

Conceptual Art: A Blind Spot for Neuroaesthetics?

Gregory Minissale

Interest in how the brain and body function during aesthetic experience has increasingly spread to different areas of neuroscience and cognitive research as well as to embodied philosophy, art history, musicology and architectural theory. *Neuroaesthetics* is a collective term I use here to designate various approaches that involve the study of art from the point of view of perceptual physiology or cognitive science. Neuroaesthetics tends either to emphasize the processes of neuronal groups in the visual cortex when artworks are perceived [1] or to suggest that visual experience depends on a tacit knowledge of how to interact physically with art objects—a proficiency that has a neurological basis in the sensorimotor areas of the brain [2].

Neuroscientist Semir Zeki claims that our perception of art has a biological substrate, a dense network of neuronal cells, feature detectors that process line, color and motion. Zeki's theories on art are based on experiments from localized perceptual sites in the brain that are also engaged in abstracting processes. They fail, nevertheless, to explain complex concepts such as ideals and beauty. Zeki himself admits, "I have been vague about the precise neurological way through which ideals are constructed by the brain" [3]. Surveying Western art, Margaret Livingstone, a neurobiologist, also analyzes perceptual feature detectors. She studies facial recognition and luminance as well [4]. Others emphasize homeostatic neural mechanisms of arousal and emotional regard involved in responses to art rooted in our evolutionary development. There is a sizable amount of literature that engages critically with these approaches [5].

Alva Nöe, a philosopher, proposes that consciousness is not something in our heads but is something that we do. Seeing becomes a way of acting in the world. Moving around and among objects, spaces and artworks is a process of active perception that helps to create concepts. With embodied concepts, neural pathways connecting sensorimotor areas process actions and thoughts associated with "back," "forward," "up," "down" or "through," which also form the basis of concepts, suggesting a mimetic relation between conceptual schema and motor orientation. Concepts are acted out using our sensorimotor knowledge [6]. There have been a number of objections that this approach privileges sensorimotor areas of the brain and the role of mirror neurons [7]. According to Clark

[8], this approach tends to minimize the role of recall, reason and the imagination (which are not associated with the sensorimotor system), variables that are important for the kind of conceptual thought that supports parody or irony, for example. We can employ prepositions (up, down, through) figuratively, or we may even parody them; such mental operations are based on broader activity in the brain [9].

It is not my intention here to dwell on objections to these approaches but merely to point out that neuroaesthetics as a whole predominantly looks to the formal and perceptible qualities found in traditional and modernist examples of art from Michelangelo to Mondrian, whereas conceptual art, which tends to downplay such qualities, is consistently omitted in these studies [10].

Instead, it is my intention to foreground what neuroaesthetics might consider addressing at some later date: namely, the kind of conceptual thought involved in conceptual art that has formed the paradigm upon which contemporary art practice continues to evolve. It is my hope that a consideration of such art will encourage neuroaesthetics to take into account larger-scale neural events such as concepts and their relation to the study of localized microstructures favored by neuroscientific approaches. Putting neuroaesthetics into this wider cognitive context, which conceptual art clearly demands, may help us to understand our varied and nuanced experiences of art.

Conceptual art is a loose historical term that refers to the works of artists, musicians, filmmakers and writers in the 1960s and 1970s that often, directly or indirectly, reference Duchamp's work. Themes identified with conceptual art are found before and after this period. We see them in Dada, Pop, Neo-Dada and postmodernism and in many different cultures. At the risk of simplifying, conceptual art brings together non-art objects ("readymades") and concepts that appear to have no author, purpose or artistic process by which to distinguish them. Its themes challenge traditional notions of beauty and formal design, artistic dexterity, aesthetic composition and technique. In short, conceptual artists devalue the qualities that neuroaesthetics find so important. One might object that these examples are "anti-art." Yet they are celebrated as art in the history books and galleries and are considered as such by artists and philosophers [11].

ABSTRACT

Conceptual art presents an important challenge for neuroaesthetics. Such art helps to stimulate complex psychological events—beyond the perceptual responses usually studied by neuroscience. If science is to engage meaningfully with art, scientists need to address the conceptual content of our experience of many different kinds of art. As a test case, this essay suggests that neuroaesthetics should come to terms with works such as Marcel Duchamp's *Boîte-en-valise* (1935–1941), which is representative of many artworks and art exhibitions organized into composite parts or groups of works. The essay shows that, typically, art stimulates a network of conceptual relations rather than merely perceptions of the visible aspects of single artworks.

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This essay looks at four main areas of conceptual art, in an approach that outlines opportunities for research for cognitive science and neuroaesthetics:

1. Some argue that conceptual art stimulates us because it is witty and puzzling, like a word game. From this perspective, art's aesthetic content can be compared to the elegance of a mathematical proof [12].
2. Some of us find it refreshing that conceptual art questions the traditional importance placed on the visible qualities of art: With conceptual art our perceptions of shape and form are less important than the parody of them. Thus, a recurrent theme in conceptual art is the interplay between the "visible and invisible" aspects of art.
3. Conceptual artworks reference other works: The viewer is invited to enjoy constructing conceptual relations between artworks (I call this *intertextuality*) using short- and long-term memory, which have a bearing on how we perceive the work at hand.
4. Often related to this intertextuality is a tendency in conceptual art to stimulate the reordering of "conceptual complexity," often into larger conceptual wholes or superordinate categories, which, in turn, help us to see art in unaccustomed ways.

PUZZLE

Joseph Kosuth's *Art as Idea as Idea* (1967) (Fig. 1) invites a perceptual examination of the shapes of the letters in the work as "art" yet also allows us to override this basic response by encouraging us to reflect on the nature of vision and art.

There are many works of art that use puns and word games to present the viewer with visual paradoxes. One of the earliest examples is Magritte's *Treachery of Images* (*Ceci n'est pas une pipe*, 1928–1929), which, according to Zeki, "goes against everything the brain has seen, learnt and stored in its memory" [13].

Yet this "going against" is pleasurable and conceptually interesting. In Kosuth's image, we alternate *reading* a text with *seeing* an image. We also read the words "human skill" and "execution" in the text presented. These concepts are extended by Kosuth to include "quoting" and re-contextualizing words, actions that he wants us to consider as also indicative of art. The artwork adopts a mutually reinforcing strategy that suggests a reading

between the lines and its visual equivalent. It is an understanding beyond optical sensation.

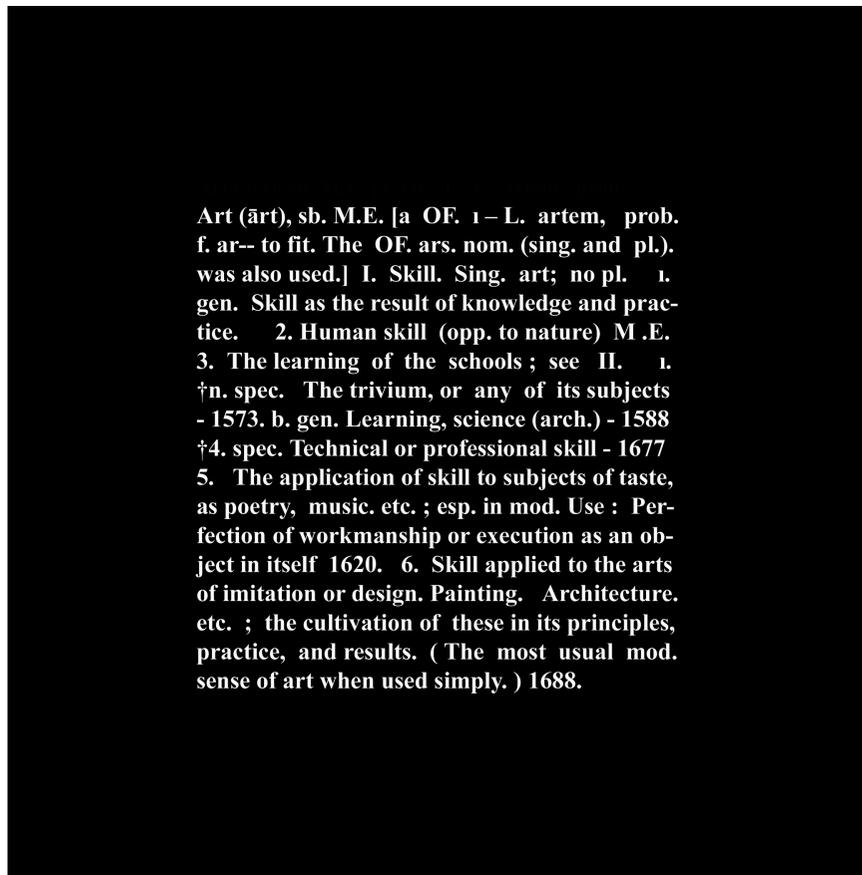
The process of viewing art by Seurat or Mondrian, the works of whom take a thematic approach to perceptual experience, is more easily traced to the action of neuronal feature detectors in early stages of perception in the visual cortex. With conceptual art, these processes are less important than mechanisms of memory, rational induction, planning, semantic and linguistic processing and categorization. Just as brain areas are associated with these functions, pleasure might be associated with solving puzzles found in conceptual art, which would involve stimulating emotions as well as linguistic processing. Thus, without going into too much detail, conceptual thought is produced from a cooperation of many brain areas together [14]. This cooperation can produce multiple interpretations that the viewer may integrate into larger conceptual wholes not easily traced to one particular area of the brain, let alone particular groups of neuronal firings. Conceptual art seems to require this "molar" conceptual integration. Zeki characterizes such multiple interpreta-

tions as "ambiguity," based on a three-tier system:

Ambiguity may be due to activity in a single area in which the micro-conscious correlate of activity may be in more than one state. Obviously, there is no "top-down" influence here. At a higher level, the ambiguity may involve more than one area, as in the Rubin vase. This may or may not involve higher areas in the frontal lobe. At a higher level still, the ambiguous state may involve several distinct areas that are able to bring their influence. . . . Here, memory, experience, learning and much else besides can influence what is perceived at any given moment. This almost certainly involves a "top-down" influence, from diverse sources, not just the frontal lobes. Thus, opening up the capacity for a given brain area to be influenced by another area is merely one step in opening up the capacity to be influenced by multiple other areas [15].

This third area, involving "higher-level" processing, is where "top-down" influence on perceptual organization is strongest. This area, which is most often functional in our experience of concepts and semantic processing in conceptual art, is largely ignored by neuroaesthetics. In other words, conceptual art reveals a

Fig. 1. Author's 2010 reconstruction of Joseph Kosuth's *Art as Idea as Idea* (Art), photographic enlargement on compressed Styrofoam board, 45 ½ × 45 ½ in (115 × 115 cm), 1967 (present location unknown).



Art (ārt), sb. M.E. [a OF. 1– L. artem, prob. f. ar-- to fit. The OF. ars. nom. (sing. and pl.) was also used.] I. Skill. Sing. art; no pl. 1. gen. Skill as the result of knowledge and practice. 2. Human skill (opp. to nature) M.E. 3. The learning of the schools; see II. 1. †n. spec. The trivium, or any of its subjects - 1573. b. gen. Learning, science (arch.) - 1588 †4. spec. Technical or professional skill - 1677 5. The application of skill to subjects of taste, as poetry, music, etc.; esp. in mod. Use: Perfection of workmanship or execution as an object in itself 1620. 6. Skill applied to the arts of imitation or design. Painting. Architecture, etc.; the cultivation of these in its principles, practice, and results. (The most usual mod. sense of art when used simply.) 1688.

new set of problems, issues and opportunities for understanding the relationship between art and neuroscience.

THE VISIBLE AND THE INVISIBLE

How this important interplay of themes requires a cooperation of several brain areas can be seen in Duchamp's much-written-about *Bride Stripped Bare by Her Bachelors, Even* (known as the *Large Glass*) (1915–1924). This elegant and enigmatic work is made of twisted metal wire and flattened metal plates cut into suggestive shapes mimicking machine forms, all pressed between two sheets of glass that are held up by a metal frame. It is thus free-standing, so that one can walk around the work, see through it and look into it. According to the artist's notes, it is divided into a female area above, suggesting a heavenly presence, in opposition to the gravitational pull of machine parts, chocolate grinder, filters and scissors below. The work has sometimes been interpreted as a metaphor for sex; yet the piston mechanism, which is supposed to connect the sections above with that below, fails to make contact and suggests instead unfulfilled desire.

A richer involvement with the *Large Glass* is achieved by using at least two ways of seeing: (1) the processing of perceptible qualities using feature detectors or sensorimotor mechanisms, in addition to (2) drawing upon areas of the brain responsible for semantic processing and rational induction. The *Large Glass* is more than a neurological stimulation of sensorimotor movements. Despite its exacting (yet ironic) system of illusionism based on geometries in perspective, it also involves a distancing from the optical "point of view" when we begin to create concepts using a series of poetic associations linked to notions of transparency and light "shining through" the sensible properties of the work.

The transparency of the glass engages different ways of seeing. We can think about the flatness of the work and the formal features of the machine parts, yet the glass invites us to see beyond them, thereby suspending our awareness of the perceptible elements of the work, as we would see beyond the shapes of letters on a page while trying to understand their meaning. While the machine parts tell us a story of a reproductive cycle that misfires, looking through the transparent glass, one is reminded of St. Thomas Aquinas's description of the Immaculate Conception as a ray of light that passes through a glass, leaving the glass (and

the Virgin's body) intact. The light shines through the glass as we gaze through it; we "read through" objects (and our sense perceptions of them).

While it is possible to interpret Duchamp's machinism in a visceral sense as a representation of sensorimotor movements in the sex act, it is also possible to view it within a tradition depicting technology as a model for processes of thought. Hobbes and Leibniz used mechanics in this way. Freud used thermodynamics as a way to articulate psychological processes, and cognitive science sometimes uses the computer as a model for the brain [16]. Seen in this tradition, Duchamp's system of machine parts in the *Large Glass* may only literally reference sex. It is also possible to see it as a body: The top part is the mind, the chocolate grinder below suggesting the sexual organs. The work invites a continual shift between different representational systems: the careful perspective in which the bachelors are placed below and the parody of the window; the suggestion of psychological sex drives; the mechanics of industrial machine forms; the absence of freedom suggested by automata; the automatism of biological reproduction; the theological implications of the light and the glass and predeterminism; and perhaps above all a life-affirming and endlessly complex relation of concepts. Each conceptual system is an interpretive framework we can engage with at any moment while we are visually inspecting the work with perceptual processes that we need not employ thematically.

Duchamp's *Large Glass* remains one of the most widely discussed works of art. Its visual allure encourages both conceptual complexity and self-reflection. However, it is placed into an even more fascinating conceptual context in *La Boîte-en-valise* ("box in a suitcase") (Fig. 2), a suitcase containing a box of hand-tinted prints and miniature artifacts that catalogue Duchamp's *oeuvre*. The artist worked on over 300 editions of this valise from 1935 to 1941. In many of them, his *Fountain* (1917) was reproduced in miniature, as if to readmit it into another "gallery" context in the valise, often called a portable museum.

Each artwork similarly gains new significance by being recontextualized and juxtaposed with other works. The valise is a visual mnemonic system as well as a form of conceptual exploration. Each artwork, the *Large Glass* prominent among them, is a token of a distinct concept; they can be viewed in any order—from right to left or vice versa, or from top to bottom. We can combine the objects in

Duchamp's box, put them in different sequences and use them as touchstones for concepts in relation to others. The box also invites us to imagine using it with our bodies as well as our minds; as a suitcase, it invites us to pack and unpack objects as we might when planning a trip or organizing a stay. It uses localized perceptual processes, sensorimotor involvement and the processes of memory and conceptual planning ahead. This experience, requiring multiple levels of explanation, thus engages dynamically with many brain areas.

Reinforcing the themes of visibility and invisibility in the valise is an image of *L.H.O.O.Q Shaved*. The "original" *L.H.O.O.Q* was a print of Leonardo's *Mona Lisa* on which Duchamp had painted a moustache and goatee. In *L.H.O.O.Q Shaved*, the moustache and goatee are omitted. The work plays with notions of absence and presence and the continually deferred "original" in the context of a box of simulacra. The work encourages us to question our perceptual responses and notes the ordinarily obvious: It is a print of the *Mona Lisa*, but we cannot help but imagine it as Duchamp had defaced it years before; we "see" the absence of the moustache. Much has been written on the enigmatic beauty of the *Mona Lisa*'s smile, more recently from a neurobiological point of view [17]. Yet with *L.H.O.O.Q Shaved*, this perceptual or pleasurable response, although still available to us, is questioned as we turn our attention to Duchamp's act of defamiliarizing a well-known face and questioning habitual ways of experiencing beauty.

INTERTEXTUALITY

Duchamp's well-known intention to "leave retinal art behind" is clearly demonstrated in the valise, which is a microcosm of the intertextuality principle. Histories of contemporary or conceptual art often begin with Duchamp's *Fountain*, a urinal turned on its side, now part of the art world, which challenges the "retinal" appreciation of formal categories. Also included in the box is *50 cc Air de Paris* (1919) (an empty glass ampoule—as a joke, containing "Parisian air"—that the artist took with him when he migrated to America).

The artists who have referenced Duchamp's examples are too numerous to mention here. One work in the spirit of Duchamp's non-retinal principle is Hans Haake's *Condensation Cube* (1963–1965). Another is Piero Manzoni's *Artist's Breath* (1960), where the artist personalized Du-

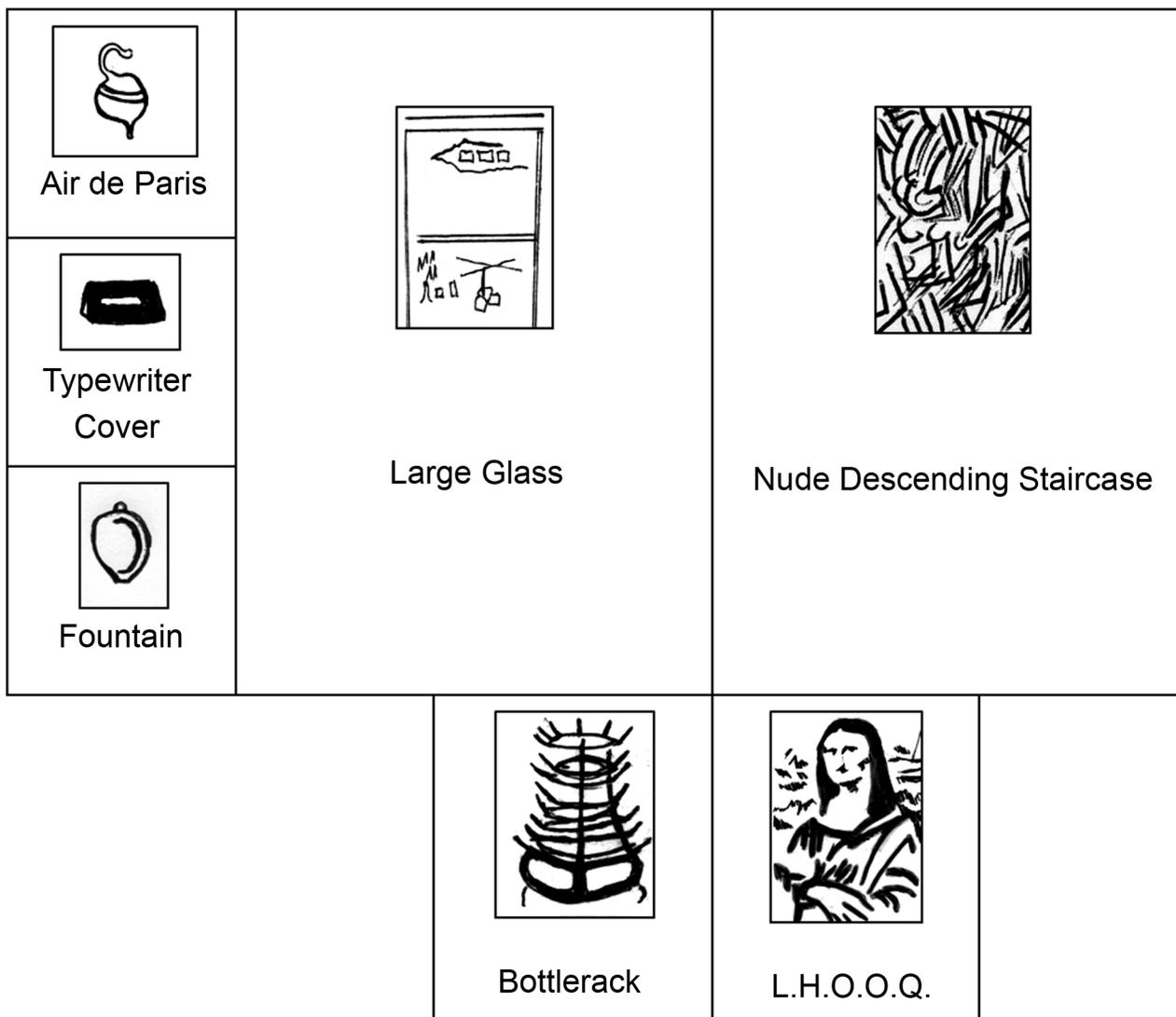


Fig. 2. Diagram of Marcel Duchamp's *Bête-en-valise/Box in a Suitcase*, 1935–1941.

champ's gesture of *Air de Paris* by breathing into a red balloon on a plinth. Also of note is Robert Barry's *Inert Gas, Helium* (1969). Examples from more contemporary art include Martin Creed's *Light Going On and Off* (2000), a room in the Tate Modern, London, where a light went on and off every 5 seconds. Creed won the 2001 Turner Prize for this exertion. The work "blinks" between appearance and disappearance, art and reality. However, the blinking also references the viewer's gaze and the fact that she also can make reality or art "disappear." This is a play on the binary of visibility and invisibility, the former showing us emptiness in a gallery, the latter repeating emptiness in a different light and "reproducing it." Art is "dematerialized," but the concept remains and can be staged in any gallery anywhere in the world or in any number of galleries at the same time.

Our experiences of all these examples

of conceptual art are not explained by neurobiological experiments that look at perceptible properties of the artworks, yet such experience generates a whole field of intellectual analysis, artistic innovation and controversy over value and meaning in the arts.

Many conceptual works of art reference other artworks in a semantic network not readily reduced to neurological explanation. This system of associations helps us to create new concepts by recombining stored ones in novel relationships using both our rational and imaginative capabilities.

CONCEPTUAL COMPLEXITY

It may be tempting to presume that concepts are merely stored in the brain and that we recognize them in the artwork through perceptual cues. In other words, the organizational work of comparing

and contrasting conceptual works in meaningful sequences is all generated from higher-order processes cut off from the world. However, some concepts, whose tokens may be found in the external world, not only help to reconfigure or re-sequence our stored concepts but also affect our eye movements and attention [18].

While phenomenology and enactivism challenge the traditional mind/body duality by asserting that embodied involvement with the world is comparable to cognition, recent developments in "situated cognition" suggest a complex interaction between stored concepts and material anchors in the external world, involving "loops and circuits that run outside the head and through the local environment" [19]. Integrating brain, body and world rather than promoting any one of these factors over the other, as do neuroaesthetics (brain) and enac-

tivism (body), is likely to provide a more balanced and comprehensive explanation of how we experience art.

With Duchamp's valise, we can argue that the work itself provides the viewer with a series of cues or guidelines for forming conceptual *relations*, rather than a situation in which fixed concepts stored in the brain are simply recognized in the art object. Edwin Hutchins [20] argues that a material object can anchor conceptual relationships in such a way that we can shift the sequence of perceptual cues to create new meanings, concepts and categories. A well-known linguistic principle is that changing the syntax of units of meaning creates new meaning; in the process of changing conceptual sequences, new concepts arise [21,22].

The valise is a repository of tokens referencing Duchamp's longstanding devotion to the concept of a non-retinal art. This organizing concept helps to guide us, in a top-down fashion, through our perceptual inspection of the valise. If we imagine that the box is a traveling exhibition of non-retinal art, an "archive of invisibles," we would see reproduced in the box, along with *L.H.O.O.Q Shaved* and the glass ampoule referring to *50 cc air de Paris*, an image of the famous bottlerack readymade, upon which we can imagine wine bottles hung out to dry. There is also the *Traveler's Folding Item* (1916), a reduced version of an Underwood typewriter cover suggesting a typewriter underneath, a tool that can be used to write a letter or poem. Although the typewriter as a symbol of creativity has been "put away," the conceptual work continues beyond the manual or mechanical execution of ideas.

Also included in the box is the fluttering love-heart print, a famous diagram used in perceptual experiments. Duchamp used it to alert us to the theme of the retinal and non-retinal in art. The image of his famous *Nude Descending a Staircase* is a conceptual depiction of motion in a fixed medium: Do we see the figure or the motion? In such cases, we are no longer seeing perceptually. As a whole, the valise helps to activate an intensity of conceptual production through a continuous parody of visual codes. We are able to see each individual object not in the customary perceptual way using feature detectors or sensorimotor capabilities but as part of a jigsaw puzzle that uses other brain areas—the memory, rational induction, linguistic processing and the imagination—in order to produce a conceptual way of seeing. This way of seeing is structured as a network of relations characteristic of many kinds of art.

Arthur C. Danto [23] suggests that much of art is, in fact, conceptual, as it invites an "enthymematic" phenomenon whereby the viewer is responsible for supplying the "missing" conceptual link, which the work itself suggests [24]. Duchamp claimed, "What art is in reality is this missing link, not the links which exist. It's not what you see that is art, art is the gap" [25]. The concept or superordinate category that Duchamp's valise helps us to construct is "non-retinal art," which primes our attention and guides our perceptual searching [26]. The objects in the box help us to "pack" new examples into our superordinate category of non-retinal art, and they can be used as loci for complex conceptual combinations. They do not provide a fixed map or coding of concepts, as it is possible to make different linkages between them and to reorder them, as we might change the syntax of a sentence in order to adjust its meaning. Like many composite artworks, the box presents the opportunity for the mental manipulation of concepts within the situational constraints provided by the artist.

The box requires that we use many different brain areas: the feature detectors of the visual cortex, the action areas of the sensorimotor system studied by neuroaesthetics and cognitive science, as well as memory, language and rational induction employed by other areas studied by these disciplines, along with cognitive psychology and philosophy. To privilege only one of these aspects massively reduces the multidimensional meaning and experience the valise affords.

The valise may seem an exception among art objects, given its complexity. I would argue that this is not the case. One need only consider that many artists collect a number of their own artworks into one exhibition and achieve a similar conceptual multiplicity. Artists commonly think in groups of works, using analogical thought, rather than simply focusing on isolated works. Art historians, too, are trained to think in terms of networks of relationships among artworks, helping to uncover an intertextual system of references.

The *Large Glass* enriches and is enriched by the company it keeps in the valise. The discoveries of neuroaesthetics need to be balanced by cognitive, psychological and other approaches; neuroaesthetics too, can be enriched by the company it keeps. Providing such a context for the perceptual data of neuroaesthetics helps us to come closer to understanding the massive neural, em-

bodied, conceptual and social integration that art entails.

References and Notes

Unedited references as provided by the author.

1. See Semir Zeki, *Splendours and Miseries of the Brain* (London: Blackwell, 2009); Margaret Livingstone, *Vision and Art: The Biology of Seeing* (New York: Harry N. Abrams, 2002); V.S. Ramachandran and William Hirstein, "The Science of Art: A Neurological Theory of Aesthetic Experience," *Journal of Consciousness Studies*, 6, No. 6–7, 15–51 (1999).
2. Alva Nöe, "Experience and Experiment in Art," *Journal of Consciousness Studies*, No. 8–9, 123–135 (2000); George Lakoff, "The Neuroscience of Art," in Mark Turner, Ed. *The Artful Mind* (Oxford: OUP, 2006).
3. Zeki [1] p. 74. Zeki concedes that the concepts used as standards by which to judge art are "difficult to study at the level of brain cells; we just do not have the technology at present . . . we therefore have to limit ourselves to generalities and to hints" (p. 53) and "where the concept itself resides is problematic" (p. 54).
4. Livingstone [1].
5. "Art and the Brain," Special Issue, *Journal of Consciousness Studies*, 6, No. 6–7 (1999); "Art and the Brain II," Special Issue, *Journal of Consciousness Studies*, 7, No. 8–9 (2000) and "Art and the Brain III," *Journal of Consciousness Studies*, 11, No. 3–4, (2004); in an essay entitled "Art and Reductionism" in the latter volume (pp. 111–116), Eric Harth writes, "almost any macroscopic physical event that involves the intervention by a human brain cannot be fully understood by just following the chain of cause and effect beginning with elementary neural events" (p. 114). Citing Livingstone, Irving Massey, in *The Neural Imagination* (Austin: University of Texas, 2009) observes the tendency to analyze episodes of vision as perfect laboratory models ignoring the differences in subjective experiences or attention spans (p. 137). Raymond Tallis, Professor Emeritus of Geriatric Medicine at the University of Manchester, questions whether "love" can be traced to "bits of brains" as Zeki proposes, when even "sophisticated neural imaging . . . cannot distinguish between physical pain and the pain of social rejection: they seem to 'light up' the same areas." The fallacy of fMRI scan studies is that "the areas that light up are regarded as 'the center' for that experience, emotion, or propensity." *Times Literary Supplement Online*, April 9, 2008. <http://entertainment.timesonline.co.uk/tol/arts_and_entertainment/the_tls/article3712980.ece> 30 June 2011.
6. Nöe [2]: 128.
7. Andy Clark, "Visual experience and motor action: Are the bonds too tight?" *Philosophical Review*, 110: No. 4, 495–519 (2001).
8. Clark [7]: 516.
9. Single or group cell experiments need to be put into a broader, dynamic context because "no cortical area operates in isolation but is connected to many other areas by anatomical long-range connections ("association fibers"). The upshot is that the behavior of a particular [brain] area cannot be predicted and explained from local microstructure alone." F. Egan and R. Matthews, "Doing cognitive neuroscience: A third way," *Synthese*, 153: 385 (2006).
10. In *Inner Vision* (London: OUP, 1999), Zeki suggests that Duchamp's work is not "universally appealing." This caveat reveals Zeki's bias for traditional art, as popularly defined (p. 146).
11. Peter Goldie and Elisabeth Schellekens, *Who's Afraid of Conceptual Art?* (London: Routledge, 2010).
12. Goldie and Schellekens [11] p. 102.
13. Zeki [10] p. 46.
14. For an attempt to ground concepts in sensorimotor areas see Lawrence, "Abstraction in perceptual

symbol systems," *Philosophical Transactions of the Royal Society of London: Biological Sciences*, 358, 1177–1187 (2003). Yet conceptual knowledge may also be stored or organized amodally in temporal and prefrontal areas.

15. Zeki [1] pp. 263–264.

16. Lev Manovich, "Visual Technologies as Cognitive Prostheses" in M. Smith and J. Morra, Eds. *The Prosthetic Impulse* (Cambridge, MA: MIT 2006), p. 211.

17. Livingstone [1] p. 73.

18. Sabine Kastner, "Attentional response modulation in the human visual system," in M.I. Posner (ed.), *Cognitive Neuroscience of Attention* (New York: Guilford Press, 2004), 144–156; and M. Hayhoe and D. Ballard, "Eye movements in natural behavior," *Trends in Cognitive Sciences*, 9, 4, 188–194 (2005). This research suggests that our visual attention is nuanced by inner motivations and goals, top-down bias in the

frontal and parietal areas, along with environmental factors. Thanks to the anonymous reviewer for these references.

19. Andy Clark, *Being There* (Cambridge, MA: MIT, 1998), pp. 206–207.

20. Edwin Hutchins, "Material anchors for conceptual blends," *Journal of Pragmatics*, 37 (10): 1555–1577 (2005).

21. In semantic theory the "meaning of a concept is given by its role within its containing system." Robert Goldstone, et al., "Connecting concepts to the world and each other," in D. Pecher and R. Zwaan (Eds.) *Grounding Cognition* (Cambridge: Cambridge University Press), 286. This suggests that the context provides meaning, not the individual lexical units, concepts or metaphors themselves.

22. "Abstract concepts are relational concepts which are likely linked to an extensive number of other

concepts." Katja Wiemer-Hastings and Xu Xu, "Content differences for abstract and concrete concepts," *Cognitive Science*, 29 No. 5, 732 (2005).

23. Arthur C. Danto, *The Transfiguration of the Commonplace* (Cambridge, Mass.: Harvard University Press, 1981).

24. Danto [23] p. 170.

25. Arturo Schwarz, *The Complete Works of Marcel Duchamp* (New York: Harry N. Abrams, 1970) p. xxxii.

26. The prefrontal cortex is said to provide abstract rules for organizing categories.

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