1914).

Kant's (2002) *Critique of the power of judgment* has many admirers and has influenced practically every study, philosophical or not, which attempts to explain the aesthetic experience, aesthetic judgment and beauty. For Kant, aesthetic judgments can be either sensory or reflecting. Sensory aesthetic judgments are based on our feelings and reflecting aesthetic judgments are judgments of *beauty* and judgments of the *sublime* (Wicks, 2007). Specifically when the agent reflects on an object or an action, such reflection leads to a judgment of beauty when the agent's two faculties, imagination and understanding, are brought into *harmony* with one another. This *free play* of the two faculties elicits a *disinterested* feeling of pleasure, disinterested because the emotional outcome is disconnected from any desire or purpose for the object or for what it may represent (Cannon, 2008). An object is beautiful (or pleases the senses) only when it is represented by an entirely disinterested satisfaction or dissatisfaction. According to Kant, *disinterestedness* is a basic criterion for an aesthetic judgment. The emotional factor seems so strong in aesthetic experience that it leaves no room for any cognitive, and thus no logical, judgment. Every interest, Kant claims, spoils the judgment of taste and as such every judgment of taste cannot be determined by any representation of an objective purpose.

For Kant, when representations are related to feelings of pleasure or displeasure, judgments are subjective and they relate entirely to the agent's personal feelings of the self through such emotional experiences. This emotional activity "grounds an entirely special faculty for discriminating and judging that contributes nothing to cognition but only holds the given representation in the subject up to the entire faculty of representation, of which the mind becomes conscious in the feeling of its state" (Kant, 2002, p. 90).

The second aesthetic concept, which is also related with reflecting aesthetic judgments, is the sublime. The ground of the sublime is also in the agent's mind and it is also characterized by *dissatisfaction*. Beauty, according to Kant (2002), is about representations of perceivable forms of *actual objects*, and sublimity is about representations of *ideas of reason,* which cannot be contained in any perceivable form.

However, in the Kantian approach, what constitutes the *feeling of pleasure* in the context of judgment is phenomenologically opaque (Cannon, 2008) and the inner process that produces those aesthetic feelings is still unchallenged. Additionally, the problem of intentionality in aesthetic experience raises several philosophical questions about Kant's claim for disinterestedness in aesthetic experience discouraging a serious consideration of his theory (Allison, 2001; Guyer, 1978; Lorand, 1994; Weber & Valera, 2002). The whole development of Kant's *Critique of the power of Judgement* is about teleological explanations that touch intrinsic and not relative purposiveness in the cognitive agent's actions (Weber & Valera, 2002) as the modern understanding of complex systems demands.

Our aim in this paper is to explore the functional significance of aesthetic emotions apart from those philosophical explanations and abstract philosophical terms like beauty, sublime, imagination etc. As Weber and Valera (2002) claim, those teleological descriptions can be possibly naturalized only by accepting that "organisms are subjects having purposes according to values encountered in the making of their living" (Weber & Valera, 2002, p. 102). In other words, there is a great necessity for explanations based on the naturalized concept of normative functionality in order to illuminate the mystery of aesthetic behavior.

Therefore, in this paper, we suggest a minimal model of aesthetic judgment proposing a systemically and organizationally causal connection between aesthetic judgment and the respective emotional values (positive or negative, i.e. pleasure or pain), as these emerge through the interaction of the cognitive agent with its environment. In the suggested model, aesthetic emotions are considered as functions that serve an evaluation mechanism, as the cognitive agent tries to resolve the interactive uncertainty in a given interaction. As such aesthetics for the proposed model are an amalgam of intentional cognitive and emotional processes that function in order to evaluate agent's interactive potentialities. Our aim in this paper is to defend a naturalized explanation about the process by which the elicitation of basic aesthetic emotions of pleasure and pain affect the development of the aesthetic judgment.

Moreover, the construction of the proposed model cannot be based on etiological descriptions that are usually offered in literature when studies tend to measure the phenomenon of aesthetic experience. Etiological models are not adequate in capturing the naturalistic emergence of functions and of their respective representations. In general, they are causally epiphenomenal, hence, naturalism fails (Bickhard, 2004). Particularly, as Johnston notes about the causal functional role of emotions:

> "…natural selection "cannot see" such internal subjective feelings, but it can see their causal consequences. The downward causation of emergent properties is real and indisputable. …our emergent feelings appear to play a causal role in learning and reasoning." (Johnston, 2003, p. 175).

On the contrary, naturalization requires the justification of an explanation based on facts, i.e. based on natural relations and interactions. It is primarily an attempt to look inside the system under consideration and try to understand and explain how it works. This seems to be the most valid strategy for naturalism, as in this case the respective explanations can be objectively verified. Lately, there is a strong emphasis on the fact that autonomy holds the

primary role in the establishment of a naturalistic framework for the analysis, explanation and modeling of the emergence and further development of meaning in a cognitive system - the emergence and development of autonomous agents (Arnellos et al., 2010; Bickhard, 2000b; Collier, 1999; Moreno, Etxeberria, & Umerez, 2008; Ruiz-Mirazo & Moreno, 2000).

Therefore, in order to construct a naturalized explanation, which strengthens the functional role of emotions in aesthetic judgment,[1] we suggest that a naturalistic and interactive model of representation and motivation in autonomous agents should be used as a canvas to model the elicitation of aesthetic emotions. We need a dynamic interactive model that considers living autonomous systems as complex, dynamic, open systems with multiple emergent properties, such as representation, motivation, learning and emotions. The important aspects of this model, which are also relevant to our goal, are described in detail in Section 2. Additionally in Section 3 we attempt to combine findings from the field of neurology regarding the complex process of aesthetic experience with the interactive model of representation, providing a deeper understanding of the mental processes that lead to aesthetic meaning. Finally in Section 4 using appraisal theory of emotions as a vehicle we suggest a functional model which attempts a better description of the development, the dynamic relation and the role of the emotional activity in the whole formation of aesthetic meaning and judgment.

2. Action selection in (living) autonomous agents

As previously stated, emotional activity plays a major role in the agent's decisions in a given interaction. However, an interactive model which explains the normative phenomena emerging during the (inter)action selection will be needed. This model could be used as a canvas in order to explore the functional role of emotions in aesthetic decisions. The *interactivist* model, as introduced by Bickhard (2000a, 2009a), provides the right functionality for this purpose. In this section, we briefly describe the main features of this model such as emergent *representation*, *motivation*, and *learning*, which are current in the interactive system ontology.

Every autonomous agent interacts continuously with the environment in order to determine the appropriate conditions for the success of its functional processes (Arnellos et al., 2010). This illustrates a fundamental fact about autonomous systems: they are open to their environments as a matter of their ontological necessity (Bickhard, 2004), which means, given the need for self-maintenance, an agent has access to functional inner systems that enable him to represent the environmental conditions and detect for possible failures of those conditions. This is functionally useful to the agent in order to serve its primary goal, i.e. to maintain its autonomy in the course of interactions. Specifically, an autonomous agent needs to exhibit a kind of functionality that will at least maintain and enhance its autonomy. This requires conditions of process and interaction closure such as the ones in which functional meaning emerges by selecting the function that will achieve closure while the agent interacts with the environment. This implies a conceptual as well as a practical interdependence between autonomy, functionality, intentionality and meaning (see Collier, 1999 and Arnellos et al., 2010, for extended explanations), but it does not, in any way, imply that the goal of self-maintenance should be explicitly represented in the autonomous agent.

Bickhard (1997a) argues that such an autonomous system should have a way to differentiate between environmental conditions, and should enable a switching mechanism in order to choose among the appropriate internal functional processes that it will use in a given interaction. Such differentiations functionally indicate that some type of interaction is available in the specific environment and hence, they implicitly presuppose that the environment exhibits the appropriate conditions for the success of the indicated interaction (Arnellos et al., 2010). As such, these differentiations are the basis for setting up indications of further interactive potentialities (Bickhard, 2004). According to Bickhard, all those conditions that are internal or external to the agent constitute the dynamic presuppositions of interaction. Dynamic presuppositions can be true or false and the interaction will succeed or fail, respectively (Bickhard, 2003, 2004).

These differentiated indications constitute emergent *representations* and the complex web of those indications can form the representations of such objects. These presuppositions constitute the *representational content* of the agent with respect to the differentiated environment (Arnellos et al., 2010). Through this process of dynamic representation the agent is able to carry out the fundamental actions of distinction and observation. In other words the cognitive agent has evolved a capacity to make distinctions based on historically evolved habits and actions according to his dynamic architecture and organization. Moreover, the agent has the ability to detect all those distinctions thus providing a feedback for his progress in the course of interaction (Hoffmeyer, 1998; Pugh, 1979). The process of detection refers to observation by means that the cognitive agent integrates itself into its own self-maintaining loop. From the cognitive agent's perspective, only actions which feed back to the agent's sensor systems can be detected. The agent cannot observe any other action, which simply disappears in the environment. Thus, as Porr and Wörgötter (2005) claim, "there is no other chance for the organism as to analyze its inputs, as this is the only aspect that the organism is able to observe. Even its own actions are only observable through its inputs" (Porr & Wörgötter, 2005, p.109). Hence, and in that way, the cognitive agent itself has the ability to observe its own boundaries in a self-referential loop in which it refers back to himself the result of its own actions. This makes the

[1] Aesthetic judgment is a higher-order agential activity combining several cognitive and emotional processes in which the cognitive agent should engage in order to accomplish the ideally ultimate aesthetic verdict. In this paper aesthetic judgment depicts fundamental emotional tensions, decisions and preferences of the agent in the interaction process. Those fundamental emotional actions are closer to what we mean by the notion of aesthetic preference. However, we will keep the term 'aesthetic judgment' for purposes of compatibility with the cognitive and philosophical approaches in the current literature of aesthetics.

agent a self-referential system, providing him with the ability to create new distinctions (actions) based on previous ones, to judge its distinctions, and to increase its complexity by creating new meanings in order to interact (Arnellos, Spyrou, & Darzentas, 2007). Summarizing, in general, a cognitive agent should have the requisite variety (e.g. an adaptive anticipatory system that acts before learning) to react against the signal, which initiates a deviation from the desired state in its feedback system and learn forward models of its own reflex-loops (Porr & Wörgötter, 2005).

If representation is a fundamental aspect of an interactive system ontology, then another equally important aspect of the same ontology is *motivation*. Living systems, however, as far-from-equilibrium and self-referential systems must always be in interaction with their environment in order to maintain their far-from-equilibrium conditions. According to Bickhard's claim, the major question concerning the significance of motivation must be: 'what makes an organism do one thing rather than another in the course of further interactive activity?' (Bickhard, 2000a, 2003; Reeve, 2008). This is the problem of interaction selection. Motivation is responsible for the function of selecting the processes and representation is responsible for the anticipation in the service of such selection. Both representation and motivation are aspects of a more fundamental form of process in certain far-from-equilibrium systems (Bickhard, 2003).

Learning and development is another fundamental aspect of choosing the appropriate interaction with respect to the current condition of the agent. Learning is a constructive process which introduces destabilization when the system fails to anticipate or stability when the system acts according to the set up of the next interactive process, which means that anticipation is successful. An autonomous system tends to stabilize on interaction process and proceed successfully according to its anticipation and to its goals. According to Bickhard and Campbell (1996), learning has a heuristic character in which the system can profit from past successes and failures. The successful outcome of a previous interaction will be functionally useful in an attempt of solving a new problem. This process presupposes a location where the old problem representations and solutions are stored and some way for the system to be able to locate these and/or the adjacent ones which may probably be useful to manage the representations of the new problem. Such a configuration of information constitutes a topology. Therefore, heuristic learning and development require functional topologies, as well as the ability to construct new topologies.

Summarizing, any complex autonomous agent needs to solve the problem of choosing the appropriate action. Action selection is the fundamental problem of what the agent must do in its next steps. Many potential interactions can be indicated in association with the internal outcomes of those interactions. All those internal outcomes pertaining to what can be expected by the cognitive agent play a major role in interaction selection. Representation emerged naturally in the evolution of interactive systems as a solution to the problem of interaction selection and as such, it functions as an aspect of indicating further interactive potentialities. The indication of an interactive potentiality will be conditional on system's motives and on all those outcomes of particular prior interactions (Bickhard, 2000a). Those functions provide the system with the appropriate conditions in order to anticipate its future courses of interaction. In general "an interactive system will be continuously interacting and continuously preparing itself for further interaction on the basis of prior interactive flow" (Bickhard, 2000a, p. 2) (see Scheme 1).

The next section is a first step to combine the findings of the neurological perspective regarding the complex process of aesthetic experience with the interactive model of representation. In this combination, we focus on the process of aesthetic meaning. Particularly, aiming at a naturalized model of the elicitation of aesthetic emotions, the neurological evidences that are considered to be in accordance with Bickhard's interactive model of representation will offer a better understanding about the functions that take place in the formation of aesthetic judgment (meaning/preference).

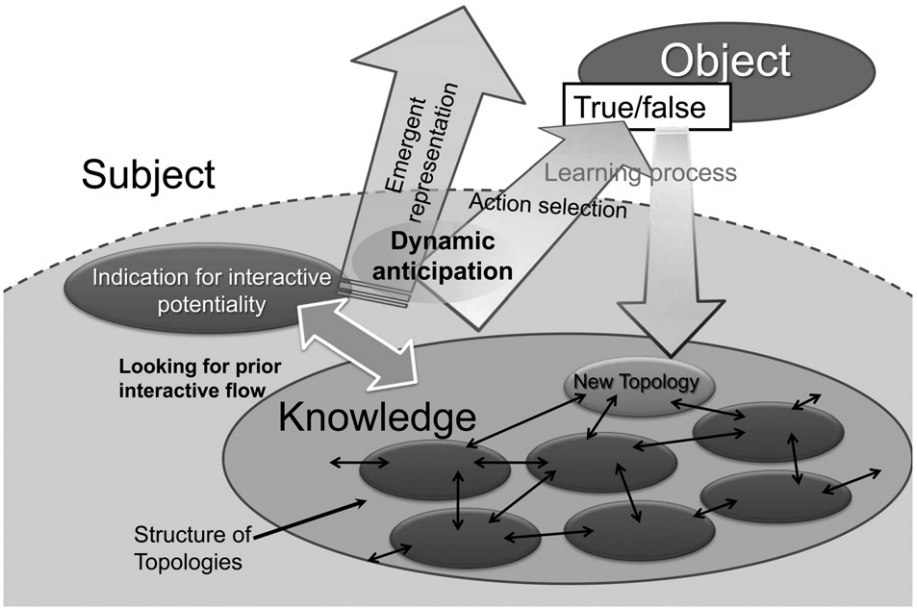
3. Aesthetic meaning: a neurological perspective

3.1. Neurological explanations regarding the aesthetic experience

When it comes to the study of aesthetic perception, contemporary neuroaesthetics combines senses, science and the experience of beauty in neural systems that determine pleasure. Additionally, they study the way information from the senses becomes meaningful in the brain and the way emotion governs the experience of both life and art (Barry, 2006). As the work of many researchers in neurology shows, aesthetic appreciation can now be considered as a neurological function based on evolutionary cognitive development. Also, and according to Barry, the fundamental function of our cognitive development, the perceptual function, "…derives primarily from an interaction with the environment and thereafter develops according to accumulating knowledge and emotional influence and memory" (Barry, 2006, p. 137). In that sense, what we perceive as pleasurable is based on recognizable patterns linked to survival mechanisms. Hence our aesthetic response may also be considered as a result of utilizing those basic emotional mechanisms.

On the same track, Ramachandran (2003) argues that the solution of the fundamental aesthetic problem (i.e. what is the origin of aesthetics and what is an aesthetic judgment) lies in a better understanding of the connections between the visual centers in the brain, the emotional limbic[2] structures and the internal logic, which drives

[2] The limbic system is a complex structure of nerves and networks in the brain, involving several areas near the edge of the cortex concerned with instinct and mood. This area of the brain is intricately involved in motivation and basic emotions like fear, pleasure, or anger and drives hunger, sex, dominance, care of offspring. Also the limbic system receives incoming sensory stimulation (sights, smells, tastes) that activate rather automatic emotional reactions. (Fellous, Armony, & LeDoux, 2003; Reeve, 2008). However, the limbic system anatomical concept and the limbic system theory of emotion are both problematic (LeDoux, 2000).



Scheme 1. An attempt to depict the dynamic functions of emergent representation and of the general learning process, which are playing a primary role in the synthesis of Bickhard's Interactivist model.

them. The visual system functions by generating visual images. Through its 32 subsystems, and as a part of a larger network of systems, the visual system interacts by the use of neural images. Particularly, Ramachandran and Hirstein (1999) claim that when the cognitive agent stares at any object, the image is extracted by the 'early' visual areas and sent to an area of the brain (inferotemporal cortex) which is specialized in detecting faces and other objects. When "the object has been recognized, its emotional significance is gauged by the amygdala at the pole of the temporal lobe and if it is important the message is relayed to the autonomic nervous system (via the hypothalamus) so that you prepare to fight, flee, or mate" (Ramachandran & Hirstein, 1999, p.32). According to them, the image produces a limbic (emotional) activation, which is mostly unconscious. Hence, for Ramachandran and Hirstein, aesthetic responses may similarly be only partly available to conscious experience.

Stimulation studies show that mental images, thoughts and feelings, as well as visceromotor and hormonal responses, are produced by the amygdala[3] in the limbic system. However, amygdala processes might still precede any conscious evaluation (van Reekum & Scherer, 1997), which does not pertain to aesthetics, since from another perspective, Damasio (1995) argues that there might be the case that the frontal lobe influences the development of affective responses, which are suited to a new interactive situation. Patients with damage in this area, even though they have stable representations or factual knowledge of future outcomes (i.e. anticipation), they lack the capacity to mark a positive or a negative value regarding those outcomes, which in turn results in the inability to reject or accept a future outcome. If these allegations could be empirically confirmed, then, as van Reekum and Scherer (1997) specifically state, "the frontal lobe can be considered as a crucial relay station in emotion-related processing in the sense of affectively priming conceptual processes" (van Reekum & Scherer, 1997, p. 276). This shows that not only the amygdala, or the limbic system in general, is responsible for the evocation of emotional responses related to aesthetic appreciation. Additionally, Jacobsen, Schubotz, Höfel, and Cramon (2006) argue that aesthetic judgments produce activations in the brain located in the medial wall and bilateral ventral prefrontal cortex, regions which have been previously reported for social or moral evaluative judgments on persons and actions. They also mention the fact that aesthetic judgments are also engaged in the left temporal pole and the temporoparietal junction. However, when the participants in an experiment judged a pattern to be beautiful or not, it appears that not only brain areas dominant in aesthetic judgments are engaged, but there is also the specific engagement of another area, which has a fundamental role in the processing of more logical judgments, such as symmetry for example.

Those studies show that aesthetic emotional states engage more than one brain area and do not exhibit a serial pattern of information processing, such as the one that considers the light to strike the object, then, the electromagnetic spectrum to be reflected and to enter the eye, and then, finally, the visual centers to activate the limbic

[3] Amygdala is shown to play a major role in the perception and evaluation of the emotional and motivational significance of sensory information. It is considered a part of the limbic system which detects and responds to threatening and emotional events, plays a key role in the learning of new emotional associations, such as environmental dangers and activates neighboring brain structures by releasing neurotransmitters (dopamine, serotonin, noradrenalin, acetylcholine) that regulate for example heart rate or the speed of breathing when a dangerous situation is experienced (Reeve, 2008; Arbib, 2003).

structure, which in turn generates visual images. On the contrary, there are several components that are engaged in an emotional episode, which activate several neural networks. As a matter of fact, it turns out that human decision making has an emotional component that involves the engagement of at least seven major brain areas that contribute to the evaluation of potential actions. These are the amygdala, the orbitofrontal cortex, which plays a crucial role in assessing the positive and negative valence of stimuli, the anterior cingulate cortex, the dorsolateral prefrontal cortex, the ventral striatum, the midbrain dopaminergic neurons, and the serotonergic neurons centered in the dorsal raphe nucleus of the brainstem. The interaction of these regions has been partly modeled by a system named ANDREA in an attempt to computationally underlie the human decision making (Thagard & Aubie, 2008). Moors (2009) also proposes a list of psychological components, which activate other neural networks through emotional response (a) a cognitive component; (b) a feeling component, referring to emotional experience; (c) a motivational component, consisting of action tendencies or states of action readiness; (d) a somatic component, consisting of central and peripheral physiological responses; and (e) a motor component, consisting of expressive behavior.

Neurological explanatory models of cognitive decision making as ANDREA, GAGE (Wagar & Thagard, 2004) and others, are based on etiological models of function trying to describe the connection between the physical and the mental world in a computational analogy. Generally, it is quite common, among cognitive scientists, to view the brain as a general-purpose biological computer that can implement a variety of outcomes (Johnston, 2003). Those explanations attempt to answer a 'why-is-it-there' question in terms of a function, by claiming that biological items exist in living systems because of the functions they have, and through which, they manage to survive the respective selection processes (Nunes-Neto, Arnellos, & El-Hani, 2011). In, Bickhard's (2009a) model of interactivism, the core notion of normative functionality claims that as the biological system is *serving a function*, it also contributes to the stability of a far-from-equilibrium process with distinct causal consequences in the environment. According to this perspective, biological subsystems have functions by virtue of the fact that they have been selected by the system to accomplish such functionality as contribution to self-maintenance (Bickhard, 2009a, b). As Bickhard (2009a) claims, "having a function, therefore, is constituted in being presupposed to serve that function by the rest of the autonomous system" (Bickhard, 2009a, p. 559). Hence, besides interactivity, biological systems presuppose autonomy and intentionality in the service of such functions (Kampis, 1999). This model of function differs in several fundamental ways from the above etiological models that focus on what it is to have *a (proper) function.* Currently, etiological models are encountering major difficulties in explaining how processes operate in living systems (Mossio, Saborido, & Moreno, 2009). They are not able to offer naturalized explanations about aesthetic emotional states because the respective functions that describe the phenomenon are causally epiphenomenal and not emergent functions grounded in an agent's intentionality. Even if etiological models are able to provide an etiology of how all those possible brain areas are engaged when a cognitive agent is about to construct aesthetic meaning, they do not constitute the organizationally causal or the dynamic properties of the aesthetic meaning. However, the question about the existence and the way an aesthetic emotional meaning emerges still remains.

3.2. Mental images and aesthetic meaning

According to Damasio (2000a, b, 2010), when a cognitive agent perceives an object he does not know the real object. He forms mental images or mental patterns in any of the sensory modalities according to the agent's complexity and capabilities. Mental images, conscious or unconscious, are not facsimiles of the environment, but rather images of the interaction potentialities between the agent and the specific enviroment. For neurologists mental images are neuron clusters of meaning. They allow the connection between sensory experience and the image maps (neural patterns) of past experience, which could even be an emotional experience. Each neuron could be a part of different patterns of meaning. The potential activation of a neuron may activate several networks resulting in a widening circuitry and spiraling meaning (Barry, 2006).

The emergence of an image is the first problem of consciousness according to Damasio. He claims that images are responsible for the conveyance of the physical characteristics of the object as well as for the conveyance of the reaction of like or dislike preference that an agent may have for this object. This could be a primitive form of an aesthetic judgment (appreciation/preference), making images crucial in the construction of aesthetic meaning.

Moreover, mental images seem to exhibit similar properties to emergent representations as they have been described by the interactivist model (see Section 2). They affect also the plans that the cognitive agent may formulate for the object or the web of relationships between this object and others. Images play a major role in life regulation representing things and events, which exist inside and outside the organism. The manipulation of images through a purposeful action and learning affects the formation of the right decision and the future optimal planning (Damasio, 2000a).

Additionally, for Damasio, conscious meaning presupposes two facts: the formation of mental images of interaction potentialities with the environment, and a *change* - detectable by the agent - in its inner structure that is associated with its relation to the environment. The perceived image is based on dynamic changes, which occur in the inner structure of the cognitive agent when the physical structure of the object interacts with its senses. This could imply a signal mechanism, which detects those differentiations of the environmental conditions and warns the agent for possible failures of those conditions. The signaling devices, located in agent's structure, aid the construction of neural patterns, which resulti also in emotional responses (Damasio, 2000a).

Hence, emotional activity could be considered as a fundamental part of the interaction process that, overall,

is implicitly associated to the representational content. As such, the formation of meaning could also be ascribed not only to the purely conscious part of the respective interactive process, but also to the respective emotional mechanism. For Damasio (2000b) consciousness and emotion are not separable. Emotions and *core consciousness*[4] tend to go together, they are present or absent together. Emotions and *core consciousness* require, in part, the same neural substrates. There is a contiguity of the neural systems that supports consciousness and emotion and this suggests several anatomical and functional connections between them. Probably those connections are fundamental in *extended consciousness*[5] by which a cognitive agent acquires awareness of the living past and the anticipated future regarding the current situation that takes place here and now (Damasio, 2000b).

From the incoming stimulus (internal or external to organism), emerge mental images or meaning through conscious and emotional responses according to survival mechanisms and motives that are affected by and/or compared to knowledge (Scheme 2). The production of aesthetic meaning, in such a basic perceptual process, results in the emotional state of pleasure or pain as everything comes together into a unified concept serving the stability of the agent. Additionally, aesthetic meaning, as an outcome of a mental image or representation, is dynamically composed by a complex web structure of neurons in conjunction with emotional reinforcement of continual feedback looping with the limbic system (Barry, 2006). In other words, the creation of an aesthetic concept lies in an emotional feedback, which is an internal process that appraises perceptions or events from inside and/or outside the organism (unified concept), serving the well being of the organism. Hence, this appraisal process that probably takes place in the limbic system always adds an emotional weight to perception.

This neurological approach to mental image and aesthetic meaning seems to confirm the dynamic nature of emergent representation as it is suggested in Bickhard's interactive model and described in Section 2. In the following section, we use the interactive model of representation as a framework for the interaction process, and we attempt to provide a naturalized model regarding the interactive formation of aesthetic experience. More specifically, by exploring the role of emotions in aesthetic experience; their evolutionary origin; and their functional significance in cognitive agents, our aim is to detect why emotions are responsible for the aesthetic experience, and how they may finally formulate aesthetic judgment.

[4] Core consciousness, according to Damasio, is the simplest kind of consciousness. It provides the organism with a sense of itself about the here and now. This is the main scope of core consciousness. Core consciousness does not support future anticipation and refers only to the immediate and most recent past. There is no elsewhere, there is no before, there is no after with core consciousness.

[5] Extended consciousness, according to Damasio, is the complex kind of consciousness with many levels and grades. It provides the organism with high-order self-reference including a strong awareness of the lived past and of the anticipated future. The extended consciousness can be achieved by assessing recognition, recall, working memory, emotion and feeling, reasoning and decision making over large intervals of time.

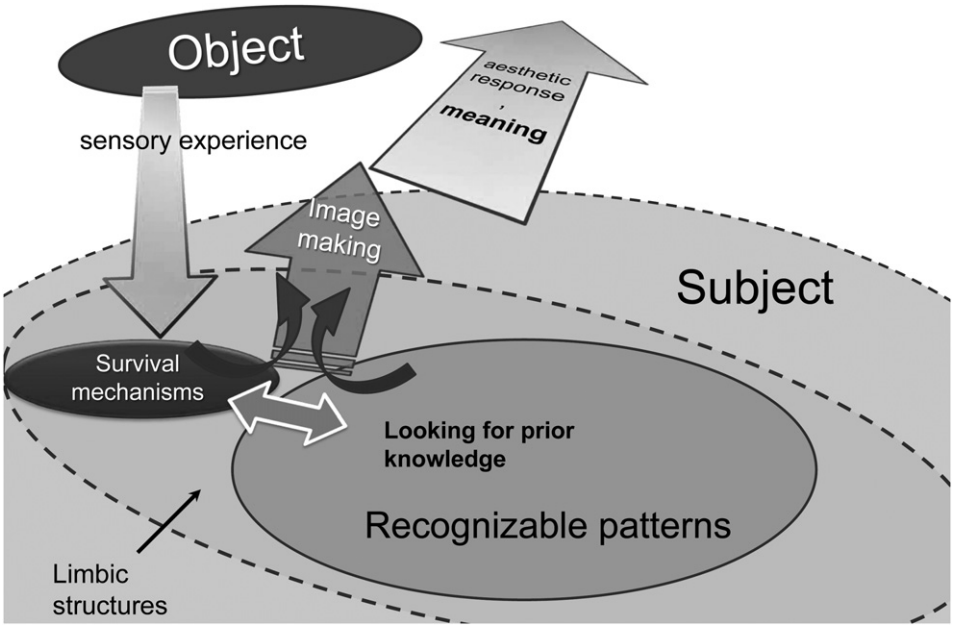
4. Modeling the elicitation of emotional meaning in aesthetic judgment

4.1. Basic emotions and their relation to aesthetics

In the emotion-related literature and also, because of their usefulness in cognitive agent's adaptation, there is a strong emphasis on the consideration of basic (privileged) emotions, which are widely enough considered to express universal biological rules handed down genetically through evolution. Those emotions are usually called primitive, basic, primary, or fundamental (Lazarus, 1994; Ortony & Turner, 1990) and their lists, number and names vary accordingly. Theorists are proposing basic emotions in order to provide several categorizations related to emotions that have evolved in experiences or/and serve biological functions related to survival needs of the cognitive agent. According to Lazarus (1994), "primary emotions derive from and express the most important adaptational tasks of animals such as protection from danger, reproduction, orientation, and exploration" (Lazarus, 1994, p. 79).

An interesting distinction that Ortony and Turner (1990) suggest has to do with two different conceptions of basic emotions; one as *biologically primitive* and one as *psychologically primitive*. These are considered to be the two irreducible constituents of other emotions. The perspective corresponding to the biological primitives concerns the problem of emotions that can be dealt with by understanding their evolutionary origin and significance and suggests that this can best be achieved by discovering and examining the biological underpinnings of emotions. Thus, the main theoretical purpose of this view is to contribute to an understanding of the functional significance of emotions for individual organisms and their species. The idea is that the biologically-based basic emotions emerge at birth or at least within the first year of life. They can be found in most human cultures and in most species, whereas other emotions are more likely to vary across cultures and to be species specific (Lazarus, 1994). The second conception to basic emotions, that of psychological primitives, starts from the idea that there might be a basic set of emotions out of which all others are built. This approach offers research prospects where one can investigate only the basic emotions, or one can attempt to use the basic emotions as primitives in the study of other. The two conceptions are not independent. Basic emotions as biological primitives can also be psychological primitives and vice versa.

From a related point of view Panksepp (2007), sees basic emotional systems as basic tools of the nervous system, providing cognitive agents "with sets of intrinsic values that can be elaborated extensively via individual and cultural learning" (Panksepp, 2007, p. 1819). Hence, basic emotional systems are genetically ingrained instinctual tools for allowing cognitive agents to generate complex, dynamically flexible action patterns -that could probably be related to emergent representations- in order to learn and cope with specific environmental enticements and threats. What he proposes is that the taxonomic identification of basic emotions does not provide explanations. In contrast, he claims that basic processes are extremely



Scheme 2. Aesthetic appreciation can be seen as a neurological function based on evolutionary cognitive development.

complex and rapidly impose coherence on both neuropsychological and bodily functions. Those basic emotional systems are integrative systems that mediate the primal affective states, which may characterize the basic emotions. Such systems can be mixed, blended, and combined in vast possible ways that could address types of *mixed* emotions and other complexities emerging from the interplay of the basic systems (Panksepp, 1992, 2005, 2007).

Many aesthetic theorists have proposed that there are basic emotional states such as pleasure or pain, which are probably connected, some of them *a priori*, with beauty or ugliness (Cupchik, 1995; Ginsborg, 2003; Guyer, 2003, 2008; Iseminger, 2003; Kant, 1914; Matravers, 2003; Matravers & Levinson, 2005a, b). William James (1890) was the first to distinguish between a primary and a secondary layer of emotional response to aesthetic stimuli. The primary layer consists of subtle feelings, which is pleasure elicited by harmonious combinations of sensational experiences (lines, colors, and sounds). This level offers an immediate pleasure in certain pure sensations and combinations of them. In the primary layer a secondary layer can be added. The secondary layer of pleasure offers the elegance in aesthetic taste. However, James did not fully define the stimulus properties which elicit the two kinds of emotional responses (Cupchik, 1995). Other authors add to pleasure and pain a value character, which is associated with our preferences, including aesthetic ones, to give an explanation to what we like or dislike (Ortony, 1991; Zangwill, 1998) and others put the aesthetic emotions (emotions that result from experience like great art, music etc.) at the top of emotional pyramid (Denton, McKinley, Farrell, & Egan, 2009; Norman, 2002, 2003). Frijda offers also a definition of affect which referred to hedonic experience as an experience of pleasure or pain (Berridge & Winkielman, 2003).

According to the approaches mentioned above, aesthetic judgment appears organizationally connected with emotional states (positive or negative, i.e. pleasure or pain). If the appraisal process is considered as a function which detects opportunities and threats in a given interaction, then the outcome of the appraisal process (emotional states of pleasure or pain) can also been seen as a function that strengthens or weakens the anticipation for the respective dynamic presuppositions. At the same time, this function implicitly informs the cognitive agent about the current internal or external condition supporting the agent's representational content. This basic emotional system mediates anticipatory incentive processes and exhibits a certain value to the agent's feedback system (Panksepp, 1992). According to these values the agent forms true or false anticipations that detect and probably prevent a representational error. The whole process functions according to the agent's motives in order to aid selection of a stable interactive step. Considering also Pugh's (1979) claim, that generally, cognitive agents make value judgments and decisions in terms of personal value criteria or in terms of their emergent motivations, we suggest that the outcome of the basic emotional systems provides a primitive form of aesthetic judgment that affects mental representations in terms of values like pleasure or pain. This also means that in our proposed model of aesthetic judgment, a cognitive agent has already the ability to recognize in those values the dynamic tendencies of a potential loss of its own viability and to respectively form the representational content. Taking into account the basic emotional states of pleasure and pain as basic aesthetic values, in the next section, we will theoretically explore and model the elicitation of emotions and consequently, those, which most probably involve aesthetic response in the interaction process.

The naturalistic modeling of complex aesthetic emotional processes requires and presupposes all the fundamental characteristics of an autonomous cognitive agent including the evolutionary character of action selection as was discussed in Section 2. Also appraisal theory, described in the following section, is used as a vehicle to aid deeper understanding of the functions that underlie the elicitation of aesthetic emotional states.

4.2. Appraisal process and aesthetic experience

As described in Section 2, a cognitive agent, through its dynamic representations, is able to observe and evaluate its boundaries and it is thus differentiated from the environment. According to the neurological perspective discussed in Section 3, emotions are a function that evaluates the stimuli coming from the limbic system, in order for the agent to evaluate or form dynamic presuppositions and its anticipation for a stable interaction. This emotional feedback seems to confirm the appraisal theory by which, emotions evaluate the relationship of the agent with the environment according to its motives (Frijda, 1987; Lazarous, 1994).

Our approach to aesthetic response is based on the functional character of the basic emotional system that through the appraisal process elicits emotional states with values such as pleasure and pain. As previously stated, pleasure and pain are considered to be the result of the appraisal of events with respect to their implications for well-being or for the satisfaction of goals, motives, or concerns of the agent (Frijda, 1993). In other words, and this is something that we intend to strongly suggest in this paper, aesthetic emotional states could be considered as a functional indication that strengthens or weakens the anticipation for the resolution of the dynamic uncertainty emerged in the specific interaction. Therefore, the aesthetic emotional states affect the dynamic and flexible action patterns of the agent, namely, its emergent representations. According to Bickhard's model of representation and motivation, the cognitive agent will seek kinds of interactions that are characterized by expectations of being able to master the solution of the current problem of interaction selection. This motivational tendency to explore the object (as the agent's immediate environment) is considered as a creative process that approaches new solutions, and is called *aesthetic motivation* (Bickhard, 2003). As such, the cognitive agent, as an autonomous and far-from-equilibrium system that must always be in interaction, makes emerge new kinds of aesthetic motivations. This comes about through the interrelationship of the outcomes of basic emotional systems (in the appraisal process), that elicit aesthetic emotions, and the process of learning in the course of interaction. Through this process the agent will try to avoid situations where the emotional value-related signals are negative (or aversive), and it will seek situations where the emotional value-related signals are positive (or rewarding) (Pugh, 1979).

According to Lazarus (1994), the appraisal process itself, has a dynamic character and "…it should be regarded as a tentative and changeable cognitive construction which emerges and reemerges out of ongoing transactions on the basis of conditions in the environment and within the person, and it is more or less subject to modification as conditions and persons change" (Lazarus, 1994, p. 138). The possibility of re-appraising the environment or the perceived events provides also the necessary dynamic character to aesthetic evaluation as the self-referential system dynamically creates new distinctions based on previous ones in order to reach the appropriate dynamic stability with respect to the dynamically changed conditions. Different stimuli trigger different patterns of appraisal, which correspond to basic emotional systems that lead to different emotional values, which in turn, appraise the current set of dynamic presuppositions that could probably make the potential interaction appropriate.

Summarizing, we consider the appraisal process as an inner dynamic function that evaluates the agent's dynamic presuppositions and its anticipation, and forms the basic level of the aesthetic experience. In this framework, the outcome of the appraisal process is an emotional value, which is organizationally connected with the interactive anticipations according to the agent's motives. Therefore, if the dynamic presuppositions in an uncertain interaction, according to a current event, are true, and the respective interaction is anticipated to be successful, then the outcome of the appraisal process is that which we use to designate as pleasure. If the dynamic presuppositions do not hold (false presuppositions) the current uncertainty creates anticipation of more uncertainty, which finally leads the agent to the elicitation of negative emotional states that we use to designate as pain. As such, every aesthetic emotional state of pleasure (the same goes for pain too) has qualitative differentiations according to the dynamic structure of its underlying neural patterns. Furthermore, as it is discussed in Section 2, anticipation of pleasure or pain has a possibility of error in its underlying functionality, which can be witnessed only when the system decides to act accordingly. Through the learning process, this outcome causally affects the next emotional response, particularly, when the agent is in front of the same or a similar condition. In this context, a positive feedback promotes the endurance of such affective states (Lewis & Granic, 1999) and gives more favorable evaluations than the negative ones (Leone et al., 2005).

4.2.1. The two stages of appraisal

Lazarus (1994) suggests that there are two stages of appraisal, i.e. the primary and the secondary. In the primary stage the agent has negative or positive presuppositions (true or false) of an event in order to maintain its autonomy. The primary appraisal is concerned as a motivational endorsement directed towards the agent's adaptation. As such, it is goal-related and checks for the appropriateness or not of the respective goal. The secondary stage of appraisal serves the function of coping with the environment and of forming future expectations (Lazarus, 1994; Scherer, 1999). In other words, it serves the function of an internal evaluation mechanism, which gives the system the ability to choose the appropriate interaction according to the current event, while it also provides a future orientation to the potentialities of interaction as the interactive model of representation demands (Bickhard, 2004). According to Frijda (2005), the secondary appraisal is what

an event allows or prevents one to deal with and includes what Gibson (1986) called affordances.

The appraisal mechanism must be capable of operating in great speed as the interval between stimulus and emotional response is extremely short. According to Ekman (1999) the appraisal is distinguished in two modes; one which operates automatically and without awareness and which is unreflective and unconscious or preconscious, and another, in which the evaluation process is slow, deliberate and conscious. Frijda (1993) claims that there is no necessary incompatibility between cognitive processes and fast emotional reactions, as the first stage of appraisal also suggests. The cognitive process, which is involved in the first stage of appraisal, has a possibility to be unconscious with no reasoning and no rational considerations or conscious deliberations (Frijda, 1993, 2009). Processing in the first stage provides possibilities of automatic emotional aesthetic responses, which can be triggered without any conscious cognitive-evaluative processing at all (Scherer, 1999).

This may imply the possibility for the consideration of a fundamental aesthetic habit (like or dislike, good or bad), which is activated when the proper event triggers the proper patterns of appraisal causing a basic or primary emotional response. According to Moors (2009) most of appraisal theorists support the idea that cognition is an antecedent of emotion without equating cognition with conscious cognition. They suggest that much of the cognitive work involved in the elicitation of emotion is unconscious or automatic. As a result, conscious cognition may be unnecessary for an aesthetic emotion but unconscious cognition is necessary. Cognition takes place as a parallel activity in an appraisal process. Additionally, emotion and consciousness cannot be equated but they also cannot be separated (Damasio, 2000a). As it discussed in Section 3, emotions and consciousness act together, as both of them require the same neural substrates.

Unconscious appraisal of stimulus takes place prior to the emotion, whereas conscious attribution of the emotion to a cause and/or labeling of the emotion (e.g., as pleasure or pain) takes place after the emotion (Moors, 2009). This allows us to conclude that the labeling of an aesthetic emotion is not an *a priori* mysterious process and probably, it does not refer to names like pleasure, happiness, joy etc., but to processes/mechanisms which result in emergent outcomes with particular characteristics. Such range of emotions with particular characteristics could be labeled as aesthetic emotional states of pleasure.

The consideration of the aesthetic emotional state as a result of an appraisal process implies a dynamic organizational linkage of the aesthetic emotion with the appraisal process. Certain patterns of appraisal cause particular aesthetic emotions that fuse agent's motivation and cognition. These aesthetic emotions, in turn, influence later appraisals. Since an appraisal process is required for an emotion to occur, knowledge is not sufficient to produce an emotion. Most probably, emotions depend on facts that are apprehended in the past, but they also depend on an internal evaluation mechanism related to the way these facts affect the dynamic presupposition pertaining to the system's self-maintenance (Lazarus, 1994). This means that autonomy is a precondition for the system to produce emotions according to its motives. However, since degrees of autonomy are organizationally and functionally connected with agent design, (using Damasio's terms in order to talk for agent's organisational structure) emotional activity is not a precondition for the autonomy of the system. In high order autonomous agents, like humans for instance, emotional activity is relatively advanced and possibly unique among animals and, as such, it aids representational content in many different ways than it does in a system with no such cognitive capacities. In low degrees of autonomy (e.g. a bacterium) the system's behavioral decisions are most probably based on other, simpler forms of information use (Baumeister et al., 2007) than emotional activity. In any case, at the moment, we have no epistemic justification to argue in favor of the existence of such emotional mechanisms in an autonomous system at the level of a bacterium.

Thus when an autonomous system has no capacities to enable the appraisal functionality, there will be no emergence of emotions. Additionally, since the elicitation of an emotion is organizationally dependent on an appraisal process, when such a process takes place, the emergence of an emotion of some kind is inevitable (Lazarus, 1994). Therefore, every autonomous system that elicits emotions, in the way we have argued so far, also has the possibility to experience a level of aesthetic emotional responses according to its functionality. However, what a primitive organism, according to its functionality, may eventually evaluate as good or bad regarding its goals, is probably analogous and equivalent but not equal to, an aesthetic primitive judgment of mammals or higher-order mammals such as humans.

The primary and the secondary stages of appraisal and their functional characteristics form the background for the synthesis of a model for the elicitation of the aesthetic emotion. This minimal explanatory model regarding the formation of the complex aesthetic preference is presented in the following section.

4.2.2. The appraisal structure and the aesthetic response

As previously discussed, the perception of an event starts with a non-cognitive step of primary appraisal. When an event is perceived from the cognitive agent, the question to be answered is 'what the living system will select to do next?'. Motivation is responsible for selecting the process that will lead to further activity, and representation is responsible for anticipation in the service of such selection. According to Brehm et al. (2009), basic affective responses have underlying motivational substrates. Motives affect behavior and prepare the cognitive agent for action by directing it to select courses of interaction over others (Reeve, 2008).

According to the model suggested in this paper, and considering emotion as a function that serves the evaluation of the current event, it could be argued that motivation is interrelated with the primary stage of appraisal process. According to Fridja (1993), in the primary stage of appraisal all emotional values derive from the anticipation of the agent or the presence of primary satisfiers or annoyers. Satisfiers and annoyers are responsible for a non-conscious

comparison and a mismatch of the current event with an expectancy formed by the goals/motives of the system. It is suggested that all those emotional appraised events point back to events that are intrinsically pleasant or unpleasant, without the possibility of a further cognitive justification (Frijda, 1993). This implies the possibility of habitual aesthetic evaluations. In other words, the cognitive agent has evolved a capacity to form primary appraisals based on historically appropriated habits and actions according to its dynamic architecture and capacity. Therefore, in order to elicit emotions with a pleasurable aesthetic value (e.g. pleasure) a primary satisfier must be initially triggered. Using this perspective, it is possible that the primary appraisal phase compares the current event with a habitual preference and in this way, initiates the fundamental process of distinction and observation. Satisfiers have an innate positive (true) outcome, which refers to successful forms of emotional interactions.

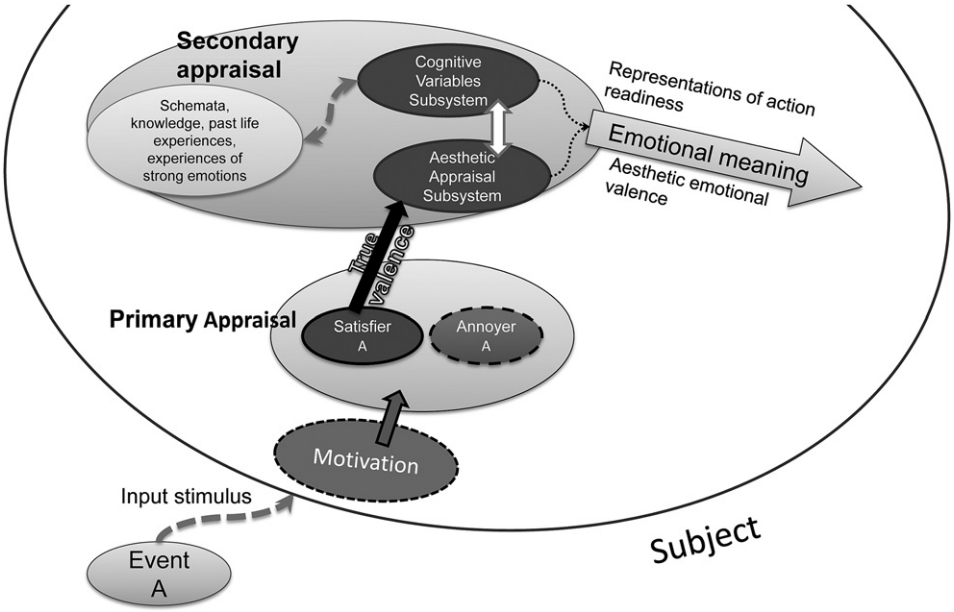
The secondary appraisal phase is the conscious part of the process and refers to the second stage, where the evaluation is much slower. The cognitive variables involved in emotional arousal do not represent additional cognitive conditions for a given emotion, but mostly, they represent additional meanings of the eliciting event. According to the suggested model, in the secondary stage of appraisal, representations lead to richer aesthetic meanings (mental images) through the process of distinction and observation as the cognitive agent tries to reduce the interactive uncertainty. As Frijda (1993) argues, the secondary appraisal presupposes some comparison with stored information, schemata and expectations of the cognitive agent even for the simplest stimuli that elicits emotion. In this phase, past emotions pertaining to successful or unsuccessful interactions, are recalled from agents memory. This knowledge is functionally useful for the cognitive agent as it attempts to solve the current interaction problem and to reduce the uncertainty according to its motivation. This process is fundamental also for the accomplishment of the function of heuristic learning. In this perspective, we propose that this part of the overall cognitive process in the secondary appraisal phase corresponds to a subsystem that involves cognitive variables which affect the action readiness of the system and not merely the resulting emotional state. We call this the Cognitive Variables Subsystem (CVS) (Scheme 3).

The management of stored information in CVS is not sufficient to elicit an aesthetic emotional meaning. Most possibly, emotions depend on facts related to stored knowledge and past experience, but they also depend on an internal appraisal mechanism of the way these facts affect the set of dynamic presuppositions for the corresponding interaction. Accordingly, we propose, in the secondary appraisal stage, the existence of another internal appraisal subsystem, the Aesthetic Appraisal Subsystem (AAS), which primarily affects the elicitation of aesthetic emotional meanings. The emergence of the aesthetic meaning, which could be useful for a solution of the current interactive situation, takes place even when the cognitive agent does not know anything about the current appraised event. Through the AAS the agent evaluates the implications of satisfiers or annoyers from the primary appraisal stage according to motives and anticipations with respect to the current event.

These two subsystems (CVS and AAS) are causally connected with the elicitation of the aesthetic emotional meaning. Additionally, action readiness is possibly affected by the whole internal mechanism in the secondary appraisal stage, enabling the cognitive agent to evaluate the situation and help it choose the appropriate interaction (action planning). The cognitive agent perceives and appreciates events through the construction of complex and dynamic appraisals, which support the respective dynamic representations in the formation of action selection. Our aesthetic emotions serve as an aspect of interactive anticipation permitting the agent to select among all possibilities those that are most suited to its current internal conditions (Bickhard, 1997b). The result of the secondary appraisal stage is the final construction of emotional aesthetic meaning, which, based on the suggested model, is considered as a minimal form of aesthetic judgment.

Overall, it could be said that what we perceive as pleasurable is causally connected with recognizable patterns of stored information linked to appraisal subsystems and making our aesthetic response a result of utilizing those basic mechanisms of appraisal. On the other hand, a negative aesthetic emotion can be evoked when interactive uncertainty is caused by an unfamiliar event, which is localized in space and time, and which is being monitored as unfamiliar by the learning process itself. Uncertainty may cause more uncertainty leading the system to confirm a negative emotion and leave or alter the current situation (Bickhard, 2000a). Pleasurable or painful values could be a part of a central control system, by which the cognitive agent benefits from selecting the best-valued alternative according to its emergent motives (Brown, 1990; Pugh, 1979). This is further witnessed in empirical tests of the motivational underpinnings of positive and negative emotional responses. Specifically, it has been found that negative evaluations produced avoidance tendencies, whereas both conscious and non-conscious positive evaluations of stimuli produced immediate approach tendencies (Brehm et al., 2009). The distinction between pleasure and pain as it results from the appraisal process is probably a problem based on the complex formation of anticipation and expectations of the system, which probably affects the primary and secondary appraisals thus changing the potentialities to resolve the uncertainty for a future interaction.

Aesthetic emotions, as cognitive responses, have also a functional role that provides emergent motivation (Bickhard, 2000a; Brehm et al., 2009) and new knowledge. The knowledge of new aesthetic meanings and new aesthetic judgments form the basis for further aesthetic emotions, judgments and actions. This is a presupposition for a future-oriented model of aesthetic judgment, which confirms the subjectivity of the aesthetic preference based on motivation and learning. In the suggested model, an object can be considered as an unlimited list of events that elicit dynamic appraisal patterns of emotional responses. Therefore, the ideally ultimate aesthetic verdict is a much more complex process than the one described and analyzed in the minimal model suggested in this paper.



Scheme 3. A depiction of the functional parts of the suggested model pertaining to the elicitation of the aesthetic emotional meaning. Particularly, the different stages of processing, the respective functions, and their interrelations, while the dynamic appraisal of the perceived event forms the primitive aesthetic judgment, are discretely depicted.

According to this model, the aesthetic judgment has to resolve also qualitative aspects of the emergent aesthetic emotions, which in turn construct more complex appraisal structures. Aesthetic emotions are more than what we have named herein as pleasurable or painful; they have qualitative differentiations (e.g. intensity), which are causally dependent on the dynamic character of appraisal. This gives us the ability to suggest that, although an emotion of pleasure, associated with a specific object, will have the same values for different moments of its elicitation, the respective emotional states could be experienced in totally different ways from the cognitive agent itself. Time is also an untouched topic in emotion studies, as Frijda (2009) notes. Additionally, attention is another aspect that connects time and appraisal, and which affects the elicitation of aesthetic emotions. These two last elements are not studied in the present framework, but we suggest that this model could be a starting point for their naturalized examination and analysis in further studies.

5. Conclusions

Emotions are functions that detect opportunities or threats and accordingly, lead individuals to engage with situations that will be advantageous for them, or otherwise, to avoid situations that will be harmful for their stability. Generally, a positive or a negative emotional state plays a major role in the survival of an agent. According to the interactive model of representation, emotions are implicitly associated to the representations and in general, to the transformation of the factual knowledge of a cognitive agent. Our aim is to provide a naturalized model describing, explaining and analyzing the process by which emotions are elicited affecting the agent's aesthetic judgment. The naturalized illumination of the mystery of aesthetic behavior demands explanations based on the concept of normative functionality. This aspect is strongly supported in the interactive framework of representation.

Considering the neurological evidence regarding emotions and aesthetics, it is argued that aesthetic judgment seems to engage more than one brain area and of course, it does not exhibit a serial pattern of information processing. Particularly, aesthetic meaning is dynamically composed by a complex web structure of neurons in conjunction with emotional reinforcement of continual feedback looping with the limbic system. According to neurological findings, in a basic perceptual process the production of aesthetic meaning results in the elicitation of the emotional state of pleasure or pain, as everything related to the respective functionality comes together into a unified concept serving the stability of the autonomous agent.

Therefore, in this paper we suggest a minimal model of aesthetic judgment and we also argue in favor of a dynamically organizational connection between the aesthetic judgment and the respective emotional values (i.e. pleasure or pain), as these are emergent in the interaction of the system with its environment. Particularly, in the suggested model aesthetic emotions are considered as functions that serve an evaluation mechanism, as the agent tries to resolve the interactive uncertainty in a given interaction. Consequently, we consider the aesthetic emotional states of pleasure and pain as *a functional indication that strengthens or weakens the anticipation for the resolution of the dynamic uncertainty emerged in the specific interaction*. Overall, this process serves the maintenance of the autonomy and the stability of the agent, since it functions as a detecting mechanism that could prevent the interactive error.

Specifically, in the suggested model, the appraisal theory of emotions is used as a vehicle to detect the functions by which the evaluation mechanism is related to the elicitation of the aesthetic emotional meaning. Therefore, according to the suggested model:

- The aesthetic elicitation is always a goal-related attribution, in contrast with the more dominant and philosophical approach to aesthetic theory that claims for disinterestedness of pleasure (*free* of satisfaction), when the agent is about to call something *Beautiful* (Kant, 1914; Shusterman & Tomlin, 2008; Wicks, 2007).
- When an agent is operating in the first stage of appraisal, the ability of automatic emotional aesthetic responses implies the strong possibility for the consideration of *fundamental aesthetic habits*.
- Considering that the appraisal of an event takes place prior to the outcome of the aesthetic emotion, we could conclude that aesthetics, in general, and aesthetic judgment, in particular, is not an *a priori* mysterious process and most probably, it does not refer to names like pleasurable, beautiful, tasty, etc., but to processes/mechanisms, which result in emergent outcomes with particular characteristics.
- Autonomy is a precondition for the system to produce aesthetic emotions. The contrary is not true.
- We specifically suggest the functional realization of two parts/processes in the overall cognitive process of the secondary stage of appraisal. The first process (CVS) corresponds to a subsystem that involves cognitive variables and it is fundamental for the accomplishment of the function of heuristic learning. The second process (AAS) primarily affects the elicitation of aesthetic emotional meanings. These two subsystems (CVS and AAS) are organizationally connected, thus affecting the action readiness or the action planning of the autonomous agent.
- Aesthetic emotions have also a functional role that provides new motivations and new knowledge. The knowledge of new aesthetic meanings and new aesthetic judgments form the basis for further aesthetic emotions, judgments and actions.
- The dynamic character of the appraisal process confirms the philosophical claim for the subjectivity of the aesthetic judgment. In particular, the same cognitive agent in different instants of the same interaction process could elicit different aesthetic judgments even if we consider the environment as static.

Overall, we propose a naturalized model for the appraisal of events as an inner dynamic function that evaluates the anticipation of an agent and partly forms, in a fundamental level, the elicitation of the aesthetic experience.

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