1. INTRODUCTION

The term neuroaesthetics was introduced fifteen years ago by Semir Zeki (1999) in reference to a potential field dealing with the biological underpinnings of aesthetics. Since then, the field has grown, matured, and diversified (Chatterjee 2011). Due to its inherently interdisciplinary nature, neuroaesthetics has emerged from the work of researchers with very diverse backgrounds, interests, and priorities. As a result, today the field is alive with different questions, methods, and opinions as to its very identity and worth. A history of neuroaesthetics in a strict sense would span no more than these fifteen years, and developments during this period have already been described (Chatterjee 2011; Nadal and Pearce 2011). Accordingly, this chapter will survey the historical antecedents that explain the sort of questions and concepts that characterize neuroaesthetics right now, the sort of disciplinary interactions and alternatives that are still available to current researchers. Our goal is to provide a sort of historical awareness for neuroaesthetics, in order to clarify how our discipline inherited its current concepts and problems from the past. Methods are clearly new in our field, but our problems and concepts are certainly not. A historical awareness is required if one does not want to reinvent the wheel in this area, or to fall back on the same positions and debates through and through.

Because of neuroaesthetics’s disciplinary diversity, the relevance of its historical precedents varies depending on how the field is conceived and delimited. This chapter takes an admittedly narrow view...
of neuroaesthetics, one that sees this discipline as aiming to explain how the brain gives rise to and sustains aesthetic experiences. Moreover, reflecting the field's own bias, our focus will be on visual neuroaesthetics. Such perspective is narrow because, by emphasizing the "neuro" component, it conceives neuroaesthetics as a part of a psychological approach, and, at the same time, it does not prejudge the question of whether aesthetic experiences are exclusively elicited by artworks. In fact, from this perspective, one of neuroaesthetics's essential foundations is the evolutionary approach, which has often argued that aesthetic experiences predate art as a human activity, and looks into human brain evolution as a key to understanding how the brain makes them possible. Our approach, therefore, cuts across the more classical psychology of art: it is interested in how the brain makes aesthetic experiences possible, but it is also open to non-artistic aesthetic experiences, and involves an evolutionary standpoint. It also cuts across philosophical aesthetics in the common interest in aesthetic experience, but in our case from an empirical point of view.

We will not discuss the reasons for wanting to adopt such an approach, and we will take it for granted in what follows. The present volume constitutes a justification for such a view as the most fruitful one. Our task is to clarify its historical roots. Given the novelty of neuroaesthetics as a discipline, our assignment affords a great deal of elbowroom. It would be a misrepresentation to pretend that our discipline, understood as we just proposed, has an extensive past. A discipline, the sociology of science teaches us, is constituted by a scientific community which shares concepts, theories, a common understanding of problems, as well as shared methods to measure progress, in addition to more clear external signs. As for neuroaesthetics, all these disciplinary marks are still very much in the making. We will focus on four central axes of neuroaesthetics, to look for their respective historical threads: i) the understanding of aesthetic experience, and its connection with aesthetic judgment, as a psychological experience; ii) the search for the determinant properties of aesthetic experiences; iii) the question of how to conceive of the relationship between brain and psychological processes involved in aesthetic experiences; and iv) the pioneers who approached aesthetic experience from an evolutionary perspective. In so doing, we aim to clarify the origin of current views and debates in neuroaesthetics, as well as some of the criticisms it has received.

2. AESTHETIC EXPERIENCE: A MATTER OF TASTE?

In this section we will review the historically most important ways in which aesthetic experience, the "object" of neuroaesthetics, has been conceived. It focuses, accordingly, on the conceptual issues that surround its project. We will have to dig into its philosophical precedents in aesthetics as a philosophical discipline, which developed in the eighteenth century (Baumgarten's 1735 Philosophical Meditations is regarded as the modern starting point). It is important to keep in mind that the initial question revolves around aesthetic judgment, and the initial views contrasted the empiricist approach that reduces it to a matter of preference or taste with the Kantian view concerned with keeping it within the scope of reason. In this section we also briefly touch on the issue of the proper domain of aesthetic judgment: whether it must be concerned only with art or whether it can also be properly applied to nature. Finally we will discuss the objective-subjective dichotomy as it applies to aesthetic judgment.

Our first issue, then, finds its roots in the philosophical aesthetics of modernity, in particular in the debate between British empiricism and Immanuel Kant on how to understand aesthetic experience. The British empiricists thought of beauty as a matter of taste, of pleasure or preference, an experience of an emotional nature in any case. Kant, on the contrary, viewed it as a sort of judgment, and hence, as an experience submitted to rational considerations. In this sense, the lines of debate between both camps are very similar to those regarding morality. While this debate broke open in the second part of the eighteenth century, just as aesthetics was emerging as a philosophical discipline, it can still be viewed as defining the basic conceptual problem for neuroaesthetics: determining what is the most adequate way of conceiving the experience itself is the field's very object of study.
Marcos Nadal, Antoni Gomila, and Alejandro Gálvez-Pol

Hume applied Hutcheson’s moral emotivism to beauty (and value judgments in general): value judgments are, in fact, the expression of taste rather than reasoned analysis. His basic idea is that aesthetic experiences are experiences of pleasure caused by some particular impression or idea. He did not reduce the experience of beauty to a sensory experience; however, he also allowed for experiences of the imagination: expected pleasure can make us value some imagined experience. While his mature essay “On the Standard of Taste” (1757) has attracted most attention, he dealt with aesthetic issues also in some of his major works (though mostly as illustrations of his views on morals).

Just as in the field of morality, the major problem for such a view of value judgment is how to avoid the skepticism and relativism that seem to follow from this extreme subjectivism. Hume believed that intersubjective agreement is made possible by the similarity among subject constitution ("human nature" is universal), so that experiences can be equally shared by different subjects. However, Hume also had to acknowledge the fact that there can be differences of "taste," different preferences; according to him, they can be accepted as long as we can notice a difference between the corresponding preferences that may help distinguish between subjects in terms of their subtlety and sensibilty. In this regard, taste can be normative: some people have better taste and a greater sensitivity to the pleasurable properties of impressions and ideas than others.

His emphasis on pleasure as the only ground for value, though, whether moral or aesthetic, raises another problem for Hume: how to explain the phenomenon of finding pleasure in tragic fiction or drama (the Greek "katharsis"), a difficulty that will require an enlargement of the field of aesthetic experiences to recognize the appeal of the fearful: "the sublime." Not all aesthetic experiences, then, need be "rewarding" (to use a trendy notion in neuroaesthetics), in the sense of providing pleasure. Other kinds of emotional effects of impressions and ideas may induce aesthetic value. According to Edmund Burke, a devout empiricist, while the experience of beauty relies on the biological mechanisms of pleasure or love, the experience of sublimity is mediated by the physiological causes of pain. Any stimulus capable of producing similar

effects to the "unnatural tension, contraction or violent emotion of the nerves" (Burke 1757, 248) that characterize pain would lead to states of fear or terror, which would then be experienced as sublime. Conversely, "a beautiful object presented to the sense, by causing a relaxation in the body, produces the passion of love in the mind" (287). What’s relevant in Burke’s development of the empiricist program is that he introduces physiological explanations for aesthetic experiences, couched in the mechanical view of the human body proposed by René Descartes’s On Man (1662), instead of adopting Hume’s phenomenalism, which would develop into the introspectionist psychology of the late nineteenth century. In this regard, it can be considered as the first effort to provide a naturalistic explanation for such experiences, and, therefore, an antecedent of neuroaesthetics. But it took more than a century to develop a new framework, one based on the emerging brain sciences, which also flourished in the second part of the nineteenth century in France (see section 4).

Kant, and German idealism in general, on the contrary, thought of the human subject as belonging to the world of reason ("Spirit"), and hence not part of the world, not amenable to a naturalistic explanation. Kant conceived of aesthetic experiences in terms of judgment—in his Critique on Judgment (1790). His proposal is rather convoluted, because it makes aesthetic judgment depend upon a more basic judgment of function. For Kant, function emerges when we find some kind of organization for a purpose. What is distinctive about aesthetic judgment, then, is the recognition of such an organization in a given experience, but without having any purpose. This may sound strange at first, but it constitutes a profound insight when considered from the standpoint of archeology, for instance, where it plays a central heuristic role: deciding on whether a mark, object, or practice is symbolic or aesthetic depends on whether it has or lacks a practical purpose. Aesthetic judgment, then, attributes value to something although it does not contribute to further our interests, our goals. More precisely, given Kant’s bent for paradox, aesthetic judgment bears witness to our non-practical interest, our interests for their own sake. As a consequence, aesthetic judgment is a judgment of value, an arena for the normative evaluation of "right" and "wrong," as
Marcos Nadal, Antoni Gomila, and Alejandro Gálvez-Pol

an intrinsic feature of the stimuli, quite apart from one’s interests in the case. In this instance, Kant offers a much stronger answer to the question of intersubjective agreement: aesthetic judgment is not arbitrary, a matter of subjective preferences that happen to coincide with those of others, but a standard for the community of rational agents.

Kant was also interested in the “sublime,” which he thought was related to our experience of the world as a finite totality, and had an enduring influence on Romantic artists. Art was also influenced by another conceptual point of agreement: both empiricists and idealists did not restrict the scope of aesthetic experience to art. Congruent with the modern emphasis on nature, both paid attention to the “aesthetics of nature,” which greatly influenced the development of landscape painting, and also of traveling and enjoying the landscape. Uvedale Price (1810) bears witness to this influence: he introduces an explanation for a new aesthetic category, that of the picturesque, related with the fashion of traveling to the Mediterranean. According to him, this experience has to do with feelings of curiosity, and its effect is to keep nerve fibers at their normal tone, and could be paired with experiences of beauty and sublimity. Where empiricism parted company with idealism was in the latter’s focus, during the nineteenth century, on aesthetic production by humans, but was related to an unconstrained metaphysics of genius, which compared artists to gods.

The notions developed by these thinkers are not mere historical curiosities. On the contrary, our study of the psychological and biological processes involved in aesthetic experience today is grounded on—and conditioned by—the concepts and viewpoints articulated during modernity. But it would be wrong to set this conceptual debate in terms of “objective” versus “subjective” options, as it is sometimes done. All approaches take aesthetic experiences to be subjective, that is to say, forms of the consciousness of the subject, because both agree on the atomistic and mechanistic view of the world, of “the objective,” as depicted by modern Newtonian physics. It is just that, for Kantian idealism (and also for the idealists that were to follow), the subject belongs to the world of transcendental reason, and it is understood as an active power, while the empiricist school focuses on emotions and preferences, and tries to apply the methods of the new science to the workings of the subject as well.

The conflict between “objective” and “subjective,” though, finds its proper place in the tension delineated in the next section, which deals with the properties that give rise to aesthetic experiences. This latter issue is largely orthogonal to the present one: whatever one’s view of aesthetic experience, it is possible to raise the following questions: What is common to all things one considers beautiful? Which properties give rise to aesthetic experiences? However, it creates a tension with the objective-subjective issue because, given the available options, aesthetic experiences are in principle not reducible to—or accountable for—such properties, since these are objective properties while the former are subjective experiences. Moreover, the more one conceives subjects as organizers of their own experience, the larger the gap between the actual experience and our possibilities of studying it objectively. It is true that empiricist approaches tend to conceive the subject in a more passive way (its activity in terms of association laws), while rationalists emphasize its active role, but both have to acknowledge a gap between objective properties and subjective experience. This issue, in any case, does not preclude the possibility of studying aesthetic experiences scientifically. In fact, it brings us to our second issue.

3. VISUAL PROPERTIES THAT GROUND AESTHETIC EXPERIENCE

The second “big issue” in neuroaesthetics refers to the characterization of the kind of properties that give rise to aesthetic experiences. At this point, again, we must begin with retrieving another classical dichotomy in aesthetics, which turns critically on the issue of formalism. Formalism contends that aesthetic experiences are induced by some formal properties of the perceptual stimuli, instead of what they represent, or how they represent its content (how well they resemble what they represent, for mimetic conceptions; how well they express the author’s attitude, for expressivest views, etc.). Admittedly, the historical precedents of neuroaesthetics have consistently adopted a formalist framework, and neuroaesthetics has commonly followed this trend, but it is impor-
tant to keep in mind, in our view, that a "content" approach is also possible, and potentially fruitful. Faces, at least, constitute a clear example in this sense. If the content approach is possible at the level of perception, it is unavoidable at the level of understanding: aesthetic appreciation, in this regard, is "cognitively penetrable," it depends to a great extent on available knowledge. The success of formalism and abstraction during the twentieth century perhaps biased research in this direction. Very many empirical studies have tried to explore which formal properties are relevant in inducing aesthetic experience, as well as to test particular hypotheses, both through observational and experimental studies.

As remarked at the end of the previous section, a common difficulty for any such approach is to ascertain whether aesthetic experience can be directly traced back to the "objective" properties of the stimuli, or whether it depends on the way such properties are experienced/organized by the subject. As already anticipated, empiricist approaches tend to prefer the former approach, while rationalistic approaches focus on how subjects structure their experience.

Three milestones will be mentioned in this section: the pioneering work of Gustav Theodor Fechner (1876), the contribution of the Gestalt, and the work of Berlyne (1971, 1974), who was deeply influenced by the intersection of cybernetics and psychology. While the first exemplifies the empiricist approach, and the second the rationalist one, the third can be seen as an attempt at a sort of interactionism that pays attention to relational properties, which emerge from combining stimulus and subject.

3.1. Fechner's Aesthetics "From Below"

Fechner's (1876) Vorschule der Aesthetik is usually considered to mark the beginning of empirical aesthetics (Cupchik 1986). Fechner (1871, 1876) characterized the new proposal as a kind of aesthetics from below. By this he meant that it had to begin with particular facts and then gradually grow toward generalization, which contrasted with the type of aesthetics carried out by philosophers and art theorists. Fechner's psychophysical knowledge and methods represented crucial additions to contemporary attempts to determine how diverse properties of art-
Marcos Nadal, Antoni Gomila, and Alejandro Gálvez-Pol

Figure 1.
Adolf Zeising's (1854) analysis of the ideal proportionality of the Apollo Belvedere. This statue, which is 224 cm in height, is a Roman copy made around the year 350 B.C. from a Greek original, and it is regarded as an example of the Ancient idealization of the human form (image reproduced from Zeising 1854).

tain whether paintings considered to be great artworks had been produced on canvases conforming to the golden section. He took the necessary measurements of an impressive amount of genre scenes, landscapes, still lifes, religious and mythological artworks from guides, catalogs, and inventories of twenty-two mostly European museums and galleries. The results of this analysis, however, revealed that, on average, the dimensions of the artworks did not conform to the ratios predicted by the golden section. Suspecting that simpler materials would afford a better approach, Fechner (1865) performed the first empirical test of the influence of the golden section on people's preference (Berlyne 1971; Green 1995). He showed his participants ten rectangles that varied in proportion from 1:1 to 2.5:1, and then asked them to indicate which one they found most pleasing, and which one they found the least pleasing. As Green (1995) noted, before many researchers considered control procedures to be important, Fechner (1865) made sure that the area of all rectangles was the same, avoiding the undesired influence of size, and he presented them in a new random order to each participant. Most of the participants' responses favored the rectangles representing the golden section or close proportions (see Figure 2). According to Fechner (1876), 34.50 percent and 35.83 percent of men's and women's choices, respectively, favored the golden section rectangle. In fact, none of the participants selected it as the least pleasing. This constituted evidence for the argument that certain properties of the stimuli—that is to say, objective features—will generally be preferred, liked, or experienced as beautiful.

Lightner Witmer (1893a, 1893b) posthumously presented some of Fechner's unpublished data, together with results from his own repli-
cations with rectangles and his additional experiments with triangles, ellipses, and other geometrical shapes. Although his participants preferred rectangles whose proportions were close to those designed in accordance with the golden section, they preferred ellipses and triangles that were wider than those with the expected height-width ratio. Many more experiments were performed throughout the twentieth century to determine the extent to which the golden section has an influence on people's aesthetic appreciation, and we refer interested readers to Green (1995), who offered a comprehensive review of the mixed support for this influence.\footnote{Fechner and Wittner did not provide specific explanations for humans' sensitivity to the golden section, but later authors did. Such accounts allude to the horizontal to vertical ratio of the visual fields, the avoidance of extremes, and familiarity with a culturally biased proportion system, among other factors, which Berlyne (1971) regarded as difficult to assess until the extent of the influence was clarified.}

Despite the fact that Fechner was not alone in his desire for an objective system of measurement of art and aesthetic experiences, and that Fechner, Zeising, and others' contributions were not intended as a self-contained reflection on aesthetics, but as part of a much larger philosophical view of the universe and humans' role in it, Fechner is considered the founding father of empirical aesthetics. Fechner's enduring impact is mostly due to the promise of his successful scientific methods for measuring sensation and his psychological experiments, although he considered them merely as supports for his philosophical views on the universe. It was this unintended influence that imprinted on his bottom-up approach to aesthetics a uniquely psychological character (Konečný 2005).

His methodological innovations are considered to be his most influential contributions.\footnote{Although we will not explore his theoretical contributions in depth, Fechner's work anticipated many of the elements that characterize the motivational and cognitive approach to modern empirical aesthetics, specifically some of Berlyne's keystone principles. He believed, for instance, that the search for pleasure is an important element in the aesthetic response. Given that people tolerate an intermediate degree of activation more frequently and for a longer time than a very high or very low degree, pleasant stimuli should provide an adequate balance between complexity—a multiplicity of fixation points—and order, or unitary connectivity (Cupchik 1986).} He introduced the practice of addressing psychological questions related with art by registering the reactions of sampled subjects representing certain populations. Additionally, instead of studying a single artwork in depth, large numbers of objects were used to determine collective attributes of classes of stimuli (Cupchik 1986). Current researchers studying the biological underpinnings of aesthetic experience still rely on this strategy, especially those using neuroimaging techniques. It is assumed that brain activity in specific regions identified by averaging across several participants who viewed or listened to a large number of stimuli constitutes a meaningful approach to the biological underpinnings of aesthetic experiences. Although these results may be representative of a sample or population, they are not, however, meant to illustrate neural activity underlying a specific person's aesthetic experience with regards to any specific stimulus.

Among the methods that Fechner developed for empirical aesthetics, the method of choice continues to be used widely in neuroaesthetics. This method consisted in asking participants to compare a number of objects' ability to please. Different variants of this method have dominated experimental psychology of aesthetics since its first implementation. The ordering method requires participants to order a series of objects according to their preference for them. In paired comparisons, objects to be rated are presented in pairs and participants are asked to indicate which of the two elements they prefer. Finally, one of the most common methods used in empirical aesthetics today is to ask participants to choose a number that represents their degree of preference or liking for each object in the presented set.

Since Fechner's seminal work, many psychological experiments have sought to elicit indicative responses of the preferences of samples of participants. Artistic materials, such as reproductions of paintings, photographs of sculptures or facades, and musical excerpts, have been used on some occasions. Most of the time, however, researchers have used much simpler materials: colors, geometric forms, or isolated sounds. The first kind of stimuli has the advantage of enabling the study of the reactions to true art, but has the disadvantage that any two artworks may differ in any number of features, such that it becomes difficult to identify the factor that is truly responsible for any
differences in the reactions to them. The use of simple artificial materials overcomes this problem because it allows manipulating specific dimensions. Nonetheless, this kind of material has been criticized for being very different to anything that could elicit a natural aesthetic response and, hence, inappropriate for studying the essential components of genuine aesthetic experiences. Given the methodological constraints inherent to neuropsychological and neuroimaging methods, this tradeoff between internal and external validity becomes an even more pressing issue in the field of neuroaesthetics. Researchers need to control so many undesired variables related with their stimuli that they risk ending up with a set of stimuli that are unlikely to elicit natural aesthetic experiences.

Stripped of its deep philosophical foundations, Fechner’s (1876) contribution to aesthetics succumbed during the first half of the twentieth century to the behaviorist belief that all human experiences could be explained without resorting to mental phenomena, and to the influence of psychoanalytical and Gestalt approaches to art. As Cupchik (1986) noted, the approach initiated by Fechner has been criticized from other perspectives for being almost exclusively empirical, quantitative, determinist, and reductionist. The Gestalt psychologists, for instance, noted the extreme limitation of the phenomena addressed by Fechner’s approach, as well as the restriction of the methods he applied. Philosophers have often criticized these methodological restrictions and the fact that crucial cultural and historical aspects are usually ignored. In its experimental approach at least, neuroaesthetics has adopted the empirical, quantitative, and reductionist character from its empirical aesthetics predecessor. This has made the field susceptible to similar criticisms, including the uncertainty as to whether aesthetic experiences can be meaningfully decomposed into elementary constituents and expressed as simple quantitative measures, and the idea that no significant contribution to our understanding of art can emerge from a field that focuses solely on aesthetic responses, that takes object and subject out of their historical and cultural background, and that, by averaging responses from many participants to many stimuli, ignores important individual features of the artwork and the spectator (Chatterjee 2011; Nadal and Pearce 2011).

3.2. The Contribution of Gestalt Psychology

The Gestalt’s valuable contribution to psychology is often viewed in counterpoint to atomistic thinking about mental processes, especially perception. Gestalt psychologists argued that experience is nothing like a mosaic of discrete and disengaged elements. They conceived any human experience as a field where parts interact dynamically with each other, and are influenced by the nature of the whole field. Their notion of field did not apply only to perceptual experiences; they also used it to explain other psychological phenomena, including memory, learning and education, problem solving, and psychopathology (Hartmann 1935). In the context of our review of historical antecedents of neuroaesthetics, though, Gestalt psychology’s most significant influence was its explanation of perception and understanding of objects and scenes as emergent processes that go beyond the mere recording of the elements in the stimulus. One popular example of this was Gestalt psychology’s solution to the problem of perceptual organization. Max Wertheimer (1912, 1923) suggested a number of grouping principles, such as proximity, continuation, similarity or closure, which organized parts of the visual scene into wholes, such as objects, clusters, and overall scenes. Figure 3 shows how the principle of similarity organizes the items in the set above as rows and the items in the set below as columns. Importantly, from the Gestaltists’ perspective, perceptual
order, organization, and form are the outcome of the subject's engagement with input. The perceiver is not regarded as a passive receiver, but as an active organizing agent.

One of the most influential notions developed by Gestalt psychologists was the general principle of Prägnanz, which stated that the perception of an ambiguous scene is always as good as “allowed” by the existing conditions. Thus, viewers tend to perceive the simplest possible configuration consistent with the information presented. Figure 4 shows a set of figures that, by virtue of the Prägnanz principle, are perceived as a square, a circle, and a rectangle, and not as a more complex possibility, shown below, though both perceptions are equally compatible with the available information.

Gestalt psychologists also postulated physiological concomitants of the perceptual phenomena they studied. They believed that perceptual experience and physiological processes were intimately connected through an isomorphic relation, such that both their structures were the same. In contrast with standard neurophysiology, they thought that signal transmission from one neuron to another along single axons could not account for the interaction and organization that impregnated their theories. Rather, they posited general electrical fields, created by stimuli, that interacted with each other throughout the brain. These fields finally converged at a state of equilibrium, or minimum energy, at which perceptions became simplified.

Although art and aesthetics were never a primary concern for Max Wertheimer, Kurt Koffka, or Wolfgang Köhler, the founders of Gestalt psychology, their framework’s implications for the appreciation of art
Marcos Nadal, Antoni Gomila, and Alejandro Gálvez-Pol

and beauty were explored in a lecture delivered by Koffka (1940) and by later psychologists who realized the Gestalt's potential to overcome some of the limitations of empirical aesthetics (Henle 1961). In our context, their project, especially in the most mature version of Arnheim (1966) and in that of art historians such as E. H. Gombrich (1960), can be seen as the application to artworks of the principles of perceptual organization and grouping discovered by Gestalt psychology. From this perspective, aesthetic preference can be accounted for in terms of the degree to which the perceptual stimuli facilitate such a preferential organization, since the organizing activity by the subject is not completely free, but constrained by the relations among the elements in the stimuli.

Many different studies have applied such general principles to the psychology of art, in order to explain why masterworks have such a strong effect on us. Koffka (1940) openly rejected the psychophysical approach where beauty is defined in terms of the physical properties of the stimulus. From the Gestaltist point of view, appreciation of beauty and art emerges from the interaction of the viewer's psychological processes and the artwork's features. Koffka (1940) considered works of art to be special kinds of good gestalts, in that their constituents are placed by the demand of the whole and that the dynamic forces are particularly well balanced. An artwork is appealing, not as a collection of parts, but as a structure with a consistent entirety where each constituent requires the others. This structure is in close dynamic interaction with the viewer, who is actively organizing the artwork in one direction, and being affected by it in another. The spectator's thoughts and feelings are elicited in an appropriate manner by the artwork. Funch (1997) summarizes Koffka's (1940) view on this intimate connection between artwork and spectator:

Thus, visual perception is a kind of creative force, striving towards the good gestalt. A work of art, on the other hand, is already a good gestalt, making it possible for the viewer to get truly and deeply involved in order to benefit from the new reality created by the artist. (Funch 1997, 78)

Sander's (1931) work constitutes another suggestive pioneering attempt at approaching art and aesthetics from Gestalt psychology. He offered an account of the difference between classical and baroque styles in terms of proportion and symmetry: while classicists provide the elements for a "good Gestalt," baroque works' imperfections and asymmetries create tension and activation in the audience. Arnheim (1964, 1966, 1969), however, is probably the best representative of Gestalt approaches to art and aesthetics. Faithful to the core notions of Gestalt psychology, Arnheim believed that aesthetic experiences arise essentially from dynamic perceptual processes: perception is not the mere automatic and passive recording of aspects of the visual field; perceiving means becoming aware of dynamic forces inherent to the stimuli. This awareness is attained by the integration of two sources of information: the structured configurations received from the image and the patterns toward which the individual is oriented by virtue of his experience and disposition. The overall configuration of these dynamic visual forces constitutes what Arnheim (1974) referred to as the structural skeleton of the design. The essence of an artwork is the creation of a dynamic whole that integrates this structural skeleton with the depicted subject matter. He explained many traditional aspects of training in "Beaux Arts" schools in terms of Gestaltic principles of organization: balance, symmetry, composition, and dynamic complexity, by which he meant an optimal tradeoff between order and complexity. He also contended that aesthetic pleasure follows from finding such aspects in perceptual experience.

Gestaltic principles have been used to support theoretical accounts of the biological basis of our appreciation of art (Ramachandran and Hirstein 1999) and to analyze the consequences of brain damage on artistic production (Butter 2004). But although neuroscience has explored the neurobiological foundations of the influential notion of perceptual organization and of some underlying organizing principles (see, for
instance, Grossberg, Mingolla, and Ross 1997; Hirsch et al. 1995), and
the notion of balance has played a prominent role in empirical aesthetics
(Locher 2003; Locher, Gray, and Nodine 1996; Solso 1994), the neu­
ral underpinnings of the contribution of Gestalt principles to aesthetic
appreciation have yet to be explored experimentally.

3.3. Berlyne's Psychobiological Framework

During the 1960s and 1970s, Berlyne developed a broad research pro­
gram, known as psychobiological aesthetics, which became the starting
point for contemporary experimental aesthetics. Its main objective
was to uncover a reduced number of motivational principles that could
explain the preference of people, as well as animals, for certain kinds of
stimuli, and its most important contribution was to provide a theoreti­
cal foundation that could bring together the existing diverse interests
and approaches into a cohesive research program (Crozier 1980).

On the grounds of neurobiological findings on motivational and emo­
tional systems, Berlyne (1971) argued that the motivational state of an
organism is the product of the activity of three neural systems: (i) a
primary reward system, (ii) an aversion system, and (iii) a secondary
reward system, whose activity inhibits the aversion system. The activi­
ty of the three systems depends on the organism's degree of arousal,
which in turn depends on the configuration of stimuli from the envi­
enment, among other factors. From this point of view, the hedonic
tone induced by a stimulus, defined as the capacity to reward an oper­
ant response and to generate preference or pleasure expressed through
verbal assessments (Berlyne 1971), depends on the level of arousal that
it is capable of eliciting and the organism's current arousal level. Given
that organisms tend to search for the optimal hedonic value, they will
tend to expose themselves to different stimuli as a function of their
arousal potential, which in turn is a function of the amount of infor­
mination transmitted to the organism through psychophysical, ecologi­
cal, and collative variables, such as novelty, surprise, complexity, ambi­
guity, or asymmetry.

In relation to aesthetics and art, Berlyne suggested that interest and
preference for a given work, whether pictorial or musical, depend pri­
arily on how complex such a stimulus appears to the viewer (Ber­
lyne 1963; Berlyne, Ogilvie, and Parham 1968; Berlyne 1970). People are
expected to prefer intermediate complex artworks over highly complex
or very simple ones, given that they afford an optimal arousal level. It is
here that Berlyne's (1971) interactionist perspective is clearer. By asser­t­
ting that it is not the object's inherent features—complexity in this case­
that influence aesthetic experience, but the way in which the spectator
organizes and perceives the object, Berlyne moved away from Zeising,
Fechner, and Wittmer's strict empiricism and acknowledged the active
role of the perceiver, as emphasized by the Gestalt.

Berlyne's work recovered Fechner's soundest methodological and the­
orical contributions, provided the necessary theoretical framework
assembled at the intersection of neurobiology, motivational psychol­
ogy, and information theory, and sparked the interest of experimen­
tal psychologists in aesthetic experience again. Many studies followed,
most of them attempting to determine how collative variables influ­
enced aesthetic experience, and some using EEG to explore the biologi­
cal correlate of such influence (Aitken 1974; Berlyne 1963; Chevrier and
Delorme 1980; Day 1967; Eisenman 1967; Francis 1976; Heckert and
Wieringen 1990; Imamoglu 2000; Neperud and Marschalek 1988; Nicki
1972; Osborne and Farley 1970). These studies produced strikingly diver­
gent results. Subsequent research highlighted inconsistencies in the
definition and measurement of collative variables (Nadal et al. 2010),
showed that the psychobiological foundations of arousal that sustained
Berlyne's model were excessively simplistic (Craven 2003; Derryberry
and Tucker 1992; Pauss 2000; Steriade 1996), and that his framework
could not adequately account for important empirical results showing,
to name only one example, the influence of prototypicality on aesthetic

5 With regards to the interactive nature of complexity and other collative variables,
Berlyne (1971) believed that "the collative variables are actually subjective, in the
sense that they depend on the relations between physical and statistical properties
of stimulus objects and processes within the organism. A pattern can be more novel,
complex, or ambiguous for one person than for another or, for the same person, at
one time than at another. Nevertheless, many experiments, using rating scales and
other techniques, have confirmed that collative properties and subjective informa·
tional variables tend, as one would expect, to vary concomitantly with the corre­
sponding objective measures of classical information theory" (Berlyne 1971, 9).
preference (Martindale and Moore 1988; Martindale, Moore, and Anderson 2005; Martindale, Moore, and Borkum 1990).

The advances in neuroscience and psychology showing that Berlyne's model was limited and oversimplified left empirical aesthetics lacking an overarching framework again until Leder and colleagues (2004) and Chatterjee's (2004a) models brought together and provided meaning to many of the psychological and neuropsychological findings produced in the three previous decades. The key feature of both these models was not to reduce aesthetic experience to one or few principles, but to recognize the involvement of diverse bottom-up and top-down psychological processes. Importantly, though, Berlyne's work was a catalyst in constituting a true field of empirical aesthetics, with its research association and specialized journal. Moreover, at a time at which most psychologists felt it unnecessary to relate their computational level of analysis with the biological level, Berlyne showed that a complete understanding of human aesthetic experience would only emerge from the confluence of psychological, neuroscientific, and evolutionary approaches.

4. BACK TO BRAIN LOCALIZATION AND BEYOND

One of the chief aims of neuroaesthetics is to characterize the brain mechanisms that make aesthetic experiences possible. Is there a specific brain system involved in our experiences of beauty and ugliness? The historical roots of the search for the neural underpinnings of aesthetic appreciation can be traced back to the works of British empiricists (Moore 2002; Skov and Vartanian 2009). As we noted above, Burke (1757) was among the first to suggest a physiological basis for aesthetic experiences. He did so on the grounds of the Cartesian view of the human body as a machine. Animal spirits were thought to act through the nerves to produce movements and convey sensory information (see Figure 5, below). Burke (1757) argued that the aesthetic experiences are grounded on the same physical mechanisms as non-aesthetic emotions.

We perceive objects, landscapes, and other people as beautiful because they produce the same relaxation of our nervous system as the emotion of love does. On the other hand, stimuli and events that have the charac-

Figure 5.

Descartes based his mechanist view of the nervous system on contemporary hydraulics and optics. He believed that the body was innervated by a large amount of filaments that originated in the brain that were susceptible to environmental stimuli. These filaments were encased in small tubes that also conducted animal spirits capable of producing bodily movements. Descartes used the pain withdrawal reflex as a means to illustrate his views on the nervous function. In this case, fire particles were thought to impact the skin with great violence, pulling at the tip of the thin filament designated \( \alpha \) that lies in the foot. This caused the tip of \( \alpha \) that lies in the brain to retract, allowing pore \( d \) to open and to release animal spirits contained in the brain ventricles (F) into the same tube that encases filament \( \alpha \) so that they could be transported to the muscles that then moved the body away from the fire. From René Descartes, *L'Homme de René Descartes. Et un traité de la formation des foetus du mesme auteur* ... Paris: Chez Charles Angot, 1664.
The characteristic effects of pain, fear, and terror on the nervous system are experienced as sublime.

This physiological approach to aesthetic experience was further developed by some of Burke's contemporaries. Daniel Webb (1769, reproduced in Katz and HaCohen 2003), for instance, explored the neural mechanisms common to music and emotions. He argued that both music and emotion excited vibrations in the nerves and produced diverse movements of the animal spirits, ranging from the violent agitation that caused anger or indignation, to the soft and calm vibrations that characterize love and wellbeing. Price (1810) believed that there was an intimate relation between feelings of curiosity and picturesque aesthetic experiences, which functioned by returning the nervous fibers to their normal tone. When the quality of the picturesque is combined with either of the aesthetic experiences explored by Burke, it "corrects the languor of beauty, or the tension of sublimity" (Price 1810, 89).

However, as noted by Moore (2002), the widespread and lasting influence of Kant's (1790) transcendental perspective separated aesthetic experiences from emotion and sensory pleasure, and brought to a halt this first physiological foray into aesthetics. This approach was not developed further until pioneering neuroscientific studies in the nineteenth century began clarifying the relation between mental and neurobiological phenomena: Gall (1822) initiated the modern study of cortical functions and their location, Flourens (1842) observed the effects of ablations of different parts of the brain on animal behavior, the work by Bouillaud (1825), Broca (1863), and Wernicke (1874) established the cortical regions supporting language production and comprehension, and Brodmann (1909) showed that the cortex was not cytoarchitectonically homogeneous.

In the context of this emerging neuroscience, the interest in the relation between pain and pleasure and aesthetics resurfaced. Marshall (1892, 1893) approached the relation between aesthetic and hedonic experiences from a psychological perspective: "The beautiful is that which produces effects in us that are (relatively) permanently pleasurable in revival. The ugly, on the contrary, is that which produces effects of (relatively) permanent painfulness in revival" (Marshall 1893, 15). The importance of pleasure and pain in the characterization of aesthetic experiences was so important in his view that he defined aesthetics as a branch of hedonics (Marshall 1894). But what is the difference between aesthetic pleasure and ordinary pleasure? Marshall drew this distinction on the grounds of the permanence of pleasure and pain inherent to their recollection:

A satisfactory basis for the difference between the two was to be found in the fact that aesthetic pleasures are relatively permanent in revival, while pleasures which are non-aesthetic are really at the moment of judgment only pleasures in name, or, in other words, are states of mind which were in truth pleasurable and aesthetic in presentation when experienced, but which are not pleasurable in revival. (Marshall 1894, 347)

Although Marshall argued extensively on the grounds of observation and introspection for the pivotal role of pleasure and pain mechanisms in aesthetic experiences, he admitted that his proposal rested on vague physiological facts. He believed, however, that the physiological level of explanation was not as important as the psychological level he espoused (Marshall 1893).

Grant Allen (1877), one of his contemporaries, did venture a physiological account of the pain and pleasure foundations of aesthetic experiences. He defined pain as the subjective experience of damage or insufficient nutrition of any bodily tissue. Although pleasure, conversely, was conceived as the subjective experience of the normal amount of functioning of such tissue, he noted that such normal function is not usually felt as pleasurable. In this state, the normal amount of energy is liberated, so most often it is actually experienced as a neutral state. Strong pleasures result from discharging large amounts of potential energy that have been stored for a long time. Moreover, activities that provide some of the greatest physical pleasures, such as eating, drinking, or sex, are directly related with the maintenance of life in the individual and the species. There is a difference of degree between the pain and pleasure concerned with survival-related activities and the pleasure and
pain underlying aesthetic experiences. In fact, he argued, the pleasure and pain associated with sight and sound are subtle, and their perception requires the involvement of attention. Therefore, in most cases, the objects that evoke these sensations are merely intellectually discriminated as beautiful or ugly, while not seeming pleasurable or painful:

The aesthetically beautiful is that which affords the Maximum of stimulation with the Minimum of Fatigue or Waste, in processes not directly connected with vital functions. The aesthetically ugly is that which conspicuously fails to do so; which gives little stimulation, or makes excessive and wasteful demands upon certain portions of the organs. But as in either case the emotional element is weak, it is mainly cognised only as an intellectual discrimination. (Allen 1877, 37)

As neuroscientists advanced our knowledge of brain structure and function, it became possible for neurologists to examine the relation between brain injuries and art or aesthetic experiences. A particular interest was the relation between aphasia and musical and pictorial activities. Dupré and Nathan’s (1911) review of the impact that aphasia and several forms of psychopathology had on the production and appreciation of music, however, seemed inconclusive: “The anatomo-clinical method is unable to identify areas of musical language: the lesions observed in autopsies are often widespread and do not allow precise localization” (Dupré and Nathan 1911, 184). Two decades later, Souques and Baruk (1930) described the case of a piano professor who suffered from a severe case of Wernicke’s aphasia. His spontaneous musical execution was correct, though limited to few tunes, and his performance of basic musical exercises that constitute the basis of professional automatism was generally accurate. His auditory recognition of popular tunes was, however, very limited, and he could not reproduce them after hearing them, playing a different tune, though with a similar rhythmical pattern. On the whole, musical perception was significantly disturbed. The patient could not read written words, yet he was still able to read music scores and play them correctly. Souques and Baruk (1930) believed that this and similar cases allowed postulating partially different neural correlates for language and music.

By comparing the production of a writer, a musician, and a painter before and after being struck by aphasia, Alajouanine (1948) attempted to determine whether such conditions influence the work of great artists in different domains. His analysis revealed that the brain damage had virtually wiped the writer’s and musician’s creative capacity out, but not the painter’s. This suggests that aphasia is especially devastating when the artist’s expressive means involves language or a symbolic system supported by language, such as musical notation. Surprisingly, though, aesthetic sensibility was unimpaired in all three artists, as well as their capacity to detect compositional problems in their own domains.

Luria and colleagues (1965) analyzed the effects of a vascular lesion affecting left-hemisphere speech regions suffered by a great composer. Their results suggest that, in some cases at least, musical abilities and creativity can be preserved despite severe linguistic impairment. Can similar expressive abilities in the visual modality survive brain damage to language-related regions? Gourevitch’s (1967) and Zaimov et al.’s (1969) reports suggested that they can. Gourevitch described the case of an art professor who suffered a left-hemisphere stroke that left him aphasic, yet he continued to communicate actively with those around him through graphic designs and symbols, suggesting that drawing is possible even when suffering a severe case of aphasia. Zaimov and colleagues (1969) described the case of the Bulgarian painter Zlatko Boyadjiev who suffered a left-hemisphere stroke, which produced a right-sided hemiplegia and a mostly expressive aphasia. In order to resume his work he was forced to learn to paint with his left hand, which led to a striking alteration in his style. In addition to the simplification attributable to this change in hand, he began using bright colors and he switched from naturalistic themes to unrealistic and strange imagery, a new style that critics judged favorably. Even two years after the stroke, however, his vocabulary was still below one hundred words.

Despite their great inherent interest, these “informative anecdotes” (Chatterjee 2011, 54), together with a number of accounts on the impact
of diverse forms of dementia on artistic and aesthetic activities, were often described in ambiguous and imprecise terms, and their implications were difficult to assess in the absence of an adequate theoretical framework. Only after these cases were gathered and analyzed together by Bäzner and Hennerici (2006), Bogousslavsky (2005), Chatterjee (2004b, 2006), Miller and Hou (2004), and Zaidel (2005, 2010) did meaningful conclusions regarding the impact of different neurological conditions on artistic and aesthetic activities emerge (Cela-Conde et al. 2011).

The advent and refinement of non-invasive neuroimaging techniques during the last decades of the twentieth century and the beginning of the twenty-first century has allowed researchers to build upon these informative cases, and to address similar and new issues in healthy subjects in controlled situations, and to correlate appreciation and enjoyment of music, painting, architecture, sculpture, and dance with the activity of several brain structures. As foreseen by Burke (1757), Marshall (1893), and Allen (1877), recent neuroimaging studies reveal that aesthetic valuation indeed relies on neural networks that integrate the reward circuit involved in many other pleasures. Rather than a simple hedonic mechanism, however, positive aesthetic experiences seem to be related with brain activity in cortical (anterior cingulate, orbitofrontal, and ventromedial prefrontal) and subcortical (caudate nucleus, substantia nigra, and nucleus accumbens) regions, as well as some of the regulators of this circuit (amygdala, thalamus, hippocampus) (Blood and Zatorre 2001; Cupchik et al. 2009; Kranz and Ishai 2006; Kawabata and Zeki 2004; Kirk et al. 2009; Vartanian and Goel 2004), reflecting a complex interplay of neural processes related with reward representation, prediction and anticipation, affective self-monitoring, emotion, and the generation of pleasure. We now know, additionally, that pleasure is not the end of the story. Aesthetic appreciation involves at least two other kinds of brain activity (Nadal and Pearce 2011): (i) an enhancement of low- and mid-level cortical visual, auditory, and somatosensory processing (Calvo-Merino et al. 2010; Cela-Conde et al. 2009; Cupchik et al. 2009; Vartanian and Goel 2004), presumably reflecting the engagement of attentional or affective processes; (ii) high-level top-

down processing and activation of cortical areas involved in evaluative judgment, including the anterior medial prefrontal cortex, and the ventral and dorsal aspects of the lateral prefrontal cortex (Cela-Conde et al. 2004; Cupchik et al. 2009; Jacobsen et al. 2006).

5. THE EVOLUTIONARY PIONEERS

Shortly after Darwin (1991/1859) introduced the mechanism of natural selection to explain the evolution of organisms, and especially his views on the evolution of human beings and the role of sexual selection (Darwin 1998/1871), these mechanisms were used to hypothesize about the evolution of aesthetic appreciation. Clay (1908), for instance, believed that modern humans inherited the ability to appreciate beauty from earlier ancestors endowed with a more rudimentary sense of beauty. The main selective advantage conferred by this capacity was, according to Clay, the possibility of distinguishing suitable from unsuitable environments:

It does not seem unreasonable to suppose that the instinctive pleasure in harmony is due to the impelling need for suitability to environment; and that to any organism the power of feeling the first sign however faint that it was out of touch with its surroundings, instead of merely proving it by living or dying, would have an inestimable value in the struggle for existence, so that such powers would be quickly increased and developed. (Clay 1908, 288–289)

Grant Allen (1880) put forward a different proposal, arguing that the starting point for the study of "the primitive source of the appreciation of beauty" (Allen 1880, 30) should be the observation of other animals' behavior. He noted that most mammals and birds show a certain sensitivity to natural beauty, though it is restricted in range to sounds made by their own species, and the forms and colors of their decorated mates. Reformulating Darwin's (1998/1871) own vision, Allen suggested that when the first humans appeared, after the differentiation of their lineage, they possessed only a rudimentary sensibility for
the beauty of form, symmetry, and color. The fully conscious manifestation of this capacity would occur solely in relation to physical features of their conspecifics of the opposite sex. Only with the continuing evolution of human beings did this primitive conception of beauty broaden to include the sensibility for natural and cultural elements:

Man in his earliest human condition, as he first evolved from the undifferentiated anthropoidal stage must have possessed certain vague elements of aesthetic feeling: but they can have been exerted or risen into conscious prominence only, it would seem, in the relation of primate courtship and wedlock. He must have been already endowed with a sense of beauty in form and symmetry ... He must also have been sensible to the beauty of colour and lustre, rendered faintly conscious in the case of flowers, fruits, and feathers, but probably attaining its fullest measure only in the eyes, hair, teeth, lips, and glossy black complexion of his early mates... In short, the primitive human conception of beauty must, I believe, have been purely anthropopinistic—must have gathered mainly around the personality of man or woman; and all its subsequent history must be that of an anthropopinisation ... a gradual regression or concentric widening of aesthetic feeling around this fixed point which remains to the very last its natural centre. (Allen 1880, 450–451)

The virtual disappearance of Darwinian thinking from the mainstream of psychology and other social sciences at the beginning of the twentieth century (Plotkin 2004) also interrupted work on the evolutionary foundations of aesthetic experience. And, in fact, researchers did not pick the topic up again until human behavior was approached from biological frameworks. Wilson’s (1975) Sociobiology and Eibl-Eibesfeldt’s (1988, 1989) Human Ethology are good examples of this.

Although these lines of inquiry have continued to develop into recent years (Aiken 1998), the work carried out during the past two decades by evolutionary psychologists has received most of the attention. Building on the early work, a large number of the proposals put forward by these authors stressed the adaptive value of recognizing suitable environments or mates. In fact, the original habitat selection and mate choice proposals remain today two of the strongest explanations for the origin and evolution of our capacity to appreciate beauty (Dissanayake 2007).

Orians (2001) argued that aesthetic experiences have been molded by natural selection through the adaptive advantages conferred by emotional responses during decision making and problem solving: “Survival is enhanced by making better decisions about avoiding environmental hazards, where to find and how to choose food, places in which to live, and associates for various activities, including reproduction” (Orians 2001, 25). Hence, current aesthetic experiences involve emotional responses that have been shaped for generations due to the advantage they conferred in determining what elements in the environment to pay attention to and the appropriate responses to those elements. From this perspective, the appreciation of natural sceneries, environments, and landscapes is not a special case of aesthetics, but probably the grounds on which some of the more traditional aesthetic domains are anchored (Kaplan 1987, 25).

On the other hand, Darwin (1858, 1871) and Allen’s (1880) notion that the evolution of beauty appreciation is related with mate choice was recently reintroduced and updated by Miller (2001). He views art and aesthetics as biological adaptations acquired throughout human evolution:

It evolved through sexual selection to serve the same courtship functions as almost all other examples of organic beauty and complex behavioral signals observable in nature. Such ornamentation often evolves as a reliable, costly indicator of the signaler’s good health, good brain, and good genes. This leads to the further proposal that many design features of art function as indicators of the artist’s virtuosity, creativity, intelligence, conscientiousness, and other important heritable mental and physical traits. This “aesthetic fitness” view suggests that aesthetic judgment is a natural part of mate choice and social cognition, in which an artwork is viewed as the extended phenotype of the artist. (Miller 2001)
He suggested that aesthetic preferences evolved, with works of art that could have only been created by high-fitness artists being favored. Hence, we are inclined to regard the production of beauty and art as an indicator of high-fitness qualities, which according to Miller (2001) could include health, energy, creativity, access to rare materials, good learning abilities, intelligence, coordination, among others. From this point of view, evolution shaped our aesthetic appreciation to distinguish difficult from easy, rare from common, skillful from careless, and costly from cheap, by means of a domain-specific adaptive mechanism.

In sharp contrast to these hypotheses, which are based on competition for resources or mates, and conceiving art from a non-Western perspective, Dissanayake (1988, 1992) has argued that human arts did not emerge as autonomous activities, but intertwined with rituals and ceremonies, and that its main evolutionary contribution has been to reinforce social cooperation and group cohesion. Furthermore, Dissanayake views “art itself as being not an entity or a quality but a way of doing or treating something: that is, a behavior of art, or ‘artification.’” When ‘artification,’ I suggest, one intentionally makes ordinary novelties extraordinary through certain operations: formalization, elaboration, repetition, exaggeration, and sometimes manipulation of expectation, or surprise” (Dissanayake 2007, 9).

By making our ancestors feel they belonged to a social group, the shared experiences of making special or “artifying” through temporal and rhythmic coordination of behavior provided, in Dissanayake’s view, a means of mitigating apprehension and nervousness, heightening the sense of coping with uncertainty. Dissanayake (2000) traces the origin of such “artification” behaviors and their soothing consequences back to early evolutionary stages of the genus Homo. The commitment to strict bipedalism required the narrowing of the pelvis in large brain-sized erectus-grade hominins about 1.8 million years ago. Natural selection then favored a shorter gestation period and strategies used by mothers to provide the additional care of extremely immature offspring. Those ancestral adults communicated with infants using simplified or stereotyped, repetitive, exaggerated, and elaborated visual, vocal, and kinesthetic signals, which must have engaged infants’ attention and generated states of anticipation and expectation. Such strategies served as a pool from which later hominins could draw when they began to engage in artistic and ritual activities (Dissanayake 2000). In fact, these are the attributes that constitute the essential components of ritualization and artification observed in the art of all human societies.

6. CONCLUSIONS

Neuroaesthetics lacks a long history of its own. This is not to say that the varied concerns, concepts, methods, and shortcomings of research that are currently associated with neuroaesthetics are all fruit of recent work. In this chapter we have shown that the situation is quite the opposite. Owing to its interdisciplinary nature, neuroaesthetics has emerged from disciplines that do have long consolidated histories, such as psychology, neuroscience, or philosophical aesthetics, and has inherited many of its features from those disciplines.

Neuroaesthetics owes its methods mainly to empirical aesthetics and neuroscience. As we saw, Fechner’s most enduring innovation was to collect information on the reactions of many people to many objects. His method of choice is still the most popular method within empirical aesthetics and neuroaesthetics. These eminently experimental approaches to aesthetics have inherited the need for quantification and decomposition. Typical experiments in empirical aesthetics and neuroaesthetics usually involve participants being asked to use some kind of rating scale to quantify a specific aspect of the subjective experience of the presented stimuli. The belief that this is a sound strategy rests on the supposition that aesthetic experience can be decomposed and quantified without rendering its components meaningless, that quantitative measures capture the essence of the aesthetic experience, and that they do not, in fact, interfere with it. However, the extent to which beauty, liking, or preference ratings are good characterizations of aesthetic experience remains uncertain. Chatterjee (2011) has put it eloquently: “Reducing components of aesthetics to quantifiable measures
risks inviting the proverbial problem of looking for the dropped coin under the lamp because that is where things are visible, even if the coin was dropped elsewhere” (59).

Aesthetic experiences arise from the encounter of subject and object. But what does each contribute to the experience? Neuroaesthetics is also indebted to empirical aesthetics on account of the role awarded to the spectator in aesthetic experience. The history of empirical aesthetics saw its emphasis shift from Fechner’s strict focus on the role of formal properties as determinants of aesthetic experience, such as proportion, symmetry, and complexity, to a perspective that integrated the Gestalt’s rejection of humans as passive recipients of environmental information. Neuroaesthetics has inherited Berlyne’s interactionist stance that acknowledges the active role of the spectator’s cognitive and affective processes in organizing the stimulus’s features during perception, attaching meaning to it, and being affectively moved by it.

With regards to the neural underpinnings of aesthetic experiences, since the eighteenth century, scholars’ contributions have revolved pretty much around the idea that beauty, ugliness, sublimity, and other varieties of aesthetic responses to art and nature are instantiated in the same nervous mechanisms that sustain pleasure and pain. The same can be said about ideas concerning the evolution of our capacity for aesthetic experience. Since Darwin’s proposal of evolution through natural and sexual selection in the nineteenth century, evolutionary approaches have sought to identify possible selective advantages, such as suitable mate or environment selection, and these continue to be the prominent perspectives today. The possibility of non-adaptive scenarios, for instance, has received little attention.

The most crucial point we have attempted to make in this chapter, though, is that our current conception of the very object neuroaesthetics aims to study—aesthetic experience—has been shaped, to a great extent, by the work of eighteenth-century European philosophers. This fact should not be overlooked. It was then that the chasm between craftwork and art, which had increasingly grown since the Renaissance, became so wide that it never completely sealed again. The basic foundations of the idea, still common today, that artworks are autonomous objects relieved from functional purpose and context, and intended for aesthetic contemplation, were established during the eighteenth century. This separation of art from other spheres of human experience, which is not common in other cultures around the world, was accompanied by the separation of aesthetic interests from all usefulness and everyday pleasure (Carroll 2008). Whereas art had traditionally engaged people’s social, moral, religious, or recreational interests, now disinterested contemplation was regarded as the appropriate response to art: ‘[T]he shift from “taste” to the “aesthetic” came about partly as a result of giving a more intellectual character to the pleasures of the “higher” senses of the eye and ear in order to further distance them from ordinary sensual enjoyments” (Shiner 2001, 141). The crucial point here is that this new understanding of aesthetic experience was not meant as a portrayal of the way all humans experience all art, given that nothing like the purposelessness and autonomy of art that characterized the modern system existed before or in non-Western societies. The notion of a disinterested aesthetic experience was developed to fit philosophical and social paradigms emerging in the eighteenth century, not as a means to study a kind of experience that is inherent to human nature.

Aesthetic experiences, however, are still frequently believed to arise from a disinterested and sympathetic contemplation of an object for its own sake. This view has remained influential because of the role it plays in understanding the modern conception and classification of the arts: “To assure the autonomy of art from everything else, aesthetic experience is defined as something utterly apart from every conceivable purpose” (Carroll 2008, 152). However, if the goal of neuroaesthetics is to characterize the biological mechanisms of a kind of experience that all humans share by their very nature, a strict focus on this Western conception of aesthetic experience, understood as a dispassionate, purposeless, and decontextualized engagement, does not constitute an adequate research strategy. Non-Western art is often performed and enjoyed as an intrinsic constituent of rituals, ceremonies, celebrations, and other events, and the associated experiences might serve several functions in which people have great interest: economic, social, poli-
cal, or symbolic, to name only a few. Accordingly, aesthetic concerns in non-Western cultures generally permeate a broader range of activities and objects and are related with the communication of spiritual, ethical, and philosophical meaning (Anderson 1989).

Paradoxically, then, neuroaesthetics has inherited a concept of aesthetic experience—its main object of study, no less—that is excessively restrictive and probably inadequate to achieve its goals. Carroll (2008) has even argued that “the standard characterization of aesthetic experience is effectively useless from the point of view of empirical research” (2008, 158). If neuroaesthetics aims to study a particular form of experience afforded by our human nature, then it must be able to account for varieties of such experience across many human cultures. But, to be applicable to other cultures, the notion of aesthetics cannot “be regarded as pertaining to the study of the visual perception of the beauty of a material object” (Van Damme 1996, 56). Neuroaesthetics needs a paradigm of aesthetics that is able to account for visual and auditory experiences, but also for olfactory, gustatory, tactile, and kinesthetic experiences, as well as multiple and dynamic combinations of them. Moreover, it needs to account for perceptual experiences that are unrelated to beauty, such as those that arise from humans’ engagement with the ugly, the comic, religious symbolism, identity markers, and so on (Van Damme 1996). And it needs to account for the physiological concomitants of experiences in which people show considerable degrees of interest, such as liking and disliking, wanting and rejecting, as well as the affective and emotional responses that accompany them.

The inadequacy of the traditional notion of aesthetic experience has even been noted within philosophical aesthetics: “The apparent consensus that aesthetics is about disinterested experience of a unique kind has now largely dissolved under the multiple pressures of artistic and cultural diversity and philosophical skepticism” (Towsend 2006, xvii). The very notion of aesthetic experience is being revised and expanded to encompass a broader range of varieties and objects (see Shusterman and Tomlin 2008). Carroll (2008), for instance, suggests a content-oriented approach to aesthetic experience, which highlights the role of voluntary exploration of formal, aesthetic, and expressive properties, such as symmetry, contrast, lightness, elegance, sadness, or joyousness, and their valuation in terms of the relevant conventions, genres, and traditions for the particular work. Thus, researchers currently working within neuroaesthetics are not alone in their need to reexamine their conceptual framework. It behooves them to explore these new philosophical approaches and examine their appropriateness in light of neuroaesthetics’s goals.

An awareness of the historical roots of certain methods and concepts inherited by neuroaesthetics, such as the commonly held notion of aesthetic experience, can help us realize that they might not constitute the best vehicles for research into the neural and evolutionary foundations of aesthetic and artistic activities that are common to all humans, and inherent to our human nature. This is because they were developed in a very different historical, social, and philosophical context to our own, and they were never intended to be used the way we would like them to work. Hence, this critical historical awareness is vital if neuroaesthetics hopes to contribute meaningfully to science and the humanities in the future.
REFERENCES


