What happens when we experience a work of art? What does it mean to have an aesthetic experience? Can science help us derive general principles about aesthetics, or is there really “no accounting for taste”? Philosophers, psychologists, and recently neuroscientists have sought answers to these questions, with each group focused on specific issues. In this volume, an interdisciplinary approach is offered that draws on philosophy, psychology, and neuroscience, and considers the feasibility of an integrative science of aesthetics.

Historically, the term *aesthetics* has been linked to the way art evokes an emotional response. Alexander Baumgarten coined the term in 1750 to advance his new philosophical approach, which was to study the “art of thinking beautifully” (*ars pulchre cogitandi*). He argued that the appreciation of beauty is the endpoint of an aesthetic experience. People sense beauty in many things, from natural objects to skillful artworks, and aesthetics is the study of how the mind beholds beautiful objects. Baumgarten posited that certain physical properties of an object may evoke feelings of beauty, but the experience itself is purely a mindful event. Many contend that the sole purpose of art is to create objects that evoke feelings of beauty—that is, to instill an aesthetic response.

Considering the many ways people experience art these days, Baumgarten’s definition is certainly inadequate. Contemporary art critics and philosophers find the term outdated and irrelevant to the way people experience art today (see Chapter 6). For now, rather than dispensing with the term, a broadening of it will be considered. Art can arouse our emotions in many ways—from beauty to anger to horror or disgust. It may pique our sensory processes through artistic balance and form, remind us of our own past, or force us to think about the world in new ways. Rather than considering the one and only aesthetic experience as that overwhelming sense of beauty people sometimes experience, perhaps while viewing Michelangelo’s *David* or listening to Beethoven’s *Ninth Symphony*, there are various kinds of aesthetic experiences, even ones that may be more focused on perceptual or conceptual features. Some may wince at a definition of aesthetics that is so broad that its experience is devoid of any emotional involvement. Indeed, it may be best to separate the notion of “aesthetics” from our experience with art.
altogether. Such issues will be addressed in the chapters to follow. At the outset, we will err on the side of inclusion rather than exclusion, and consider aesthetics as any “hedonic” response to a sensory experience. A hedonic response refers to a preference judgment: an object may be preferred or not, liked or not, interesting or not, approached or avoided. Artworks are prime objects for aesthetic evaluation, because for many their sole purpose is to instill an hedonic response. As such, this volume centers on the way we behold artworks, though hedonic responses may be elicited by any object.

The contributors of this volume were asked to address the potential of an aesthetic science. This chapter provides background material by briefly describing general issues of aesthetics from philosophical, psychological, and neurobiological perspectives. Other chapters delve further into these issues and even debate the plausibility of aesthetic science as a workable enterprise. The focus of the book is primarily on the visual arts, though many issues pertain to all traditions within the arts, including music, film, theater, dance, and literature. We also focus on the way art evokes aesthetic responses rather than how or why art is created—that is, the intent is to consider the nature of the beholder’s experience rather than the artist’s creative output. In this way, we hope to downplay such thorny issues as defining art (What is art?) and specifying its meaning within a culture (Why do humans make art? What is its function in modern society?). By focusing on the beholder’s experience, we hope to highlight the ways in which art is perceived, interpreted, and felt. In other words, we will explore what goes on in the mind and brain of the beholder.

Philosophical Approaches

Long before attempts were made to approach aesthetics scientifically, philosophers addressed the nature of aesthetic experiences. Their analyses have been and continue to be essential, as they define and sharpen essential issues concerning the quality of these experiences. Here we provide a brief overview of four philosophical approaches to aesthetics—mimetic, expressionist, formalist, and conceptual—each of which highlights different aspects of human psychological experiences.

A MIMETIC APPROACH: SEEING NATURE THROUGH A WINDOW

In Plato’s Republic (Book X), art is defined as mimesis or imitations of reality. According to Plato’s view of idealism, there exist ideal or pure forms, such as a perfect circle or a perfect bed. Such ideal forms cannot be realized by the hands of humans, because no one can draw a perfect circle or build a perfect bed. Plato denigrated art as intellectually distant from ideal forms. A carpenter’s bed is a copy of the ideal form. A painting of a bed is even worse, because it is a copy of a carpenter’s bed, and indeed a rather poor copy. It lacks the function of a bed, as one
cannot sleep on it, and it is depicted from only one viewpoint. Thus, a painting
grossly misrepresents the nature of objects, as it is at best twice removed from ideal
forms. Plato was willing to banish all art from his Republic. Poets and dramatists
were just as far from the truth as the lowly painter, because their works merely
imitate human experiences and conditions. Even worse, art stirs emotions, thus
clouding the ability to think rationally. According to Plato, artists are unworthy
rivals of philosophers, because they try to reveal truth but manage only to create
poor imitations of reality. Plato’s negative view of art is certainly extreme. Yet his
characterization of art as *mimesis*, as an imitation or representation of the real
world, could be applied to much of Western art.

As in many philosophical issues, Aristotle offered a view that opposed Plato’s
position. In *The Poetics*, Aristotle acknowledged that art is a form of mimesis,
but viewed it as a natural form of pleasure instead of a perversion. We delight in
listening to a poem or watching a good drama. Moreover, we can learn from art as
imitations of reality. A dramatic play may depict what could happen just as much
as what has happened. We learn from the mistakes or triumphs of fictional char-
acters, such as the hero in a tragic drama. Indeed, art can depict and rarify essen-
tial universals of the human condition. Aristotle thus proposed that art should be
valued, not vilified, as an imitation of reality.

Plato and Aristotle defined the Western approach to art as creating imitations
of the real world. With respect to painting, the ability to do this accurately required
extensive knowledge and technical skills that were not well developed until the
15th century, when Renaissance artists began to study the mathematics and scien-
tific knowledge necessary to create realistic scenes. With this information, an artist
could mimic with paint on canvas the sensory experience of viewing an actual
scene. Indeed, the artist created a window through which the beholder could view
nature.

Painting scenes accurately depends upon the representation of a three-
dimensional (3-D) world onto a two-dimensional (2-D) surface. Interestingly, in
every waking moment we perform this process, as our retina, that curved 2-D
surface at the back of the eye, serves as the brain’s canvas from which we derive and
represent a 3-D world. Our brains transform these ever-changing upside-down
and mirror-reversed images into spatial relations of objects in the real world, a feat
accomplished with exquisite rendering of size, depth, and color. In paintings,
artists create the *illusion* of objects in 3-D space, a feat that requires knowledge of
how light is reflected off objects and projected to the eye.

Before the Renaissance, artists had acquired some skill in depicting 3-D objects.
For example, early Greek and Roman artists were aware of the importance of shading
and foreshortening to create the impression of depth. Yet it took Renaissance
artists, such as Brunelleschi, Masaccio, and Leonardo, to conceptualize and imple-
ment the rules of linear perspective with mathematical and artistic acumen. Another
significant advance was the development of *chiaroscuro* (Italian for
*light-dark*), a technique in which shading is used to heighten the perception of
three dimensionality in objects. In the real world, contoured surfaces reflect light in various directions. Surfaces that reflect more light into the eye appear lighter than surfaces that reflect light away from the eye. Thus, information about the spatial orientation and depth of objects can be gleaned by changes in shading. Leonardo was a master of chiaroscuro, as can be seen in his study of drapery (Fig. 1.1). Note how the gradations of light and dark render exquisitely the contours of the folds. Leonardo’s masterful application of chiaroscuro created the illusion of seeing 3-D forms in a 2-D drawing. The realism is so accurate that the drawing resembles a photographic image. Leonardo’s artistry was grounded in knowledge about linear perspective and the way light reflects off surfaces.

**FIGURE 1.1 Leonardo da Vinci (1452–1519).** Drapery for a seated figure. Distemper with white highlights. (Photo credit: Réunion des Musées Nationaux/Art Resource, NY.)
In a mimetic approach to art, the beholder evaluates an artwork on the basis of how closely it resembles a view through a window onto a real-world scene. Renaissance artists advanced this approach with linear perspective and chiaroscuro. When we experience art today, we can appreciate the skill involved in creating such scenes. Indeed, much of Western art, particularly art up to the mid-19th century, was principally concerned with creating artworks intended to be experienced from a mimetic approach.

**AN EXPRESSIONIST APPROACH: PERCEIVING WITH FEELING**

Most museum-goers would say that art, while offering a window to the world, has its primary goal in expressing emotions. More specifically, they would concur with Baumgarten's thesis that art is meant to evoke feelings of beauty. We sense beauty in many things—in nature, in people, in ideas, and in art. Francis Hutcheson, in a treatise considered to be the “first modern essay in philosophical aesthetics,” described art as instilling a sense of beauty and pleasure in the beholder. He argued that when we behold a beautiful object we do so independently of the object's purpose or function. Hutcheson acknowledged that people have different opinions about what is beautiful, though he argued that there are absolute standards. He claimed that we all appreciate the beauty of a harmonic chord, an elegant mathematical theorem, or a well-composed painting.

The ancient Latin aphorism *De gustibus non est disputandum* ("About taste there's no disputing") sets the stage for David Hume's 1757 essay *Of the Standard of Taste.* According to Hume: “Beauty is no quality in things themselves: it exists merely in the mind which contemplates them; and each mind perceives a different beauty.” Hume advanced Hutchinson's argument by describing what seems to be a totally subjective view of taste: "a thousand different sentiments, excited by the same object, are all right: Because no sentiment represents what is really in the object.” Nevertheless, Hume argued that there are universal standards by which we evaluate and judge beauty. Good taste depends upon expert knowledge, training, and having a "delicate" sense. Moreover, the ideal beholder avoids personal prejudices and cultural biases. With such rules for guiding one's aesthetic experiences, Hume asserted that there is a common basis (i.e., a standard) for evaluating beautiful objects.

From Hume, we advance to Immanuel Kant, whose viewpoint is often considered as the beginning of a cognitive approach to the mind. In *Critique of Pure Reason* he wrote: “though all our knowledge begins with experience, it by no means follows that all arises out of experience.” Kant argued that there is more to knowledge than just the sights, sounds, and smells that impinge on our senses. We interpret the world by linking sensory experience to pre-existing concepts or ideas. This interaction between experience and knowledge forms the basis for Kant's philosophy of aesthetics, which he described in *Critique of Judgment.* Kant stated that judgments of taste are evaluations of pleasure (or displeasure) and that these
evaluations are largely subjective. Many things elicit pleasurable feelings, such as fine food, a lovely home, and sex, but these things are also appreciated for other reasons, such as sustenance, shelter, and procreation. Kant identified three features of objects that give us pleasure: they are agreeable, good, and beautiful. Aesthetic judgments are specifically based on our evaluation of beautiful things. For Kant, beauty is an innate ideal that is shared among all individuals and is thus a universal concept. Thus, Kant echoed the sentiments of Hutcheson and Hume by arguing that aesthetic judgments are both subjective (based on experience) and universal (based on a pre-existing concept of beauty).

In addition to beauty, Kant considered sublime feelings. Whereas beauty refers to the quality of an object and is thus bounded by the object, the sublime refers to a feeling of overwhelming boundlessness. We experience the sublime when we consider the immensity of nature: galaxies of innumerable stars; the vast, seemingly unending expanse of the ocean; or the earth-shaking power of an erupting volcano. Unlike feelings of beauty, which are always pleasurable, the sublime may involve a sense of fear or pain, as when we compare the enormity of nature with the vulnerability and inadequacy of one’s own being. Although many associate sublime feelings with religious or spiritual experiences, Kant took a decidedly secular viewpoint by referring to people’s aesthetic response to nature. With respect to art, Kant argued that artworks themselves cannot be sublime, but in representing magnificent things or events, they can elicit sublime feelings.

For Kant, aesthetic judgments are not associated with an object’s function or purpose. A sunrise is not beautiful because it offers warmth, nor is a painting of a woman beautiful because we desire to have amorous relations with her. Aesthetic judgments are made in an entirely disinterested manner (ohne alles Interesse). This term is rather misleading, as it should not be interpreted as meaning without interest. Instead, Kant meant that an object viewed aesthetically should be considered without reference to its function or other practical uses, such as satisfying one’s hunger, physical comfort, or sexual desire. According to Kant, art accentuates reality by providing beautiful or sublime renderings of nature that are appreciated in a disinterested manner—without regard to the purpose, function, or desire of the objects portrayed. This notion is the basis for the common view of aesthetics as art for art’s sake.

In the 19th century, Romanticism took hold by emphasizing emotional expressiveness in art. Art was not meant to represent mundane copies of the real world; rather, it was meant to be magnificently dramatic and heroic. At the Louvre museum in Paris, Théodore Géricault’s The Raft of the Medusa (Fig. 1.2) illustrates an actual event, the aftermath of the wreck of the French naval ship Méduse, which ran aground off the West African coast. In this tragic event, a makeshift raft was constructed and of the 146 people aboard, only 15 were finally rescued. Géricault’s painting depicts the moment when survivors see a boat that has come to their rescue. In The Raft of the Medusa, we witness a sublime moment filled with terror and awe. The painting inspires an expressionist approach, which follows the Kantian notion that art must arouse and excite our feelings of beauty and sublimity.
Throughout the 19th century and into the 20th century Western art was experienced from both a mimetic and expressionist approach. In *What is Art?*, Leo Tolstoy argued that the essential success of an artwork is the degree to which the artist is able to communicate his or her feelings to the beholder. Philosophical theories under the rubric of *Expressionism* placed the emotional quality of an artwork at the forefront of all aesthetic experiences. As exemplified by the 20th-century development of *Abstract Expressionism*, art could be the pure embodiment of emotion as depicted by splashes of colors, bold lines, and nondescript shapes. When asked about his view of art, Matisse pointed to a table and stated: “Well, take that table, for example... I do not literally paint that table, but the emotion it produces upon me.” For many artists, philosophers, and indeed most laypeople, the essential purpose, if not the only purpose, of art is to induce feelings in the beholder.

**A Formalist Approach: Abstracting Significant Form**

During the second half of the 19th century, a markedly different approach to art emerged. Artists began experimenting with the perceptual quality of their works and rejected the traditional approach of creating the illusion of 3-D scenes on canvas. Pictorial skills admired since the Renaissance, such as linear perspective and chiaroscuro, were viewed as old-fashioned tricks that artists applied to make...
scenes look realistic. Why should art be restricted to portrayals of the world as we see it? In his seminal treatise, *Modernist Painting*,¹⁵ the noted art critic Clement Greenberg stated that the essence of modern art is its flatness. Rather than portraying 3-D objects in natural scenes, modern art is about the “flat surface” and the “properties of pigment.”¹⁶ Artists (and beholders) must recognize that the canvas is fundamentally a 2-D surface onto which paint is brushed, dripped, or smeared.

Greenberg identified Manet as the first Modernist painter, as his paintings did not include traditional finishing touches that created the illusion of 3-D space. His paintings were often rejected by the Académie des Beaux-Arts, the established organization that defined good and bad art, because his backgrounds were bare or roughly painted, and the application of subtle shading to create depth was missing. Critics at the time considered his paintings crude and unfinished. In hindsight, we now see the beginning of a bold form of painting. Manet accentuated the flatness of his canvas: gone is the strong sense of 3-D space attained by linear perspective, gone is the extensive use of chiaroscuro to enhance the three-dimensionality of objects, gone is the heavy glazing of paint to conceal brushstrokes. Manet emphasized the sensual quality of paint itself, thus foreshadowing Impressionism, the tradition he later embraced.

From Manet to other Impressionist artists, such as Monet and Renoir, one sees the application of color on canvas in a new and dynamic manner. The interpretation of form changes from mimetic depictions of realistic scenes to “impressions” of nature. At the time, Impressionist paintings were considered ugly, hardly worthy of consideration as art. The revolution they began was to use paint as light, creating form almost as a byproduct that emerged from rendering their impressions. In the paintings of these then-renegade Impressionists viewers now appreciate the sensual quality of their art. Post-Impressionist artists such as Van Gogh, Gauguin, and Cézanne experimented further with the dissolution of realism by distorting color, perspective, and form. It is virtually impossible to appreciate a Van Gogh painting without noticing the force of his brush strokes and his application of paint on canvas.

Clive Bell, the art theorist who, along with Clement Greenberg, helped define early-20th-century art, described the essence of the aesthetic experience as perceiving *significant form*. For Bell,¹⁷ the actual content of a painting was irrelevant; instead it was critical that the artist magnify the sensual quality of lines, colors, and abstract shapes. This view of art forms the basis for *formalism*: the view that art should be appreciated solely on the basis of its sensory qualities. Formalism offers a means of interpreting abstract art, because the content and objects in a painting are irrelevant. With a formalist approach, the beholder considers an artwork purely on the basis of sensory features—that is, the aesthetic interplay of colors, lines, textures, and shapes.

What motivated the shift from a mimetic or expressionist approach to a formalist approach? Historians have suggested that the advent of photography acted as a
catalyst for this change. Photography rendered mimetic paintings as inadequate or outdated. Why should an artist paint a realistic scene when a photograph could do the job with perfect depiction of perspective and shading? By the 1860s, photography was in the mainstream. People could pose at photography studios and obtain family portraits to send to family and friends. Landscape photographers, such as Carleton Watkins and Francis Frith, were showcasing magnificent scenes of distant lands. Given the popularity of photography, artists, such as the Impressionists, may have decided to create a style different from that offered by this new technology.

Interestingly, artistically inclined photographers during the 19th century de-emphasized the exquisite detail of their medium and tried to mimic the appearance of paintings. To give their work an “artistic” feel, soft, out-of-focus images were in vogue as they emulated oil paintings. Some scratched their prints with fine needles to mimic etchings. It was not until the 20th century that “straight” photographers, such Edward Weston and Ansel Adams, used the medium to its fullest. These two photographers were part of “Group f.64,” an informal cadre of photographers who advocated sharp focus and detail of form (the term f.64 refers to the smallest lens aperture available at the time, which afforded maximal sharpness through more extensive depth of field). These photographers developed a formalist approach as they discounted content and emphasized the interplay of lines, shades, and shapes. Consider Edward Weston’s *Pepper No. 30* (Fig. 1.3). Such a common object is not depicted for its function or purpose. Weston photographed the vegetable to highlight the lines, contours, and shadings that give the object its form. There is, of course, an organic—some say erotic—quality to Weston’s photographs. In his own words, however, he simply wanted to abstract the sensory quality of the object depicted—that is, he wanted to express aesthetic appeal in terms of significant form.

**A CONCEPTUAL APPROACH: BELIEVING IS SEEING**

Long before artistic advances in linear perspective and chiaroscuro, in prehistoric cave paintings and ancient mummy portraits, artworks were meant to communicate concepts or messages, often to a higher being. In other words, the purpose of such “artworks” was to convey a conceptual point (e.g., a plea to the gods) rather than to present a realistic view of the world or to express feeling. When we search for the underlying meaning of an artwork we apply a conceptual approach to art. Contemporary art critics rely heavily on this approach, because art during the past 50 years has focused on the representation of conceptual statements. This contemporary view has its roots in Marcel Duchamp’s 1917 piece *Fountain*, which was submitted to an art exhibition sponsored by the Society of Independent Artists, a group of avant-garde artists who eschewed juried exhibitions and awards. *Fountain* is actually a men’s urinal turned on its back. Duchamp purchased it from the
J. L. Mott Iron Works in New York City, signed it “R. Mutt,” and submitted it under that pseudonym. Although the Society stated that they would show all submitted works, Fountain was never exhibited, as some board members refused to consider the piece as a work of art. Even if one claimed it was art, then Mr. Mutt must be guilty of plagiarism, as the piece was obviously a commercial product.

Although the original Fountain was never exhibited, Duchamp later commissioned several replicas, which are now displayed in prominent art museums. In 2004, a survey of 500 art experts voted Fountain as “the most influential...
modern art work of all time,” thus surpassing any work by Picasso, Matisse, or Warhol. Why? Clearly, in order to consider *Fountain* a work of art the actual concept of art needed to be radically changed. *Fountain* was (1) not created by an “artist,” (2) not intended to express a sense of beauty, and (3) not intended to elicit a sense of significant form. Duchamp’s intention was to make people think and question the very definition of art. You may find beauty and significant form in *Fountain*, but that certainly was not Duchamp’s intention. His selection of a urinal was intended to disturb and disgust viewers, which adhered to his alliance with *Dadaism*, an art movement designed to shock and poke fun at the beholder.

One could view *Fountain* as an early example of post-modern art. The term has many meanings and has been bandied about in numerous ways. However, one attribute of post-modernism is the role of the artist as a conceptual theorist attempting to define the meaning of art itself. I will refer to this notion as *meta-art* or *art about art*. Although some art historians would suggest that all art is essentially a comment about art, I view the strong notion of meta-art as an outgrowth of early modernist views, evidenced initially by Impressionist artists who experimented with the nature of the medium. Post-modernism continued the investigation by conceptualizing the process of creating art. A conceptual approach strives to extend the boundaries of art: Does art need to be created by an “artist”? Does it need to be beautiful or have significant form? What distinguishes art from non-art? Post-modernism intellectualizes the practice of art. It is thus anti-expressionist, anti-formalist, indeed some may even say anti-aesthetic. Issues of beauty, significant form, and other aesthetic experiences, such as the sublime quality of artworks, give way to conceptual statements about the meaning of art.

It took the art world several decades to appreciate fully the significance of *Fountain* as a harbinger of post-modernism. At the time, Duchamp’s *Fountain* and his other offerings of everyday objects that he christened as “art” were generally considered Dadaist jokes, a way of teasing and rattling the art establishment. It was not until the latter half of the 20th century that many artists began to express themselves as conceptual theorists. The goal of the post-modern artists was essentially the goal of any philosopher of art: namely to define and characterize the nature of art. The post-modern artist, however, used art itself to describe a theoretical point rather than writing or talking about it. To interpret post-modernist works, one needs to understand the language of art. Nelson Goodman’s *Languages of Art* and Suzanne Langer’s *Art in a New Key* characterized this new approach, wherein artworks are viewed as conceptual interpretations or expressive symbols of thought. Pop Art, as exemplified by Warhol’s paintings of Campbell’s Soup cans, Lichtenstein’s large renditions of comic strip panels, and Jasper Johns’ painting of the American flag, depicts symbols or icons of popular culture that before were considered mundane, everyday objects.

A conceptual approach to art requires knowledge about the symbolic referents displayed in an artwork. To appreciate meta-art statements, it is necessary to have knowledge about art history and the various ways art has been defined.
For example, Joseph Kosuth’s *One and Three Chairs* (1965) is a gallery installation that includes a real chair, a photograph of the same chair, and a dictionary definition of the word *chair*. This artwork is meaningful from a conceptual approach, as knowledge of art history, such as Plato’s description of mimesis and Langer’s notion of art as symbols, helps us understand the piece. Interestingly, for each exhibition of *One and Three Chairs*, Kosuth provides only an enlarged printout of the definition of the word “chair” and instructs the museum installer to select a real chair and display it and Kosuth’s printout of the definition along with a life-sized photograph of the same chair. Thus, the actual chair that is used in each museum exhibition is different from previous ones and is selected by the installer rather than the artist. In this way, Kosuth seems to accentuate the conceptual rather than the formal or emotional nature of his artwork, as the objects themselves (the chair used and the photograph of it) change with each installation.

To summarize philosophical approaches, beholders over the centuries have considered artworks in terms of (1) how successfully they mimic the sensory experience of looking at the real world as if through a window, (2) how well they express feelings and a sense of beauty, (3) how well they create significant form, and (4) how well they convey conceptual statements. Each of these approaches highlights different aspects of the beholder’s mental processes involved in the art experience: sensory processes with mimetic and formalist approaches, emotional processes with an expressionist approach, and semantic or cognitive processes with a conceptual approach. Today, pluralism is key, in the sense that anything goes, from retro artworks relying on mimetic representations to post-modern statements about art.

**Empirical Approaches**

What sets scientific analyses apart from other practices is its reliance on empirical research, which involves objective, systematic, and repeatable measurements. For over 125 years, aesthetic experiences have been studied scientifically using behavioral measures. Most of these investigations have been conducted under the rubric of psychological science. Recently, neuroscientists have begun to delve into the biological underpinnings of aesthetics by studying neurological patients with impairment in aesthetic experiences and applying neuroimaging methods to locate brain circuits that are active when we look at art.

**PSYCHOLOGICAL SCIENCE**

Psychological science has its roots in investigations of sensory processes. In 1860, Gustav Fechner offered a method for the scientific analysis of human sensation in his major treatise *Elemente der Psychophysik* (Elements of Psychophysics). This new science of *psychophysics* considered the ways in which physical stimuli are
registered by the mind. In 1876 Fechner published *Vorschule der Aesthetik (Primer of Aesthetics)*, which presented his seminal analysis of the psychophysics of aesthetics. Fechner suggested that aesthetics could be studied from the bottom up (von Unten herauf). In other words, rather than confronting complex philosophical concepts about beauty and sublimity, Fechner focused on analyses of elemental perceptual features. He studied preference judgments for basic shapes, such as rectangles of varying proportions, to determine which one was most appealing. He also studied preferences for colors. By understanding these basic elements of visual aesthetics, Fechner hoped to build a general understanding of the perceptual qualities that drive our aesthetic experiences.

Fechner paved the way for countless psychological investigations under the rubric of empirical aesthetics. In these experiments, observers are shown various stimuli, such as a collection of shapes, colors, objects, or even actual paintings, and are asked to rate their preferences: that is, how much they like one stimulus over another. Fechner believed that by studying the building blocks of perception, such as basic shapes and colors, he could construct a general theory of aesthetic experiences. With this elemental, bottom-up approach—from basic sensory features to more complex representations—Fechner defined an empirical approach to the study of aesthetics that is still practiced today.

In the early 20th century, Gestalt psychology offered an alternative to the elemental, bottom-up approach exemplified by Fechner’s psychophysical approach. Three German psychologists, Max Wertheimer, Kurt Koffka, and Wolfgang Köhler, were prominent in establishing this holistic approach to perception. They considered the visual scene as an organized grouping of features and argued that perceptions could not be dissected into basic elements. This stance was inherent in their credo that the whole is different from the sum of its parts. The Gestalt psychologists developed the principle of *Prägnanz*, the notion that we organize our perceptions based on the simplest or most succinct interpretations. They acknowledged that the perceptual world is ambiguous and illusory. Thus, it is the organization of a visual scene that we interpret and not the elemental features themselves that make up a scene.

The psychologist Rudolf Arnheim applied Gestalt principles to the study of visual aesthetics. In his seminal book *Art and Visual Perception*, Arnheim analyzed the ways in which artworks conform to Gestalt principles of perceptual organization. He described paintings with respect to the “perceptual forces” that artists induced through balance, harmony, and object placement. These forces give rise to aesthetic experiences, such as a sense of calm or tenseness. For example, a circle placed at the center of a rectangle is balanced and reduces tension, whereas a circle moved to one side of a rectangle is unbalanced and thus heightens tension. Arnheim’s writings on visual aesthetics offered a theoretically motivated approach to the psychology of art. His Gestalist interpretations stressed the manner in which the organization and dynamics of perceptual features act to create interesting works of art.
Whereas Fechner and Arnheim were primarily interested in perception, other psychologists studied how art influences the beholder’s emotions. Daniel Berlyne developed a theory about the way artworks arouse feelings. Consider a painting that you have never seen before. A painting that does little to arouse you or one that causes minimal tension will lead you to be indifferent to it. On the other hand, a painting that is so terribly arousing or causes so much tension will be overpowering and likely cause confusion or displeasure. According to Berlyne, optimally pleasing artworks are those that create some arousal or psychological tension but not so much that they become disturbing. He suggested that arousal is determined by specific features of artworks, such as novelty, complexity, surprisingness, uncertainty, and incongruity. He called these features “collative” properties because they must be put together (i.e., collated) in order to drive one’s emotional experience. The greater the number of collative properties in an artwork, the greater our arousal.

According to Berlyne, we prefer some novelty, surprise, or incongruity in artworks, but too much will lead to a negative response. Notice that the features Berlyne defines are not, strictly speaking, properties of the artwork itself, but instead related to the beholder’s past experience. How novel or surprising a painting is for a given viewer depends on that viewer’s past experiences and knowledge. Thus, Berlyne’s model can explain why individuals differ in their appreciation of artworks, and how appreciation can change over time. Consider the mid-19th-century beholder who has seen only realistic (mimetic) and romantic art. Impressionist paintings may have been considered too surprising or incongruous and thus be considered disturbing or odd. With our 21st-century eyes and brains, we have been exposed to all kinds of abstract forms, not only in art museums but also in television commercials and magazine ads. As a result, Impressionist paintings may be just complex and incongruous enough to be pleasing and moderately arousing. Experience with post-modern works may allow one to garner positive feelings from 20th-century styles such as Cubism, Abstract Expressionism, Surrealism, and Minimalism.

Since Fechner’s seminal treatise, the empirical analysis of aesthetics has undergone periods of growth and stagnation. Arnheim, Berlyne, and others stimulated interest and offered important theoretical frameworks, yet many have questioned the value of the methods and theories developed by these pioneers of aesthetic science. Even among psychologists, the study of aesthetics has generally been viewed as a “fringe” topic. Moreover, many philosophers have ignored or rejected empirical approaches, and likewise, psychologists have typically discounted philosophical notions. The insular nature of these disciplines has thus limited progress in aesthetic science.

COGNITIVE SCIENCE

Cognitive science is a outgrowth of experimental psychology. It seeks to understand mental processes such as perception, memory, language, emotion, and
reasoning through an interdisciplinary approach. Several features distinguish cognitive science from traditional psychological science. First, cognitive science incorporates findings and perspectives from many practices outside of psychology, including philosophy, computer science, anthropology, linguistics, and neuroscience. Second, it draws heavily on computer-based models of how the mind works. Although cognitive scientists do not believe that the brain is a digital computer, they often adopt the analogy of the mind as a computational mechanism that manipulates information and has its own input, storage, and output devices. Third, a prominent concern is how information in the mind/brain is represented or stored. Cognitive scientists rely on an information processing approach originally developed in computer science. The goal of this approach is to characterize the way sensory signals act as information that is encoded, interpreted, and represented.

One particularly important distinction is between bottom-up and top-down processing. Bottom-up processing refers to the route of information processing from sensory signals to knowledge. Top-down processing refers to the use of knowledge to direct what we perceive. Thus, bottom refers to low-level sensory processes, whereas top refers to knowledge. Consider the drawing in Figure 1.4a by psychologist Roger Shepard, entitled Sara Nader. If you focus on the black region, you see a silhouette of a man playing the saxophone. However, if you focus on the white region to the right of the man, you see a woman’s face. Now that you know that both objects exist, you can guide your perception by “seeing” the saxophonist or the woman’s face. Thus, knowledge guides your sensory processes and orients you to critical features. This is top-down processing—knowing is seeing.

Figure 1.4b shows the inter-relationship between top-down and bottom-up processing. Early cognitive approaches, such as Fechner’s psychophysical approach,
were based primarily on bottom-up processes, as it was thought that perceptual elements (e.g., shape, color) could be constructed to derive meaning (e.g., recognizing objects). Indeed, it was once thought that engineers could build robots that could identify objects in a visual scene based purely on bottom-up information, such as the kind of information recorded from a video camera. Although such robots could function in very restricted environments, it soon became apparent that humans rely heavily on top-down processes to interpret complex visual scenes. In other words, we apply our knowledge of the world to interpret what we see.

The noted art historian Ernst Gombrich was the first to consider top-down processing as an integral part of aesthetic experiences. In *Art and Illusion*, Gombrich argued that an artist “begins not with his visual impression but with his idea or concept.” This point is equally important for the experience of the beholder. Based on our personal and cultural knowledge, the beholder forms expectations that help interpret an artwork and direct viewing to salient features. Just as the image of Sara Nader is ambiguous, Gombrich suggested that all art is illusory and we must build an interpretation of what an artwork represents based on existing knowledge—or what he (and cognitive scientists) call schemata or, more simply, schemas. Schemas are conceptual frameworks that people use to form expectations. For example, as you enter a restaurant you apply a restaurant schema that sets up expectations that include sitting at a table, ordering from a menu, enjoying a meal, paying for the meal, and leaving a tip. We also have a museum schema that includes walking through galleries, developing preferences about artworks, and considering what the artist is trying to communicate. Past knowledge and experiences determine the nature of these expectations. Gombrich integrated psychology, art history, and philosophy in an analysis of the art process (both in making and viewing art). He adopted a cognitive science approach, suggesting that artworks act as symbols that describe or represent real-world objects and experiences.

The cognitive science approach to aesthetics has gained in interest recently with the commercial importance of digital animation and web design. For example, computational analyses of chiaroscuro, or what computer scientists call shape from shading, have provided extraordinarily realistic computer-generated animations. With respect to web design, commercial ventures depend on attracting and maintaining clients to their websites. People tend to dislike modifications in the color and organization of favorite websites. Web designers now take this tendency into account and often apply findings from cognitive science to reduce the impact of design alterations. For example, a finding called “change blindness” shows that alterations in a visual display can go unnoticed when they are done gradually, one feature at a time or in small increments of single features, such as color or texture. In 2008, Yahoo.com gradually introduced a new look to their homepage across days. Similarly, eBay.com took 30 days to change its background from gray to white. It is likely that many did not notice these changes.
NEUROSCIENCE

Can the complexities of aesthetic experiences be understood by examining brain mechanisms? Neuroscientists have studied the workings of the brain from many levels of analysis—from analyses of individual brain cells (i.e., neurons) to the study of neural activity in the human brain. By the late 19th century, staining techniques were developed that enabled scientists to visualize individual neurons so that their shape, size, and connectivity could be examined. In 1909, Korbinian Brodmann published a seminal atlas of the human cerebral cortex based on his detailed anatomical studies. We now know that the cerebral cortex is a thin sheet of interconnected neurons that has expanded considerably during evolution, in fact so much so that it has become enfolded within the human skull, thus giving its appearance of many ridges (gyri) and valleys (sulci). If the cerebral cortex were flattened, it would be equivalent in area to the size of an extra-large (very thin) pizza (about 20 inches in diameter, 2 mm thick). Brodmann compared the cellular structure of neurons in different parts of the cerebral cortex. He defined 52 distinct areas, ZIP codes if you will, on the basis of physical features, such as size, shape, and density. We refer to these regions as Brodmann areas, which are still used today to identify regions of the human cerebral cortex.

Neural circuits have been identified that pertain to various mental capabilities, such as vision, memory, language, emotional drive, and motor control. Both structural (anatomical) and functional (brain activity) analyses have been used to investigate the neural correlates of human cognitive function. With respect to anatomical landmarks, Figure 1.5 shows the lateral (side) surface of the left cerebral cortex. The medial surface is hidden from view as it sits flat against the other cerebral cortex. The initial input of visual information into the cortex occurs at the most posterior region of the occipital lobe, an area called the primary visual cortex. From this point, visual information is processed along two major paths. The dorsal or “where” path courses up to the parietal lobe and processes spatial information, whereas the ventral or “what” path courses down through the temporal lobe and processes object information.

The most anterior region of the frontal lobes is called the prefrontal cortex (PFC). It receives inputs from other brain regions and sends projections back to these regions. In this way, the PFC coordinates and controls neural processing. If one considers the multitude of neural signals active at any given moment, it becomes obvious how important it is for us to have a mechanism that orchestrates this cacophony of brain activity. Our ability to focus attention to specific sensory signals or retrieve specific memories depends on the PFC to monitor and control neural activity, just as an orchestral conductor must control the activity of a group of musicians in order to present a smooth performance. The PFC’s role in monitoring and controlling neural activity forms the basis for top-down processing as it guides and selects sensory signals. Various terms, such as executive control and
metacognition, have been used to describe the role of PFC in supporting top-down processing.\textsuperscript{36}

Before the advent of neuroimaging techniques such as fMRI (functional magnetic resonance imaging), neuroscientists studied human brain function by observing the way damage to different parts of the brain disrupts cognitive function.\textsuperscript{37} Such neuropsychological investigations offered insights into the organization of the human brain, as discrete damage often led to rather discrete behavioral disorders. For example, patients with damage along the dorsal visual pathway exhibit deficits in spatial ability, whereas those with damage along the ventral pathway exhibit deficits in object recognition. From such studies, the neural underpinnings of mental abilities, such as perceiving, reading, remembering, and even appreciating art, have been analyzed (see Chapters 12 and 15).

With respect to emotions, we know that the ventral (lower) region of the PFC, an area called the orbitofrontal cortex, is important for the control and regulation of emotions. This fact became quite apparent from studies of the now-classic neurological case of Phineas Gage.\textsuperscript{38} Gage was a railroad foreman for the Rutland and Burlingame Railroad. On September 13, 1848, he was working with explosives to clear a rail path through a rocky area in Vermont. This procedure involved the use of an iron rod, called a tamping iron, to compress explosive powder into a bored hole. Gage was using his tamping iron when it inadvertently struck the side of the

![Figure 1.5 The lateral surface of the cerebral cortex.](image)
hole, causing a spark that ignited the explosive powder. The explosion sent the rod, harpoon-like, up through Gage's left cheekbone, through his frontal lobes, and out the top of his skull. Amazingly, Gage survived the accident and lived for another 11½ years. Although he did not appear to exhibit intellectual impairment, his emotional disposition changed. Prior to his accident, Gage was known to be a good foreman and friendly with the other workers. After the accident, the physician who treated Gage, John Martyn Harlow, stated that Gage was “fitful, irreverent, indulging at times in the grossest profanity (which was not previously his custom).”

Contemporary analyses of patients with orbitofrontal damage have affirmed the role of the orbitofrontal cortex in emotional control (see Chapter 15). It is as if these patients act out their feelings and desires without considering the consequences of their actions. If they feel angry, they may become violent; if they are sexually aroused, they may immediately act out their feelings. In a recent case, Samantha Fishkin was ejected out the window of an overturning pickup truck as her boyfriend swerved to avoid another vehicle. She hit a concrete embankment, which fractured her skull and caused severe frontal lobe damage. In a *New York Times Magazine* article about Samantha's injury, the author, Peter Landesman, wrote: “the new Samantha was savagely disinhibited. Breaks in her neural web had erased all sense of social convention. She couldn't control her desire to talk, her anger, her sexual urges.” Patients with orbitofrontal damage often exhibit emotional outbursts, inappropriate social behavior, risk-taking behavior, and obsessive-compulsive disorder.

Since the 1990s, neuroimaging techniques have given neuroscientists a window to the workings of the human mind in a way that would have been considered science fiction only 20 years ago. With the development of fMRI, neuroscientists can assess brain activity in specific regions, virtually on a moment-to-moment basis. In fMRI, the same scanner used in hospitals can be tuned to detect subtle changes in blood flow that occur when a brain region becomes active. At any given moment, however, tens of thousands of neurons are active just to keep us alive, such as maintaining heart rate, respiration, body temperature, and general conscious awareness. Other brain activity occurs in response to whatever we are doing at the moment, such as listening to a lecture, remembering a past event, or viewing a painting. An image of the brain's activity at any moment would not be very informative, as we would not know which areas are active in response to a specific event and which areas are active merely to keep us alive. Thus, neuroscientists obtain scans from one condition and compare them to scans from another. For example, one could scan subjects when they have their eyes open and compare the scans to moments when they have their eyes closed. By subtracting the eyes-open scans from the eye-closed scans one can assess brain activity that is specific to having the eyes open. All other brain activities would be canceled out because they occur in both conditions. This *subtraction method* has allowed neuroscientists to identify brain areas that are related to particular mental events.
With the advent of human neuroimaging techniques, particularly fMRI, studies of the brain’s response to art have been conducted (see Chapters 13 and 14). In this burgeoning field of *neuroaesthetics*, the orbitofrontal cortex has been shown to be particularly active during emotional responses to art. Kawabata and Zeki presented realistic and abstract paintings that participants had previously rated as ugly, neutral, or beautiful. The orbitofrontal cortex was active when subjects were presented with paintings that they rated as beautiful compared to those rated as neutral. In another study, the orbitofrontal cortex was active while listening to classical music that was rated as intensely pleasurable (e.g., Rachmaninoff’s *Piano Concerto No. 3 in D Minor*, Opus 30). These findings show that the orbitofrontal cortex is involved in the evaluation of beautiful works of art.

It is important to note, however, that complex mental processes activate broad neural networks that are important for a multitude of functions. To appreciate a painting numerous brain regions are working together to process sensory signals, connect sensory information with what we know, and derive emotional significance. In the Kawabata and Zeki study, the orbitofrontal cortex was particularly involved when the viewing of beautiful paintings was compared with the viewing of neutral paintings. Thus, the study isolated a particular feature of the brain’s response to paintings—namely the judgment of beauty. Many other brain regions were active, such as those involved in perceiving and conceptualizing paintings, but these activations would have occurred for both sets of paintings and were thus subtracted out in the analysis. Other studies have focused on sensory or conceptual aspects of aesthetic experiences (see Chapter 16). Thus, it is important to keep in mind that we are not dealing with a form of neural phrenology, linking one brain area with one mental function. Instead, many brain regions are involved in aesthetic experiences, and the goal is to understand the dynamic interactions across these brain regions.

**Issues for Aesthetic Science**

**DEVELOPING A FRAMEWORK FOR EMPIRICAL ANALYSES**

Philosophical approaches offer guidelines for scientific investigations of aesthetics. Mimetic and formalist approaches key on perceptual qualities and stimulate questions such as: What does it mean to interpret a painting as a window to the real world? What perceptual processes are involved in experiencing realistic scenes versus abstract art? How do lines, colors, shapes, and scenes influence our aesthetic experiences? Expressionist approaches consider the manner in which perceptual features evoke emotions. Since Berlyne’s seminal work on the way emotional arousal influences aesthetic responses, scientists have considered both psychological and neuroscientific factors associated with an expressionist approach (see Chapter 10).
Relatively few empirical studies have addressed conceptual approaches to art. The role of knowledge in our art experience has often been downplayed, as many feel that art should be experienced directly, from perceptual qualities to emotions, as if knowledge could only detract from our aesthetic experiences. It is clear, however, from cognitive science, and particularly in the writings of Gombrich, that knowledge plays a significant role, particularly in guiding top-down processes. Also, when we try to grapple with the way we experience post-modern art, it becomes imperative to consider the role that knowledge plays in our analysis of such works (see Chapter 6).

The promise of an interdisciplinary aesthetic science is motivated by an interest from a growing number of philosophers, psychologists, and neuroscientists who feel a need to bridge resources and form a more comprehensive analysis of art and aesthetics (see Chapters 2, 3, and 5). The goal is analogous to the tradition of cognitive science, in which many disciplines are valued and considered in the service of understanding cognition. What is needed is a way of triangulating information from many perspectives (see Chapter 4). In aesthetic science, many disciplines must be included and valued. In particular, philosophers, psychologists, anthropologists, historians, artists, and neuroscientists must consider the many ways we experience and value art.

This introductory chapter provided a brief background of philosophical and scientific approaches to art. Aesthetic experiences are captured in the ways we approach art, which include: (1) a mimetic approach (how well does an artwork portray a realistic scene?), (2) an expressionist approach (how well does an artwork drive emotional experiences?), (3) a formalist approach (how well does an artwork enhance sensations?), and (4) a conceptual approach (how well does an artwork communicate meaningful statements?). The beholder may experience art from any or a combination of these approaches. Moreover, some artworks may lend themselves better to one approach than another.

Figure 1.6 diagrams a componential framework of the art experience. It is purported that The Artist intends to offer an Artwork for aesthetic judgment. Definitions of “The Artist” and “Artwork” could be discussed ad infinitum; we will simply assert that The Artist is a human and The Artwork must be sensed. Our essential concern is how we experience art—that is, the beholder’s aesthetic experience. I propose that the beholder’s experience is best understood by considering the ways in which an artwork influences three primary mental functions: sensation, knowledge, and emotion. These psychological functions relate directly to the philosophical approaches that we have considered. Mimetic and formalist approaches emphasize sensation, conceptual approaches emphasize knowledge, and expressionist approaches emphasize emotion.

This framework is called I-SKE in reference to the four critical features—the artist’s intention to offer an artwork for aesthetic evaluation and the beholder’s three mental components, sensation, knowledge, and emotion. With respect to the beholder, sensory and emotional factors are rather obvious, as they have been
Knowledge refers to world (i.e., semantic) knowledge, personal knowledge, and cultural knowledge (including knowledge about art history and art practices). These aspects of knowledge influence how we interpret and appreciate art (see Chapter 11). According to the I-SKE framework, sensation, knowledge, and emotion all contribute to aesthetic experiences, though one or two of these components may be more emphasized than others. I propose that the fullest aesthetic experience is one that heightens all three components.

By keying on these three components, a more balanced approach to aesthetic science may be developed. The preponderance of studies in aesthetic science has been directed toward sensory aspects of aesthetics (see Chapters 7 and 8). Recently, research has considered ways in which artworks drive emotional responses (see Chapter 10). The I-SKE framework suggests that knowledge plays just as important a role in our aesthetic experiences as sensation and emotion. Only a few investigators have considered ways in which knowledge drives our art experience (but see Chapter 9). Finally, it is clear that various approaches to art can be taken—from appreciating realism to delving into conceptual, social, or political responses to art. Art may or may not induce strong emotions; it may or may not refer to objects in the real world.
WHAT, THEN, IS THE PHENOMENON OF INTEREST?

It is clear that meaningful advances in aesthetic science must first develop an appropriate and workable definition of the phenomenon of interest—namely, what is *aesthetics*? If we consider a very narrow definition, such as the one proposed by Baumgarten and echoed by Kant, then the phenomenon of interest would focus specifically on disinterested feelings evoked by beautiful objects. As stated in the beginning of this chapter, Baumgarten’s definition is much too narrow. One issue is whether aesthetic science should be tied specifically to the study of artworks. It is certainly useful to broaden the concept and include aesthetic responses to any object, including natural ones and ones not intended to be *art*. This broadening of the objects of interest is particularly prudent for our understanding of art, because what is defined as “art” is always changing. The broadening of acceptable objects raises interesting questions. Does our “aesthetic” experience differ when we appreciate a painting, say of a waterfall, as opposed to the way we appreciate natural phenomena, such as an actual waterfall? Does an object’s presence in an art museum create a different kind of experience?

Another way to broaden the definition of “aesthetics” is to consider how objects evoke different kinds of emotional responses, including humor, sadness, horror, and disgust. Many postmodern works are intended to shock or disgust the beholder. Should all emotions be considered as relevant for aesthetic science? It is clear that conceptual approaches to art demand a non-emotional, even anti-aesthetic, analysis of art (see Chapter 6). One could consider broadening the concept of “aesthetics” to include completely non-emotional aspects of the art experience, though such a stance may go too far. If we, as many art critics suggest, consider the art experience as going well beyond what many consider an “aesthetic” experience, it may be prudent not to “tether” aesthetic science to art (see Chapters 3).

As proposed earlier, we might tie aesthetic science to our understanding of the *dimension* of hedonics, from very positive (beautiful) to very negative (disgusting) or from very interesting to not at all interesting (see Chapter 8). From this perspective, we could consider any object and derive an explicit preference or interest judgment: we like it or we don’t, it’s interesting or it’s not. Such preferences could be mapped onto emotional (pleasant or not) or conceptual (interesting or not) aspects, and aesthetic science could address the reasons why certain objects are more pleasant or interesting than others. Hedonic responses could be related to evolutionary factors, such as analyses about the ways in which objects evoke an approach vs. avoidance response (see Chapter 5 and 8). Of course, artworks have often been created for the sole purpose of eliciting “disinterested” hedonic responses (i.e., art for art’s sake), and thus it is not unreasonable to consider the psychology of art as a prime subarea within aesthetic science. Yet many objects not considered as art (e.g., foods, people, locations) evoke strong hedonic responses and these responses may be mapped onto psychological processes, such as motivation, drive, arousal, and pleasure. Moreover, underlying brain responses associated
with these processes are relevant to aesthetic science. As such, research in such diverse areas as affective neuroscience (e.g., neural basis of empathy), neuroeconomics, and theory of mind (e.g., mirror neurons) is important for aesthetic science to consider.

The ideas discussed in this chapter provide a foundation for building a multidisciplinary approach to the science of aesthetic experiences. The following chapters address the viability of aesthetic science and discuss possible avenues of interest. Philosophical, psychological, and neurobiological approaches are considered here, with the intention of initiating a discussion concerning the beholder’s experience.

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Endnotes


18. The term “conceptual” is used here to include all knowledge-based approaches to art, rather than referring specifically to the genre of conceptual art.


47. *The Artist* is a human because intention is a human characteristic (though a human could offer for aesthetic evaluation an artwork created by some other person, an animal, or a computer). *The Artwork* must be sensed and thus cannot be a thought or dream (though a written or visual description of a thought or dream would suffice as an artwork).