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Scientific and Aesthetic experiments: Vision as Cognitive Action According to Helmholtz and Cézanne

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"REALISATION": A COGNITIVE AND NOT A "RETINAL" VISION

Cézanne speaks of "realisation" to describe how the object of vision is constituted while being observed, an idea translated as the process of *Dingwerdung*, the becoming-of-the-object, by Rainer Maria Rilke in 1907 in regard to his experience of the painter's canvases.[1] In 1904, Cézanne wrote to Émile Bernard:

> Let us read nature; let us realise our sensations in an aesthetic that is both personal and traditional [...]. To paint from nature is not to copy the object, but to realise one's sensations. There are two things in the painter, his eye and his brain, both of which must help one another. We must work on their mutual development; on the eye by means of the vision of nature; on the brain by means of the logic of organised sensations, which provides the tools of expression.[2]

But what did he mean by "realise"?[3]

Since Rainer Maria Rilke, the question of the way in which Cézanne evoked space, while at the same time insisting on the fact that the canvas was no more than a flat surface, has caused much ink to flow (Fig. 1).

This essay is dedicated to Hans-Jörg Rheinberger.

1. Rilke to Clara Westhoff, October 9, 1907, in Rainer Maria Rilke, *Briefe* über Cézanne, ed. Clara Rilke, Wiesbaden, Insel, 1952, p. 22-26, cit. p. 22-23. "'La réalisation' nannte er es, und er fand es bei den Venezianern, die er früher im Louvre wieder gesehen und unbedingt anerkannt hatte. Das Überzeugende, die Dingwerdung, die durch sein eigenes Erlebnis an dem Gegenstand bis ins Unzerstörbare hinein gesteigerte Wirklichkeit, das war es, was ihm die Absicht seiner innersten Arbeit schien". See also: Evelyn Benesch, "Vom Unfertigen zum Unvollendeten – Zur 'réalisation' bei Paul Cézanne", in *Vollendet Unvollendet. Cézanne*, exhibition catalogue, Kunstforum Wien and Kunsthaus Zürich, January-July 2000, Ostfildern-Ruit, Hatje Cantz, 2000, p. 41-61; Martina Kunz, *Bild-Verdichtungen. Cézannes Realisation als poetisches Prinzip bei Rilke und Handke*, Göttingen, Vandehoeck & Rupprecht, 2003.

2. Cézanne to Émile Bernard, in 1904, first published by Bernard in *L'Occident*, No. 32, July 1904, then in Émile Bernard, Jules Borély, Maurice Denis, Joachim Gasquet, Gustave Geffroy, Francis Jourdain, Léo Larguier, Karl Ernst Osthaus, R.P. Rivière, Jacques Félix Schnerb and Ambroise Vollard, *Conversations avec* Cézanne, ed. Michael Doran, Paris, Macula, 2011 [1978], p. 66-86, cit. p. 75-76. The authenticity of the statements published by Bernard is an issue of some controversy. Defended by Doran (see his preface, p. 66), Shiff is less convinced (Richard Shiff, *Cézanne and the End of Impressionism*, Chicago/London, University of Chicago Press, 1984; French edition: *Cézanne et la fin de l'Impressionnisme. Étude sur la théorie, la technique et l'évaluation critique de l'art moderne*, Paris, Flammarion, 1995. In any event, on July 25, 1904, Cézanne sent a letter to Bernard to thank him for his article containing the aphorisms on art attributed to him. See: *Paul Cézanne. Correspondence*, annotated collection with a preface by John Rewald, Paris, Grasset, 1978 [1937], p. 304-305. See also: Émile Bernard, "Souvenirs sur Paul Cézanne et lettres inédites", *Mercure de France*, October 1, 1907, p. 385-404, reprinted in *Conversations avec Cézanne*, op. cit., p. 97-145, here p. 111.

3. The analysis of Cézanne's terminology provided by Lawrence Gowing is indispensable. Lawrence Gowing, "The Logic of Organized Sensation", in: William Rubin (ed.), *Cézanne. The Late Work*, New York/Boston, The Museum of Modern Art/Graphic Society, 1977, p. 55-72 (French edition: *Cézanne. La logique des sensations organisées*, Paris, Macula, 1992 [2015]).

Generally, Cézanne is credited with having highlighted, as no one had before him, the processes by which a spatial illusion can emerge in a painting.[4]

At first, in the rhythm of horizontal and vertical, curved and straight lines, one sees only flat pictorial signs responding to the rectilinear outlines of the painted surface. It is only later that the impression of depth is perceived and that objects arrange themselves simultaneously in their outlines by gaining a plasticity described by Rilke as "indestructible".[5]

Up until now, art historians have primarily been interested in the tension between surface and space that miraculously emerges when one looks at a picture like *Still Life with Apples on a Tray* for a sustained period. The time involved in the realisation of what one sees has played only a secondary role in their analyses.[6] In this article, which is dedicated to sight as a process or, indeed, an action, we shall focus particularly on time.

Helmholtz, equipped with the ophthalmoscope, which he invented in 1851, was the first person to examine the back of the eye (Fig. 8).[7] For the edition of his *Handbook of Physiological Optics* published two years after his death, an illustration of this view of the eye was reproduced in a colour lithograph (Fig. 7).[8] For a doctor equipped with an ophthalmoscope, vision had now become its own spectator. This representation of the retina was highly idealised. Metaphorically speaking, it foreshadowed Helmholtz's theories concerning not only the structure and functioning of the eyeball, but also all the corporeal actions and processes involved in vision. Initially, the sole intention of the great physicist and physiologist was to study and identify the physiological and biophysical

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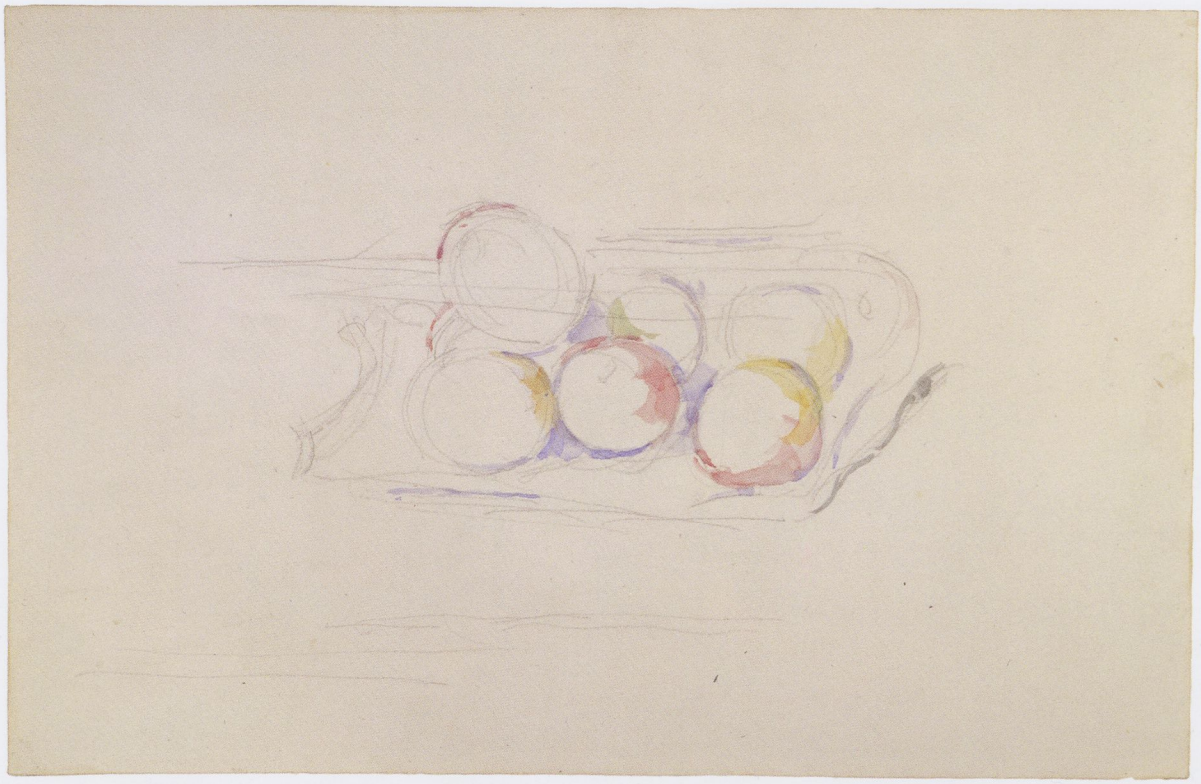
4. Roger Fry, "The Post-Impressionists" [1910], in Christopher Reed (ed.), *A Roger Fry Reader*, Chicago, The University of Chicago Press, 1996, p. 81-85; Fritz Novotny, "Cézanne und das Ende der wissenschaftlichen Perspektive" [1938], in *Paul Cézanne. Gesammelte Schriften zu seinem Werk und Materialien aus dem Nachlass*, ed. Gabriel Ramin Schor, Vienna, Klever, 2011, p. 117-380; Clement Greenberg, "Abstract Art" [1944], in *The Collected Essays and Criticism*, Vol. 1: *Perceptions and Judgments 1939-1944*, Chicago/London, Chicago UP, 1986, p. 202-204; Kurt Badt, *Die Kunst Cézannes*, Münich, Prestel, 1956.

5. Rilke to Clara Westhoff, October 10, 1907, in Rainer Maria Rilke, *Briefe über Cézanne*, op. cit., p. 22-26 cit. p. 26: "Wenn ich mich erinnere, wie befremdet und unsicher man die ersten Sachen sah, als sie mit dem neugehörten Namen zusammen vor einem waren. Und dann lange nichts, und plötzlich hat man die richtigen Augen [...]".

6. In any analysis of the unfinished, incomplete aspect of many of the artist's works, the temporal factor in their interpretation inevitably becomes a part of the underlying process. See the exhibition catalogue: *Vollendet Unvollendet. Cézanne*, op. cit., notably Gottfried Böhm, "Prekäre Balance. Cézanne und das Unvollendete", p. 29-40. See also my article: "Cézanne und die Zeit des Stilllebens. Die Entfaltung des Oeuvres als Allegorie der Gattungsgeschichte", in: Ulla Haselstein with Friedrich Teja Bach, Bettine Menke and Daniel Selden (ed.), *Allegorie. DFG-Symposium 2014*, Berlin, De Gruyter, 2016, p. 303-332 and 748-756.

7. Hermann von Helmholtz, *Beschreibung eines Augenspiegels zur Untersuchung der Netzhaut im lebenden Auge*, Berlin, A. Förstner, 1851; id., *Handbuch der physiologischen Optik*, Leipzig, Voss, 1867 (online: <http://echo.mpiwg-berlin.mpg.de/ECHOdocuView?mode=imagepath&url=/permanent/library/VTFZK5ZT/pageimg> [consulted on 25/09/2016]; French translation by Émile Javal and Théodore Klein, *Optique physiologique*, Paris, Victor Masson, 1867, p. 226-257 (online: <http://gallica.bnf.fr/ark:/12148/bpt6k63342406/f18.item.r=%22Helmholtz,%20Helmholtz%20von%201821-1894%22.zoom> [consulted on 25/09/2016]). David Cahan (ed.) *Hermann von Helmholtz and the Foundations of Nineteenth-Century Science*, Los Angeles/London, Berkeley/University of California Press, 1993, especially, Timothy Lenoir, "The Eye as Mathematician: Clinical Practice, Instrumentation, and Helmholtz's Construction of an Empiricist Theory of Vision", p. 109-153; R. Steven Turner, "Consensus and Controversy: Helmholtz on the Visual Perception of Space", p. 154-204; and a bibliography of research on Helmholtz, p. 607-636. See also: Timothy Lenoir, "Das Auge des Physiologen. Zur Entstehungsgeschichte von Helmholtz' Theorie des Sehens", in: Philipp Sarasin and Jakob Tanner (ed.), *Physiologie und industrielle Gesellschaft*, Frankfurt am Main, Suhrkamp, 1998, p. 99-129. On the images produced by one of Helmholtz's assistants, Richard Liebreich, using an ophthalmoscope in view of developing an atlas of retinal illnesses, and on the reception they received in Europe, see the large amount of material conserved in the archives of the oculist, Albrecht von Graefe, *Deutsche Ophthalmologische Gesellschaft, Medizinhistorisches Museum der Charité*; retrieved by Margarete Vöhringer, "Der Augenspiegel. Sehen und gesehen werden in der Augenheilkunde des 19. Jahrhunderts", in: Beate Ochsner and Robert Stock (ed.), *Mediale Praktiken des Sehens und Hörens*, Bielefeld, transcript, p. 45-58. For a biographical introduction, see: George Guéroult, "Une vie de savant – Hermann von Helmholtz", *Revue des deux Mondes*, t. 136, 1896, p. 77-105.

8. Hermann von Helmholtz, *Optique physiologique*, op. cit., p. 26-32 and 86-88; Helmholtz talks of the retina's appearance throughout the book. The illustration of the back of the eye is taken from the German edition of the *Handbuch der physiologischen Optik*, Vol. 2: *Atlas*, Hamburg/Leipzig, Voss, 1896 (lithograph without page numbers).



▲1
Paul Cézanne,
Still Life with Apples on a Tray,
1902-1906, pencil and watercolour
on white paper, 31.5 cm × 47.9 cm,
Museum Boijmans van Beuningen,
Rotterdam.

operations involved in visual *aisthesis* and the epistemological understanding via which sensations are transformed into perceptions. But during his research – and almost unbeknownst to him – he was obliged to explain the process and action of vision by means of speculations of a psychological or even philosophical nature.[9] He had understood that in limiting his analysis to what is produced in the retina, in the eyeball, in binocular vision and in the movements of the eye, he would only be able to explain the secondary aspects of vision. He had to take into

9. On January 3, 1865, in a letter sent to Du Bois-Reymond, Helmholtz expressed regret over indulging in "psychological" reflections in interpreting perception, which he did in the third part of his *Handbuch*. See: *Dokumente einer Freundschaft. Briefwechsel zwischen Hermann von Helmholtz und Emil du Bois-Reymond*, ed. Krista Kirsten, Herbert Hörz and Siegfried Wollgast, Berlin, Akademie-Verlag, 1986, p. 213-214. Later, in explaining – and defending – his "empiricist" theories on visual perception, Helmholtz reflected repeatedly on questions linked to the methodological character of his research, considered either in terms of discoveries, or as theories or even speculations. See: Hermann von Helmholtz, *Optique physiologique*, op. cit. p. 43-50, 561-593 and 999-1028. See also: id., "Über das Sehen des Menschen" [1865], as well as "Die neueren Fortschritte in der Theorie des Sehens" [1868], in: *Vorträge und Reden* [1865], Braunschweig, Vieweg, 1896, Vol. 1, p. 85-117 and 265-365 (the second essay is a résumé of the *Optique physiologique* by the author, who, however, indicates, in a particularly clear manner, the epistemological and methodological status of his discoveries and theories) (<http://echo.mpiwg-berlin.mpg.de/ECHOdocuView?url=/permanent/library/FX7CZM6M/index.meta&pn=9> [consulted on 25/09/2016]; id., "Die Tatsachen in der Wahrnehmung" [1878], in: *Schriften zur Erkenntnistheorie*, ed. Paul Hertz and Moritz Schlick [Berlin, 1921], facsimile, Saarbrücken, VDM, 2006, p. 109-175.

▲ 2
Paul Cézanne,
Still Life with Fruit and Crockery,
circa 1869-1871, oil on canvas,
64 cm × 80 cm, Staatliche Museen
zu Berlin, Nationalgalerie.

account the fact that vision is not entirely dependent on the eyes, but also involves the cognitive apparatus.[10] This iconic representation of the retina added to the final edition of the *Handbook* shows vessels and areas, including, on the right, the *macula* (also referred to as the *fovea centralis*, the most sensitive region of the eye, which controls sharp perception at the centre of the visual field); and, in the middle, the papilla, the blind spot where visual nerves exit the retina in order to transmit their stimuli to the brain (Fig. 7).[11] Nevertheless, in addition to what we see, the back of the eyeball bears witnesses here to what it hides: cognitive procedures, the only ones capable of reading and interpreting signs coming from the sense organs and transmitted by the optic nerves.

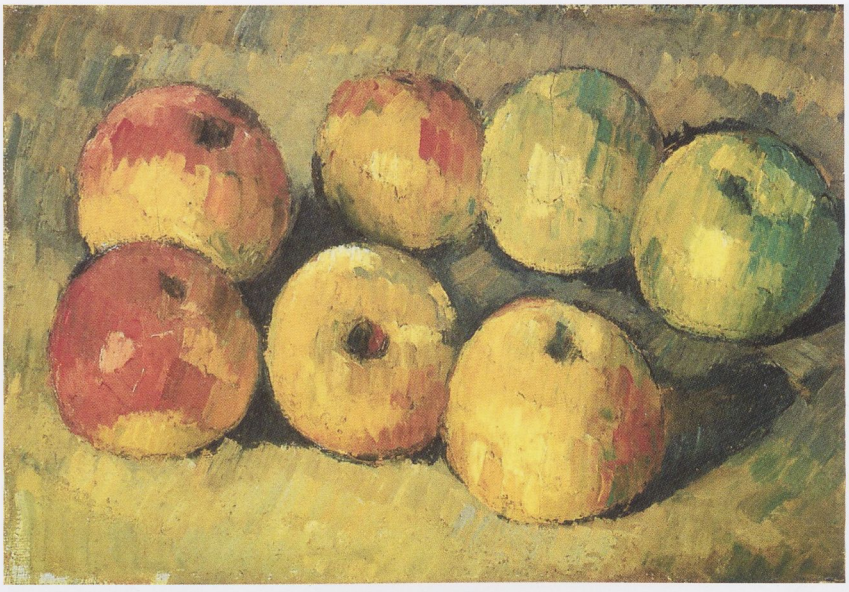
10. Hermann von Helmholtz, *Optique physiologique*, op. cit., p. 999-1029. On the way in which Helmholtz anticipated cybernetic theories, and even information theory and the theory of perception, see: Michael Ruoff, *Hermann von Helmholtz*, Paderborn, Fink, 2008.
11. Hermann von Helmholtz, *Optique physiologique*, op. cit., p. 26-32, p. 86-88.

▲ 3
Paul Cézanne,
Still Life with a Pot of Olives, a Sugar Bowl and Apples,
oil on canvas, 65.5 cm × 81.5 cm,
Kunsthaus Zürich.

AN EXPERIMENTAL POETICS OF VISION: STUDIES OF APPLES

Still Life with Apples on a Tray, the light and subtle watercolour that Cézanne painted in the early 20th century, will help us understand what the artist meant by "realisation" (Fig. 1).[12] The apples are presented in two rows on a curved tray in the shape of a painter's palette. The tray is

12. Lionello Venturi, *Cézanne. Son art – son œuvre* [1936], San Francisco, Alan Wofsy Fine Arts, 1989, Vol. 1, No. 855, p. 244; John Rewald, *Paul Cézanne. The Watercolours. A Catalogue Raisonné*, London, Thames & Hudson, 1983, No. 228, p. 139. On the place of this watercolour in Cézanne's work, see: Friederike Kitschen, *Cézanne. Stillleben*, Ostfildern-Ruit, Hatje, 1995, p. 104-167. Recent analyses of Cézanne's watercolours of the period are to be found in: Matthew Simms, *Cézanne's Watercolours. Between Drawing and Painting*, New Haven/London, Yale University Press, 2008, p. 127-167 (Chapter 4, "Sensation of Light and Air: Watercolour and the 'Envelope'"); and: Christopher Lloyd, *Paul Cézanne. Drawings and Watercolours*, London, Thames & Hudson, 2015, p. 261-309 (Chapter 6, "The Ultimate Construct in Still Life").



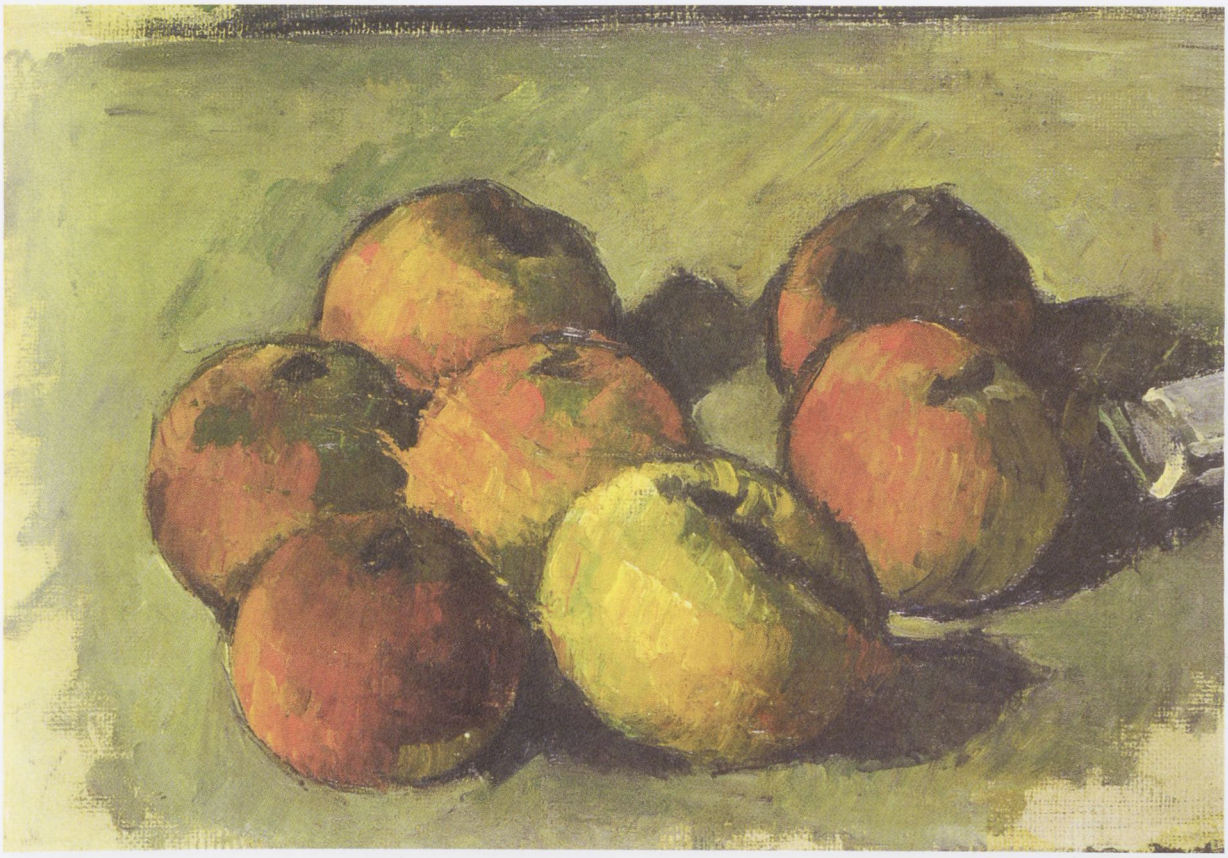
◀4
Paul Cézanne,
Still Life with Seven Apples,
circa 1877-1878, oil on canvas,
19 cm × 27 cm, Fitzwilliam Museum
(The Provost and Fellows of King's
College, Keynes Collection),
Cambridge.

placed on a table, the bottom edge of which reflects the edge of the sheet of paper, while the upper edge coincides with that of the tray.

The painter drew these objects life-size with a pencil, apparently held with his arm outstretched. The outlines alternate between multi-coloured shadows: black-grey at the edge of the tray, blue around the edge of the apples. The shadows combine with the pencil strokes – without melding into them – to complete the outlines. A few dabs of yellow and red and an additional vaguely greenish stroke interact with the rhythms of the outlines without, however, completely inscribing themselves in the design of the objects. Our understanding of the objects is the result of an interpretation (in Cézanne's words, of a "reading") or, more accurately, of multiple interpretations of pictorial signs that correspond to different pictorial semantics.

We have attempted to comprehend how much time is involved in the "reading" of a painting using the example of this watercolour, which can, when compared to Cézanne's oil paintings, be described as minimalist (Figs. 2 and 5). But this micro-temporality should be studied in its relationship with the time configured by the painter's oeuvre, in this case by his career as a painter of still lifes. In effect, the young Cézanne's output enables us to interpret his late works.[13] These successive "realisations" can be read as long series of responses to various aesthetic problems. Often, the painter used motifs already examined in previous paintings, thereby demonstrating that the later work was no

13. See my article, "Cézanne und die Zeit des Stilllebens", op. cit., p. 303-332 and 748-756.



▲ 5
Paul Cézanne, *Still Life: Seven Apples and a Tube of Paint*, circa 1877-1878, oil on canvas, 17.2 cm × 24 cm, Musée Cantonal des Beaux-Arts, Lausanne (bequest of Henri-Auguste Widmer, 1936).

more than a variation of past realisations.[14] It was in strictly observing the conventions of pictorial genres, here the still life – and this at a time when Romanticism and Naturalism had combined pictorial genres or dissolved the hierarchy in which they were contained – that Cézanne produced these variations.[15] The familiarity of spectators with paintings in the same genre produced by the artist in earlier times has, therefore, an important role to play in their appreciation of any given work.

In the early 17th century, the Dutch called still lifes *ontbijt* or *banketje*, a kind of meal table displayed in front of the diner (Fig. 2).[16] But in *Still*

14. Friederike Kitschen, op. cit., p. 99-103; Benedict Leca (ed.), *The World Is an Apple. The Still Lifes of Paul Cézanne*, exhibition catalogue, Barnes Foundation, Meryon (PA), June-September 2014, and The Art Gallery of Hamilton, November 2014-February 2015, Hamilton, The Art Gallery of Hamilton, 2014, especially the essays by: Benedict Leca, "'The Painter of Apples': Cézanne, Still Life, and Self-Fashioning", p. 27-90, and: Nina M. Athanassoglou-Kallmyer, "Cézanne in the Studio", p. 197-234.

15. On the history of the still life in painting, see: Eberhard König (ed.) *Stilleben*, Berlin, Reimer, 1996; Sybille Ebert-Schifferer, *Die Geschichte des Stillebens*, Münich, Hirmer, 1998.

16. On the history of terminology linked to still lifes – terms such as *Stilleven*, *Vanitas*, *Blompot*, *Bancket*, *Ontbijt*, *Frytagie*, *Fruystuck*, etc., see: Alan Chong, "Contained under the name of still life: the associations of still life painting", in: Alan Chong and Wouter T. Kloek (ed.), *Still-Life Paintings from the Netherlands 1550-1720*, exhibition catalogue, Amsterdam, Rijksmuseum and Cleveland Museum of Art, Zwolle, Waanders, 1999, p. 11-37.

Life with Fruit and Crockery, the objects do not form an *ontbijt* or *banketje*. A coffee cup, a jug of milk, a pot of olives, and a bottle of wine, a few apples and some raw onions – these ingredients do not make for a meal. The pot of olives appeared repeatedly in Cézanne's work in the following decades (Fig. 3).[17] Generally speaking, the artist often painted the same objects.[18]

What links them? They are all personal objects. And yet we would be wrong to think of them as silent witnesses to a form of narcissism, since Cézanne did not use these objects in his day-to-day life. For the painter, the olive pot was a device for use in the workshop. While all these containers have a fetishistic quality to them, the impression of naïve narcissism they give off is the result of a purely aesthetic game.[19] When Cézanne displayed the opaque green ceramic pot for the first time in the canvas at the Nationalgalerie in Berlin, he was thirty years old (Fig. 2).[20] It was not, therefore, a juvenile work, as has been too often claimed. Prone to depression, the painter was simply making his way, rather belatedly, in the profession.[21] Feelings of aggression and dread inspired the provocative canvases he painted in the 1860s.[22] Nevertheless, the fog lifted to reveal a light that was still a little too blinding to seem gay and joyful. The effect of a bottle looming over the other objects in the painting is doubled by its shadow. Like a ghost, the shadow is placed directly above the rounded outlines of a small jug.

Under the bottle, with its poignant shadow, Cézanne places apples among onions, with their changing colours contrasting with the whiteness of the jug, the cup and the folds of the tablecloth, producing a purely aesthetic rhythm. As in the Rotterdam watercolour, every individual element fits

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17. Lionello Venturi, op. cit. Vol. 1, No. 71, p. 81; John Rewald with Walter Feilchenfeldt and Jayne Warman, *The Paintings of Paul Cézanne. A Catalogue Raisonné*, New York, Abrams, 1996, Vol. 1, No. 138, p. 117.

18. John Rewald, "Sur les traces de Cézanne à Aix", in: Denis Coutagne *et al.*, *Les Sites cézanniens du pays d'Aix. Hommage à John Rewald*, Paris, RMN, 1996, p. 31-58; on objects that appear in the still lifes, p. 52-53.

19. In this sense, "fetishism" is a contemporary concept in Cézanne's era. See: Alfred Binet, "Le fétichisme dans l'amour", *Revue philosophique*, Vol. XXIV, 1887, p. 142-167 and 252-274; Hartmut Böhme, "Fetischismus und Sexualität. Auf dem Weg zu einem metapsychologischen Konzept. Binet, Krafft-Ebing, Freud", in: Johannes Cremerius, Gottfried Fischer and Ortrud Gutjahr (eds.), *Kulturtheorie*, Würzburg, Königshausen & Neumann, 2005; id., *Fetischismus und Kultur. Eine andere Theorie der Moderne*, Reinbek, Rowohlt, 2006.

20. Lionello Venturi, op. cit., Vol. 1, No. 71, p. 81; John Rewald with Walter Feilchenfeldt and Jayne Warman, op. cit., Vol. 1, No. 138, p. 117. See also: Claude Keisch, note on Cézanne's *Stilleben. Früchte und Geschirr, um 1869-1871*, in: Udo Kittelmann, Philipp Demandt, Peter-Klaus Schuster, Angelica Wesenberg et al., *Nationalgalerie Berlin. Das XIX. Jahrhundert. Katalog der ausgestellten Werke*, Berlin/Leipzig, Staatliche Museen zu Berlin – Preußischer Kulturbesitz/Seeman, 2015, p. 86-88. Keisch recalls that, for a long time, the painting was attached, without a frame, on the wall of the painter's workshop.

21. The question of Cézanne's juvenile work is a controversial one. By underlining the expressive, even neurotic aspect of those paintings full of a cynical eroticism, the painter's development has been interpreted as corresponding to a process of sublimation in the psychoanalytical sense. See: Meyer Schapiro, "The Apples of Cézanne. An Essay on the Meaning of Still-Life" [1968], in: *Modern Art. 19th and 20th Centuries. Selected Papers*, New York, Braziller, 2011 [1979]; id., *Cézanne* [New York, Abrams, 1952], Cologne, DuMont, 1960 [1956]; André Dombrowski, *Cézanne, Murder, and Modern Life*, Berkeley/Los Angeles/London, University of California Press, 2013. In regard to the friendship between Cézanne and Zola, documented by the exchange of letters between the painter and the writer, see: John Rewald, *Cézanne and Zola*, Paris, Sedrowski, 1936, p. 7-82. Jean-Claude Lebenszteijn published other letters by Cézanne which add nuance to the sublimation approach: Paul Cézanne, *Cinquante-trois lettres*, Jean-Claude Lebenszteijn (ed.), Paris, L'Échoppe, 2011; Jean-Claude Lebenszteijn, *Études cézanniennes*, Paris, Flammarion, 2006 (collection of texts published since 1988). Mary Tompkins Lewis, *Cézanne's Early Imagery*, Berkeley/Los Angeles/London, University of Chicago Press, 1989. In my view, the so-called juvenile work should be seen against the background of the history of contemporary art. For an interpretation that challenges the validity of an interpretation that is sceptical towards the mechanism of sublimation, and which highlights the parodic aspect of the juvenile works, see my article, "Cézannes Erkundungen seines Gesichts. Von der Selbstparodie des Mörders 'Laurent' zum Malen aus der Mitte der Selbstbetrachtung", in: Barbara Kuhn (ed.), *Selbst-Bild und Selbst-Bilder. Autoporträt und Zeit in Literatur, Kunst und Philosophie*, Münich, Fink, 2016, p. 213-241. The murderer Laurent, a figure inspired by his friendship with Cézanne, appears in Zola's *Thérèse Raquin*.

22. *Cézanne. Les années de jeunesse (1859-1872)*, exhibition catalogue, Musée d'Orsay, edited by Françoise Cachin, September 1988-January 1989, Paris, RMN, 1988; *Cézanne et Paris*, exhibition catalogue, Musée du Luxembourg, edited by Denis Coutagne, October 2011-February 2012, Paris, RMN/Grand Palais, 2011.

▲ 6
Paul Cézanne,
Apples and Oranges,
circa 1895-1900, oil on canvas,
74 cm × 93 cm,
Musée d'Orsay, Paris (bequest
of Isaac de Camondo, 1911).

into an ensemble. The objects respond to one another, their differences complete them, developing a shared, often syncopated rhythm: onion/apple, apple/apple/apple, onion/onion. Beyond these rhythms, the aesthetic of the Berlin painting seems opposed to that of the Rotterdam watercolour. The shadows are not sufficient to confer plasticity to these life-size pieces of fruit. Cézanne models them using bold, chunky colours, as if they had been made by a potter. The brushstrokes, following the rounded forms, create strong associations with the sense of touch, and the shadows are not the result of a gradual, progressive darkening of the fruits, but seem as if they are placed behind the coloured pigments, thereby forming thick black outlines.

Later, Cézanne took approaches other than those consisting of isolated outlines, reminiscent of Medieval stained-glass windows, when working with less dense, more conceptual visual idioms. Towards the end of the 1880s, he completed several paintings of a small group of apples on a table; a systematic series of studies in which he exploited the effects of various procedures before integrating them into his pictorial language

(Figs. 4 and 5).[23] It was during that period that Cézanne added small diagonal brushstrokes – alternating coloured accents of yellow, red, and, more rarely, light green (Fig. 4) – to the rhythm already established by the fruits. An example of this is seen in a small study purchased by Degas in 1896 and, later, by John Maynard Keynes in 1918.[24] These parallel brushstrokes are read line by line. Analogously, the apples are arranged like notes in a musical score. They are isolated from one another as objects by exaggerated shading. Cézanne did not hold back from commenting on the materiality of his medium, in this case, oil painting. In the uncompleted *Still Life: Seven Apples and a Tube of Paint*, we see the canvas materially outside of fiction and diegesis, and concurrently, at the very heart of fiction, the end of a paint tube (Fig. 5).[25] Such tubes of paint were, at the time, a new product that had recently conquered the market.[26]

Cézanne managed to enrich, in a quasi-Baroque manner, the coloured rhythms that were so elementary to his small-scale studies of apples (Fig. 6). Shortly before the Rotterdam watercolour, he painted a mountain of folds, arranged on a table, in a vertiginous composition, in his work *Apples and Oranges*.[27] The folds falling like the rocks of the Bibémus Quarries, which he often painted during that period, provide a counterpoint to the horizontal rhythm of the fruits.[28] The coloured modulations contrast with the accentuated white sections, the purple colours with others in orange, the unsettling diagonals with the soothing horizontals. In the same period, Cézanne painted compositions that were much more silent (Fig. 1). Instead of thick shadows, there were outlines vaguely indicated in pencil. The painter never really grasped outline; it seems, on the contrary, that there was always a slight gap between the strokes of his brush or pencil and the objects they surrounded. His earlier paintings contain what look like corrections to the design, referred to as *pentimenti*. Retrospectively, and in regard to the various aspects of Cézanne's work in the still-life genre, the little Rotterdam watercolour appears to be one aesthetic solution among others, a way of representing his apples using a new, systematic pictorial language.

It was in these closely controlled experimental situations that Cézanne turned away from the poetics of the Impressionists based on vision broken down into spots of colour applied in pastose brushstrokes.[29] Experimentation dominated his life, and he devoted himself to realising a certain

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23. Friederike Kitschen, op. cit., p. 68-82 and 99-103.

24. Lionello Venturi, op. cit., Vol. 1, No. 190, p. 108; John Rewald with Walter Feilchenfeldt and Jayne Warman, op. cit., Vol. 1, No. 346, p. 232. See also: Jane Munro, *Fitzwilliam Museum Handbooks. French Impressionists*, Cambridge (UK), Cambridge University Press, 2003, p. 120-121.

25. Lionello Venturi, op. cit., Vol. 1, No. 195, p. 109 (with no information other than "Photo Bernheim Jeune"). When the painting was displayed in the Montrose Gallery in New York in 1816, a critic published an article in *American Art News* on January 8, 1916, in which the following phrase appeared: "how infantile to talk geometry over such realism" (p. 2). See: John Rewald with Walter Feilchenfeldt and Jayne Warman, op. cit., Vol. 1, No. 332, p. 225. See also: Jörg Zutter and Catherine Lepdor (ed.), *La Collection du Dr Henri-Auguste Widmer*, Lausanne/Milan, Musée Cantonal des Beaux-Arts/Skira, 1998, p. 27 and 131-132.

26. Anthea Callen, *Les Peintres impressionnistes et leurs techniques* [1980, original edition in English], Paris, Art & Images, 2006.

27. Lionello Venturi, op. cit., Musée Cantonal des Beaux-Arts, Vol. 1, No. 341, p. 139; John Rewald with Walter Feilchenfeldt and Jayne Warman, op. cit., Vol. 1, No. 418, p. 277-280. See also: Robert Rosenblum, *Paintings in the Musée d'Orsay*, New York, Stewart, Tabori & Chang, 1989, p. 348, 358 and 360-361.

28. Meyer Schapiro has observed that Cézanne often introduced an aesthetic element that barred the spectator from any imaginary access to the objects in his paintings. In this sense, the folds in a still life can take on the same role as the rocks in a painting of the Bibémus Quarries. See: Meyer Schapiro, *Cézanne*, op. cit., p. 14-15.

29. The term "experimentation" is used in the context of "historical epistemology", a concept employed by Hans-Jörg Rheinberger to describe scientific practices. Inspired by a re-reading of Gaston Bachelard, he opposed the historical reconstruction of research which is always conducted in groups working together in laboratories. This view is opposed to an approach that frames the history of science as progress resulting from an accumulation of theories produced by a series of great geniuses and only confirmed by researchers in laboratories. According to Rheinberger, a "system of experimentation" used by research teams is based on a synthesis of previously established expertise, condensed – so to speak – in the instruments of a laboratory, while the practice of experimentation leads to unpredictable results. Furthermore, like other members

idea of vision which is parallel to and possibly influenced by the one developed by Hermann von Helmholtz.[30] However, he completed it with his discoveries about the impact of the medium on vision itself.

PROCESSES AND ACTIVITIES INVOLVED IN THE GENESIS OF THE MENTAL IMAGE

In the *Handbook of Physiological Optics*, a work published by Helmholtz in 1867 and still read by ophthalmologists today, vision coincides with the visual and aesthetic perception of objects.[31] A large part of the handbook is dedicated to the physiological and biophysical operations involved in vision. Three different processes contribute to the genesis of spatial vision. The first, the accommodation of the eye to close and distant objects – a central mechanism in dioptrics (Fig. 9) – is dependent on muscles in the eyeball that enable the lens in the centre of the iris to adapt according to the need to focus on such objects.[32]

The few art historians who have taken an interest in Cézanne and physiological optics have focused on binocular vision (Fig. 10).[33] Helmholtz developed a stereoscope, an instrument that was then used for decades to examine stereoscopic photographs, which were much in vogue since

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of his school, he focused his attention not only on the way in which certain things happen in a given experiment, but also on strategies designed to render those things visible and observable. See: Hans-Jörg Rheinberger, *Toward a History of Epistemic Things: Synthesizing Proteins in the Test Tube*, Stanford, Stanford University Press, 1997 (an exemplary study on the process that led to the discovery of DNA); id., *Historische Epistemologie zur Einführung*, Hamburg, Junius, 2007 (introduction to a new way of writing the history of science). If we apply this model to Cézanne, the tradition of still lifes and Impressionism are "systems of (aesthetic) experimentation" for the painter; while his new approach to constructing space on the surface, but also to activating a process of vision whose temporality can be followed by the spectator, are the result of his way of working with those systems, inspired, so the hypothesis defended here, by the type of scientific experimentation initiated by Helmholtz. On Cézanne's Impressionist background and the strategy used by Symbolist and Neo-Classicist painters such as Émile Bernard to appropriate it, see: Richard Shiff, op. cit., p. 125-140, French translation p. 113-126.

30. We cannot focus here on what brought Helmholtz's new theory of vision to Cézanne's attention. The impact of the new physiological optics on the artistic debate in France has been studied by: Carla Cugini, *"Er sieht einen Fleck, er malt einen Fleck". Physiologische Optik, Impressionismus und Kunstkritik*, Basel, Schwabe, 2006. The translation of Ernst Brücke's book clearly played an important role. See his book that introduces in a systematic manner – and, indeed, in a fairly traditional way in regard to teaching in schools and academies of fine arts – the components of painting, from perspective to lighting and illumination: Ernst Wilhelm von Brücke, *Bruchstücke aus der Theorie der bildenden Künste*, Leipzig, Brockhaus, 1877; French version, with the addition of a text by Helmholtz (p. 169-223): *Principes scientifiques des beaux-arts. Essais fragments de théorie. Suivis de l'optique et la peinture par Helmholtz*, Bibliothèque Scientifique Internationale, Paris, Alcan, 1878; Helmholtz's text, "L'optique et la peinture", is a translation of "Optisches über Malerei", in: *Populäre wissenschaftliche Vorträge* [Braunschweig, 1876], Vol. 2: *Vorträge und Reden*, Braunschweig, Vieweg, 1903 (5th edition), p. 93-135. Like Brücke, Helmholtz was writing for artists with an academic background, but both of them used elements from traditional teaching, generally based on Leonardo da Vinci's *A Treatise on Painting* along with his observations on physiological optics. On the tradition of academic treatises, see: Claire Farago (ed.), *Re-reading Leonardo: The Treatise on Painting across Europe 1550-1900*, Burlington, Ashgate, 2009. On the impact of physiological optics on art criticism in France, see: Carla Cugini, op. cit., p. 133-206. The author speaks of a "semantic crisis" in art criticism in the 1870s and observes a slow penetration of the paradigms of physiological optics over the course of the 1880s (with only a few remarks on Cézanne). See also two publications of a different character, both of which are useful in terms of describing the context of the aesthetic positions attributed to Cézanne: Anja Zimmermann, *Ästhetik der Objektivität. Genese und Funktion eines wissenschaftlichen und künstlerischen Stils im 19. Jahrhundert*, Bielefeld, transcript, 2009; Annika Lamer, *Die Ästhetik des unschuldigen Auges. Merkmale impressionistischer Wahrnehmung in den Kunstkritiken von* Émile *Zola, Joris-Karl Huysmans und Félix Fénélon*, Würzburg, Königshausen & Neumann, 2006.

31. Hermann von Helmholtz, *Optique physiologique*, op. cit.

32. Ibid., p. 804-805.

33. Angela Breidbach, *Anschauungsraum bei Cézanne. Cézanne und Helmholtz*, Münich, Fink, 2002. However, a first rapprochement between Cézanne and Helmholtz, in epistemological terms, can be found in: Marianne L. Teuber, "Formvorstellung und Kubismus oder Pablo Picasso und William James", in: Siegfried Gohr (ed.) *Kubismus. Künstler, Themen, Werke (1907-1920)*, exhibition catalogue, Kunsthalle Köln, March-July 1982, Cologne, König, 1982, p. 9-57, especially p. 21-24.

the 1870s.[34] He published a substantial number of plates designed to demonstrate stereoscopic vision. We shall present just one of them here (Fig. 11). Illustration 12 shows the image that one might see if one had looked at the previous image through a stereoscope. The luminous effect which can be observed along the edges of the two black stripes at the area where they intersect shows that in stereoscopic vision, the sensations of the two eyes do not simply complement each other through juxtaposition. On the contrary, the sensation perceived with one eye modifies what the other eye sees. Helmholtz understood that this effect could not be explained solely by the biophysics of the eyes as organs of perception. The observable luminous effect is indeed produced by a cognitive process, but Helmholtz could not yet explain this.[35]

The synchronic movements of the eyes constitute the third physiological process at work in vision. Illustration 13 shows the six muscles that control the motility of the eyeballs.[36] The oblique muscle, which is primarily responsible for the horizontal movement of the eyes, is worthy of attention: apparently, it had an impact on Cézanne's concept of horizontality. Models simulating eye movements have not only been used to demonstrate how the muscles work, but also in fundraising (Fig. 14). It should be recalled that Helmholtz was one of the greatest-ever developers of research centres in physics and physiology.[37] He explained certain optical illusions by means of vision in movement (Fig. 15). For example, he declared that the illusion we see in an illustration disappears if we look at the plate with just one immobile eye, for example to observe afterimages.[38]

We shall address colour vision last because it is in this field that Helmholtz was obliged to quit the field of "organic physics", the name he gave to what is now called "biophysics" (Fig. 16).[39] In 1897, the English ophthalmologist and physicist, Thomas Young, published a theory according to which colour vision is produced by three types of receptors in the form of cones on the retina.[40] At the time, this theory of trichromatic vision was no more than an unfounded hypothesis; it was only after Helmholtz carried out his demonstrations that it was accepted. According to Helmholtz, rods controlled the perception of light and darkness, while the three types of cones, which were much less sensitive, controlled the perception of colour. He believed there were very few rods in the *fovea centralis* (Fig. 7). As we now know, there are only cones there, particularly those that are

34. Hermann von Helmholtz, *Optique physiologique*, op. cit., p. 877-964.

35. The effect is due to the transverse nerves which link the photosensitive cells on the retina so that the activation of a group of cells always causes the cells next to that group to be activated also. For a simple explanation of this effect, notably on the Mach bands and Hermann grids – phenomena comparable to those observed by Helmholtz –, see: Karl R. Gegenfurter, *Gehirn und Wahrnehmung. Eine Einführung*, Frankfurt am Main, Fischer, 2011, p. 47-48. The state of contemporary science is described in: Dale Purves, George J. Augustine, David Fitzpatrick, William Hall, Anthony-Samuel LaMantia and Leonard White, *Neuroscience*, Sunderland (MA), Sinauer Associates, 2012, p. 229-256 (Chapter 11, "Vision: The Eye"), p. 257-276 (Chapter 12: "Central Visual Pathways"), p. 435-450 (Chapter 20: "Eye Movements and Sensory Motor Integration"); Leo M. Chalupa and John S. Werner (ed.), *The Visual Neurosciences*, Cambridge (MA), MIT Press, 2004, 2 vols.

36. Hermann von Helmholtz, *Optique physiologique*, op. cit. p. 761-789.

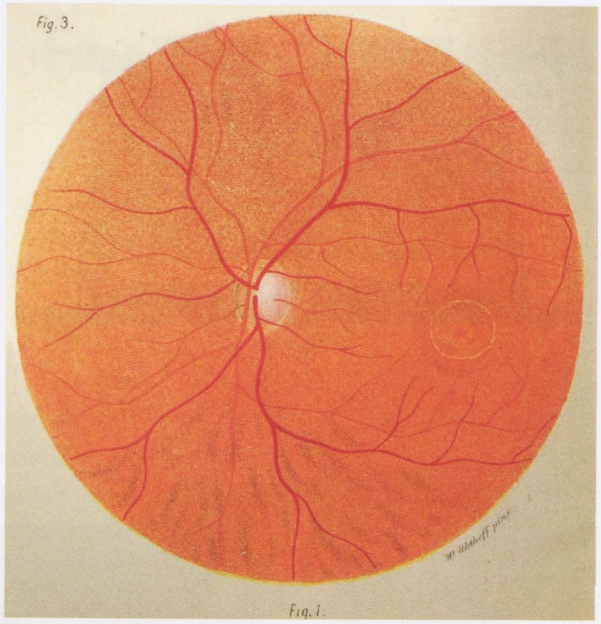
37. On the success of Helmholtz as a founder of research institutes, see: Timothy Lenoir, *Instituting Science. The Cultural Production of Scientific Disciplines*, Stanford (CA), Stanford University Press, 1997, p. 131-178 (Chapter 6, "The Politics of Vision: Optics, Painting and Ideology in Germany, 1845-95"). See also, in regard to the historical background, Michael Hagner, "Scientific Medicine", in David Cahan (ed.), *From Natural Philosophy to the Sciences. Writing the History of Nineteenth-Century Science*, Chicago / London, The University of Chicago Press, 2003, p. 49-87. Recently, an important study substantially added to our knowledge of Helmholtz: M. Norton White, *Aestheties, Industry, and Science. Hermann von Helmholtz and the Berlin Physical Society*, Chicago / London, The University of Chicago Press, 2018.

38. Hermann von Helmholtz, *Optique physiologique*, op. cit., p. 411-506.

39. Ibid., p. 261-558. See: Richard L. Kremer, "Innovation through Synthesis: Helmholtz and Color Research", in: David Cahan (ed.), *Hermann von Helmholtz and the Foundations of Nineteenth-Century Science*, op. cit., p. 205-258.

40. Thomas Young, "On the Theory of Light and Colours", *Philosophical Transactions*, 1802, p. 12-48.

▶ 7
Back of the Eye,
in Helmholtz, *Handbuch der physiologischen Optik* [1867], 1896, *Atlas,* Plate VIII.



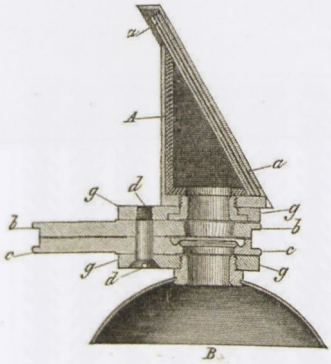


Fig. 113.

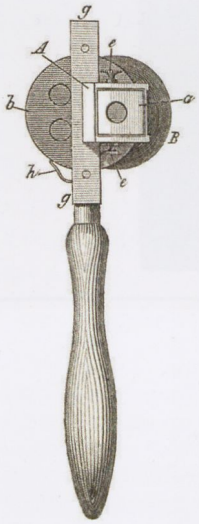


Fig. 114.

◀ 8
Ophthalmoscope,
in Helmholtz, *Handbuch Handbuch der physiologischen Optik,* 1867, Vol. 2: *Atlas,* Plate III, Figs. 1 et 2; and *Handbuch der physiologischen Optik* [1867], 1896, Figs. 113 et 114.

▶ 9
Section of the iris looking into the distance and up close,
in Helmholtz, *Handbuch der physiologischen Optik,* 1867, Vol. 2, Atlas, Plate I, Fig. 3; and *Handbuch der physiologischen Optik* [1867], 1896, Fig. 70.

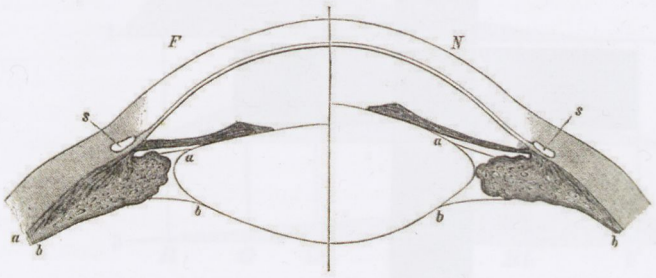


Fig. 70.

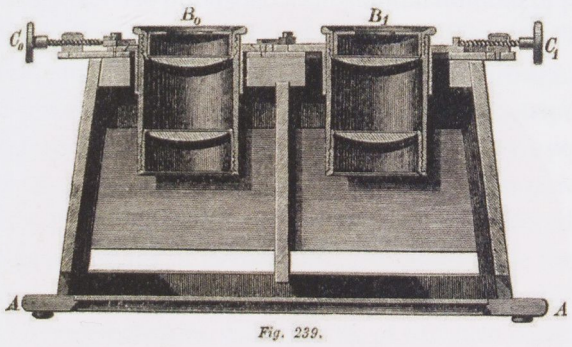
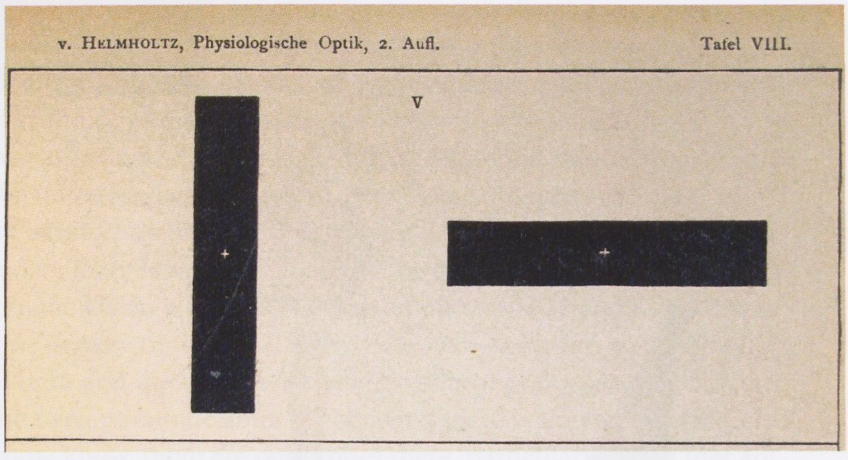


Fig. 239.

◀ 10
Stereoscope by Helmholtz, in Helmholtz, *Optique physiologique,* 1867, p. 859, Fig. 198; and *Handbuch der physiologischen Optik* [1867], 1896, Fig. 239.



▶ 11
Plate to be observed through a stereoscope, in Helmholtz, *Handbuch der physiologischen Optik,* 1867, Vol. 2, Atlas, Plate XI, Figs. 1 and 2; and *Handbuch der physiologischen Optik* [1867], 1896, Vol. 2, Atlas, Plate VIII.

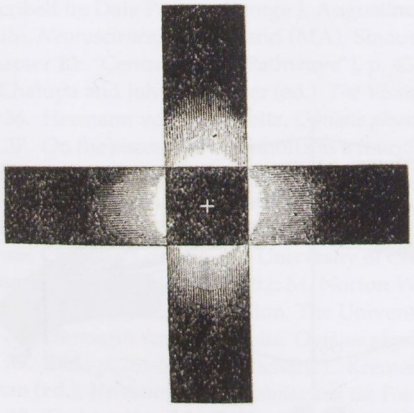


Fig. 252.

◀ 12
Stereoscopic vision image, in Helmholtz, *Optique physiologique,* 1867, p. 966, Fig. 210; and *Handbuch der physiologischen Optik* [1867], 1896, Fig. 252.

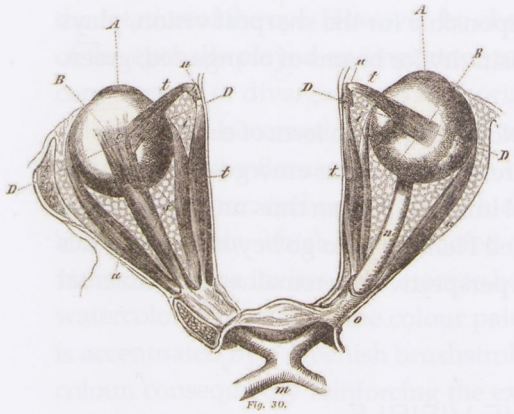


Fig. 30.

◀ 13
Position of the eyes and the areas surrounding them, in Helmholtz, *Optique physiologique*, 1867, p. 40, Fig. 17; and *Handbuch der physiologischen Optik* [1867], 1896, Fig. 30.

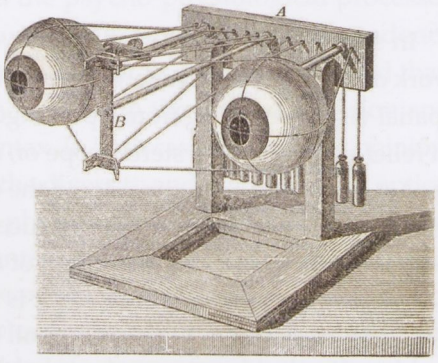


Fig. 211.

▶ 14
Ophthalmotrope by Knapp, in Helmholtz, *Optique physiologique*, 1867, p. 678, Fig. 168; and *Handbuch der physiologischen Optik* [1867], 1896, Fig. 211.

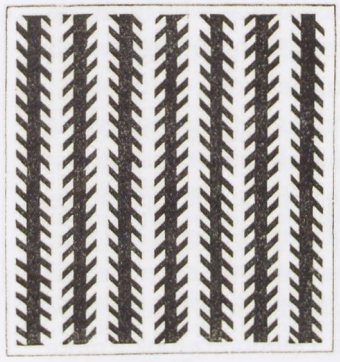


Fig. 222.

◀ 15
Optical illusion presented by the movement of the eyes, in Helmholtz, *Optique physiologique*, 1867, p. 724, Fig. 179; and *Handbuch der physiologischen Optik* [1867], 1896, Fig. 222.

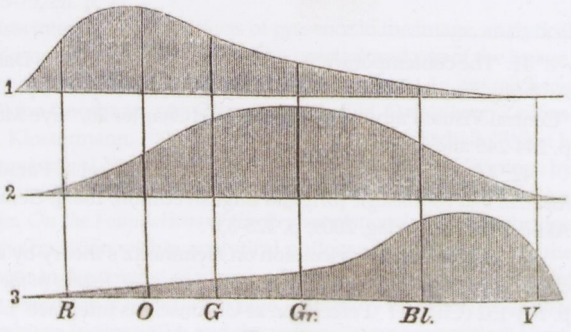


Fig. 140.

▶ 16
Curves illustrating the sensitivity of three types of photoreceptors (cones) on the retina – from red, orange through green blue and purple, in Helmholtz, *Optique physiologique*, 1867, p. 119, Fig. 382; and *Handbuch der physiologischen Optik* [1867], 1896, Fig. 140.

sensitive to the colour red.[41] At night, this zone, which is responsible for the sharpest vision, plays practically no role at all. The cones are at the peak of their sensitivity for beams of orange-red, green, and blue-purple light, respectively.

Photoreceptors on the retina transmit their affected states exclusively in the form of electrochemical signals.[42] It is only thanks to a cerebral process that the impression of colour emerges. Colours are phenomena *par excellence* in that they only exist in the mental image.[43] We can thus understand that it was, more than anything else, the field of colour that obliged Helmholtz to go beyond biophysics and propose a cognitivist theory of colour vision. This shift in perspective has remained fundamental even in contemporary neurophysiology.

CÉZANNE AND THE MANY SYNTAXES OF THE VISIBLE

In studying Cézanne's still lifes, we have been able to observe the experimental nature of his work on the medium, namely painting (Figs. 1 to 6). Recently, comparisons have been made between spatial vision, resulting from a prolonged viewing of works like our little watercolour, and the vision in relief provided by a stereoscope or, nowadays, in watching a 3D film.[44]

Art historians have considered the effect produced by the multipel outlines drawn by Cézanne as analogous to that which is produced by two views (for example, photographic views), whose outlines differ due to the repetition of a motif in two distant positions (for example, with the aid of a stereoscopic camera). However, it is not only binocular vision that is relevant when one looks at Cézanne's Rotterdam watercolour; all the operations studied in the field of physiological optics are involved. Accommodation plays a trick on spatial vision. Since paintings are flat objects, the lens of the eye focuses on their surfaces, and not on the surface of the objects represented in them, which would, of course, be further away. Cézanne takes this phenomenon into account also by inclining his objects (notably the table), ensuring that they are closer to the surface of the painting, which means that the positions of some of the objects are slightly incoherent. Furthermore, every object has its own vanishing point (in this case, the apples). Thanks to these techniques, Cézanne reveals to the spectator that the illusion of space is not produced automatically, but that, on the contrary, it results from a multitude of projection strategies, all of which begin at the surface of the painting.

In the interpretation of these aligned objects, the horizontal movement of the eye plays a key role. Wilhelm Wundt, one of Helmholtz's students, commented that this movement was the only one that could be followed continuously, without subjecting it to the twitching, zig-zagging movements to be seen in the modern technique of eye-tracking (Figs. 13 and 14). Meanwhile, Helmholtz took a more prudent view, contenting himself with elaborating a law of torsion explaining his experiments on

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41. The contemporary state of science is described in: Dale Purves, George J. Augustine, David Fitzpatrick, William Hall, Anthony-Samuel LaMantia and Leonard White, op. cit., p. 229-256 (Chapter 11, "Vision: The Eye"), p. 257-276 (Chapter 12, "Central Visual Pathways"), p. 435-450 (Chapter 20, "Eye Movements and Sensory Motor Investigation"); on the fovea, see p. 244-245 and 260-263.

42. Mark F. Bear, Barry W. Connors and Michael A. Paradiso, *Neurowissenschaften. Ein grundlegendes Lehrbuch für Biologie, Medizin und Psychologie* [original English edition, 2007], German edition edited by Andreas K. Engel, Heidelberg, Spektrum Akademischer Verlag, 2009, p. 325-337.

43. For a modern discussion on Helmholtz's theory by a philosopher equipped with considerable expertise in neuroscience, see: Gary Hatfield, *Perception & Cognition. Essays in the Philosophy of Psychology*, Oxford, Oxford University Press, 2009, p. 124-152 (Chapter "Perception as Unconscious Inference"). Hatfield highlights the contemporary relevance of Helmholtz's cognitivist theory, but insists on the fact that the question of cognitivist aspects of vision is still an open one.

44. Angela Breidbach, op. cit.

the rotation of the eye. However, he observed that the muscle controlling the horizontal movements of the eyeballs played an important role in the almost imperceptible movement of the eyes – the convergence or divergence on the horizontal axis between them – in order to adapt to the object in view.[45] These observations enable us to understand certain enigmatic remarks made by Cézanne and reported by Bernard, notably on the conical nature of objects circumscribed by the gaze in a circular manner; on horizontals, which, according to him, correspond to the sense of extension; and on verticals, which he considered as being linked to depth (Figs. 1 and 2).[46] In regard to colour vision, Cézanne invites spectators to become aware of their own cognitive work. In the Rotterdam watercolour, he reduces the colour palette of the apples to yellow and red (Fig. 1). Only one apple is accentuated by a greenish brushstroke. The eye attempts to see according to its own concepts of colour, consequently reinforcing the exaggeratedly matt colour. Furthermore, the complementary contrast contributes to accentuating this overly vague green.

However, there is limited scope for analogies between the psycho-physiological processes in vision described by Helmholtz and the artistic procedures of Cézanne. The correspondence between a single optical mechanism and a single pictorial procedure is, in effect, less marked than the correspondence between the ensemble of operations that make up the process of vision and Cézanne's strategy of separating the elements of pictorial syntax. In both cases, it is, in my opinion, essential that an analogy be made between, on the one hand, the diversity and multiplicity of optical processes, and, on the other, pictorial procedures.[47] Multiple physiological operations contribute to the act of seeing, and there are multiple syntaxes – and semantics – of the visual in operation when we look at even the most minimalist of Cézanne's works. The painter does everything in his power to ensure that there is no synthetic, unified image of the apples on their tray. As we have seen, the outlines are composed of a few pencil strokes, to which are added shadows; some black, others blue. The colours, while forming their own rhythm, are only vaguely arranged within these outlines. The shading is not a result of continual work on the colours. Instead of obtaining a synthetic vision of colours and shading resulting from a darkening of the hues around the edges of the objects – with

45. Wilhelm Max Wundt, *Beiträge zur Theorie der Sinneswahrnehmung*, Leipzig/Heidelberg, Winter, 1862, p. 105-180; Hermann von Helmholtz, *Optique physiologique*, op. cit. p. 601-612 and 877-964.

46. Cézanne to Bernard, April 15, 1904: "The lines parallel to the horizon provide extension, or, in other words, a section of nature, or, if you prefer, the spectacle that the Pater Omnipotens Aeterna Deus lays out before our eyes. The lines perpendicular to that horizon provide depth," and on July 25, 1904: "For progress to be realised, we only have nature, and the eye educates itself on contact with it. By watching it and working on it, it becomes concentric. What I mean is that, in an orange, an apple, a ball, a head, there is a point of culmination; and this point is always – in spite of the terrible effect: light and shade, colour-creating sensations – the point closest to our eye; the edges of objects flee towards a centre positioned at our horizon". (In *Paul Cézanne. Correspondence*, op. cit., p. 300 and 304-305). Apparently, these remarks were too obscure for Bernard to quote among the aphorisms included in the articles published in 1904 and 1907, alongside the famous remark: "Everything in nature is based on the sphere, the cone and the cylinder". See: Émile Bernard, "Paul Cézanne", 1904, reprinted in: *Conversations avec Cézanne*, op. cit., p. 66-86, aphorisms p. 75-79, cit. p. 77.

47. To a greater degree than philosophers and anthropologists interested in the effects of presence in the image, analytical philosophers – and theorists of the image informed by that philosophy – have focused on the practice and use of the image, the interpretation of paintings and, later, the syntaxes of the visual. See: Nelson Goodman, *Languages of Art. An Approach to a Theory of Symbols* [1968], Indianapolis, Hackert Publishing, 1979 (on Goodman, see: Oliver Scholtz, *Bild, Darstellung, Zeichen. Philosophische Theorien bildlicher Darstellung*, Frankfurt am Main, Klostermann, 2004); William John Thomas Mitchell, "What Is an Image?", *New Literary History*, Vol. 15, No. 3 (*Image/Imago/Imagination*), Spring 1984, p. 503-537; and other publications by Mitchell. See also: Flint Schier, *Deeper into Pictures. An Essay on Pictorial Representation*, Cambridge/New York et al., Cambridge University Press, 1986; Kendall Walton, *Mimesis as Make-Believe. On the Foundations of the Representational Arts*, Cambridge (MA)/London, Harvard University Press, 1990. Meanwhile, the tradition within analytical philosophy of focusing on the visual has been discussed in an original and fundamental manner in the context of visual culture studies and image theory, particularly by Whitney Davis, *A General Theory of Visual Culture*, Princeton/Oxford, Princeton University Press, 2011. See also: Wolfram Pichler and Ralph Ubl, *Bildtheorie zur Einführung*, Hamburg, Junius, 2014; and the volume of essays entitled: *Vision in Motion. Streams of Sensation and Configurations of Time*, Berlin/Zürich, Diaphanes, 2016, edited by the author of this article.

the hues inserting themselves clearly into the picture – we interpret all the elements of the visual syntax one by one. The synthesis remains precarious; the image, as well as the fictional space, fails to achieve an integral homogeneity. The spectator continually "realises" the painting by synthesising all these syntaxes and by understanding – in the act of seeing – that the function of this ensemble of operations is to produce the mental image of the apples. We are not confronted by the apples. Instead, we create an image of them; a cognitive action that we apply as we concretise the image, which, in this sense, constitutes not only a fictional space, but also a temporal journey.

CÉZANNE'S PAINTING AND THE ROLE OF THE MEDIUM

Cézanne experimented with vision conceived and experienced as a cognitive activity. Nevertheless, unlike Helmholtz, the painter did not analyse vision in and of itself, but, instead, through the medium of his art.[48] According to Cézanne, painting was not simply an act of translation, but of "realisation". In the medium of his painting, he configured what he saw in the process of seeing it. We should recall that Cézanne only painted while the subject was present. The artist did not consider his medium as a simple representation of his visual (and cognitive) activity. The work of the medium plays a role in vision itself – not only in communicating it to the spectator, but also in creating it. In Cézanne's work, mediality is therefore not only linked to the translation of vision onto the canvas, it is also inscribed within vision itself. Taken in a radical sense, "realisation" means here that codification into a visual language is part of perception. Just as language does not serve merely to communicate thought, but is central to the process of thinking, the medium does not serve to transmit perception, but to render it possible.[49] We only perceive the apples because we configure them according to a visual medium (whichever that may be). To see is always "to see as", or, in other words, to see something as an object and what we know about that object.[50] The object could be, indiscriminately, a pot of olives, brushstrokes, outlines or spots of colour. The material forming the visual signs is also composed of objects, but it forms syntaxes capable of being read in different ways. Thus, vision is always coded by a medium; by the at least latent possibility of being inscribed in a medium. The medium is a language that is shared with others before becoming personally mastered and enabling "us" to express our emotions, our perceptions and our ways of seeing in

48. On theories of the medium that are not exclusively based on the sender-receiver aspect of communication or on technological developments and their impact on the mechanisms of perception, but that, instead, take into account the role of the medium in the aisthesis, in perception itself, without, however, constituting a preconceived idea of it in the sense of "we only see what is provided to us in media", see: Dieter Mersch, *Medientheorien zur Einführung*, Hamburg, Junius, 2006; id. *Die Medien der Künste. Beiträge zur Theorie des Darstellens*, Münich, Fink, 2003; id. *Epistemologien des* Ästhetischen, Zürich/Berlin, Diaphanes, 2015.

49. A contemporary of Cézanne, Charles Sanders Peirce, discovered the importance of using homologous signs and, therefore, media, not only to communicate perceptions etc., but to conceive of them. See: Gerhard Schönrich, *Zeichenhandeln. Untersuchungen zum Begriff einer semiotischen Vernunft im Ausgang von Ch. S. Peirce*, Frankfurt am Main, Suhrkamp, 1990; Vincent Michael Colapietro and Thomas M. Olshevsky (ed.), *Pierce's Doctrine of Signs. Theory, Applications, and Connections*, Berlin/New York, De Gruyter Mouton, 1996.

50. Ludwig Wittgenstein, *Philosophische Untersuchungen* [1958], Frankfurt am Main, Suhrkamp, 1977, p. 307-367; id. *Philosophische Untersuchungen. Kritisch-genetische Ausgabe*, ed. Joachim Schulte in collaboration with Heikki Nyman, Eike von Savigny and Georg Hendrik von Wright, Frankfurt am Main, Suhrkamp, 2001, p. 1024-1051, and 1052-1086. There is an enormous amount of literature on what Wittgenstein terms "Sehen als"/"seeing as" and "Aspekte-Sehen"/"seeing something under the aspect of" or "vision of aspects". For an introduction, see: Thorsten Jantschek, "Wittgenstein über Sehen und Sehen als", *Wittgenstein Studien*, 3, 2, 1996, <http://sammelpunkt.philo.at:8080/485/1/07-2-96.TXT> [consulted on 27/09/2016]; Emmanuel Alloa, "Seeing as, seeing in, seeing with. Looking through images", in: Richard Heinrich, Elisabeth Nemeth, Wolfram Pichler and David Wagner (ed.), *Image and Imaging in Philosophy, Science and the Arts*, Frankfurt am Main, Ontos, 2011, Vol. 1, p. 179-190.

that medium. This is another factor that justifies the analogy between medium and language. It is in reading the languages of the image that we structure the visual and semantic syntax. It would be an error to consider the image as an utterly personal, private affair. We are born into the language and we acquire our freedom by appropriating it.[51] This observation, central to what has been referred to as the "linguistic turn", is also valid for the language of visual media, coded in images.

The act of "realising" objects in an image (including a mental image) is accomplished once the image is in front of our physical eyes or mind's eye. It seems to reach completion in a sense "at once", at the same time as its realisation. Insofar as it is resulting from the configuration of the image, the visual act is almost forgotten, negated at the end of the process. Only then, the act of imagination and representation is overshadowed, supplanted by the presence of what we see, objectively, in the image.[52]

Although the image annihilates the cognitive process from which it results, there is, in painting, a beginning (*arche*) and an end (*telos*). The beginning is the sheet of white paper: a metaphor for the empty, inactive retina or for a cognitive vision whose origin is the *tabula rasa*, for example seeing only pure qualities, as if in an installation by James Turrell.[53] At the end of this process, the sheet of paper, unlike the apples on their tray (Fig. 1), no longer catches our attention. However, the paper has not yet been present to us – at least not as a medium – before the apples begin to form in our thinking eyes. Before being painted on, the sheet of paper is no more than an object. It could have been folded into a paper airplane, written upon or used to do a mathematical calculation. It could then have been used as a different medium, constituted through other rules, other syntaxes and other semantics. It is only through an operation of visual interpretation that the watercolour is constituted and that the paper becomes a medium, a platform for Cézanne's visual language. It is only *après-coup*, to borrow the term employed by Jacques Derrida, that we can think of the white sheet of paper as a latent image carrier for the syntax of the medium.[54] Abstracting from everything that appears on the sheet, we could nevertheless experience the illusion that, although blank, it was already a medium. But abstraction is a process directed towards the future, whereas *après-coup* implies the past. These few apples represented on a sheet, this quasi-nothing of painting, reaches the beholder from its origin (*arche*) on the empty medium. The same observation applies for the *telos*, the image once it is realised on the paper and in our imagination. The apples, thus, are the result of interminable interpretations and their mental image remains precarious. They are not "given" to us as images, at least not the type of full image we are used to. For a considerable period of time, they are in a state of becoming; objects of an endless semantic practice. Yet, as Rilke said, "For a long time

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51. Saul Kripke, *Wittgenstein on Rules and Private Language*, Cambridge (MA), Harvard University Press, 1982. See the collection of historical articles by Richard M. Rorty, *The Linguistic Turn. Essays in Philosophical Method*, Chicago/London, Chicago University Press, 1982 [1967].

52. However, we should be careful of talking about a media *a priori*, lest it lead us towards an idealism of media, consequently considered as the *raison d'être* of all visual imagination. On the risks described by all sorts of apocalyptical theories on media, according to which we "disappear" in a "spectacle" in which "simulacra" replace reality, see: Dieter Mersch, "Medialität und Undarstellbarkeit. Einleitung in eine negative Medientheorie", in: Sybille Krämer (ed.), *Performativität und Medialität*, Münich, Fink, 2004, p. 75-96. Education through media is implied in all visual practice. Vision, therefore, is never "pure". With this in mind, we can consider the famous comment supposedly made to Cézanne by Ambroise Vollard in 1894, as representing a note of caution on the part of the painter, albeit an admiring one: "Monet is nothing but an eye. [...] But, good God, what an eye!" (from Ambroise Vollard, *Paul Cézanne*, Paris, Crès, 1919, p. 118).

53. George Didi-Huberman, *L'homme qui marchait dans la couleur (J. Turrell)*, Paris, Éditions de Minuit, 2001.

54. Jacques Derrida, *De la Grammatologie*, Paris, Éditions de Minuit, 1967, p. 42-108; id., *La Vérité en peinture*, Paris, Flammarion, 1978, p. 6-14 (on the various ways of understanding the "truth in painting" that is "due", according to Cézanne, as written in his letter to Émile Mâle, dated October 23, 1905), p. 44-94 (second part, "Le parergon", deconstruction of Kant's aesthetics based on his notion of "ornament").

nothing, and suddenly one has the right eyes". It is only at this moment that the object acquires an augmented plasticity, as if it were part of a superior, "indestructible" reality.[55]

In his *Handbook of Physiological Optics*, Helmholtz rejected the idea that we initially see just coloured spots and only later recognise individual objects. For him, vision was always an operation designed to understand the objects around us. Like Cézanne, he was convinced that sight was an endless process of learning. The painter worked all his life to change the codes of pictorial language in order to move beyond received, stereotypical codes. Through this work, he *realised* a vision which was understood as a language. Such was his "realisation": a veritable poetology of both image and vision.

In regard to Helmholtz's work on optics, it is impossible to conceive of vision as a passive reception of the external world that penetrates our consciousness via the windows of our eyes, nor as an input of data which are then stored away as mental images.[56] It is not enough to add the temporal dimension and to grasp the fact that vision is the result of a process.[57] Vision is not, or at least not exclusively, an automatism triggered by visual stimuli. Helmholtz thought of vision as an activity; an activity that seeks always to grasp and confirm its object. Seeing is a cognitive activity; a practice of interpretation acquired through education and cultivated through experience – or through a visit to the Louvre, to provide just one example referring to Cézanne's autodidactic education as a painter. Vision is always conditioned and subjected to media and to the ways in which we learn how to see.[58]

Is seeing a process or an activity? Neurophysiologists have not yet solved the problem. The two aspects seem to be involved to varying degrees. It is not easy to determine the tipping point between what is associated with instinctive processes and what is associated with cultural action. Among art historians, researchers like Raphael Rosenberg analyse the processes involved in vision via applications such as eye-tracking by dialoguing with neurophysiologists. Confronted by the cultural conditioning of vision – for example, European and Japanese people have different ways of appreciating an image – their work culminates in vision as action.[59] In interactions with these colleagues, we learn a great deal, as we do in dialoguing with physicists. Nevertheless, the art historian's field of specialisation is vision where it is considered not only as a process, but also as a cognitive and cultural activity.

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55. On Rilke, see Note 1.

56. On the eye as a window to the soul, pure or otherwise, see: Matthew 6:22-23; on the painting as an open window, see: Leon Battista Alberti, *Das Standbild. Die Malkunst. Grundlagen der Malerei*, ed. Oskar Bätschmann and Christoph Schäublin, in collaboration with Kristine Patz, Darmstadt, Wissenschaftliche Buchgesellschaft, 2000, p. 224-229 (*De pictura*, 19, original Latin with German translation), commentary, p. 324.

57. See, by the author of this article, "Seeing", in: *Vision in Motion*, op. cit., p. 69-108.

58. An exhibition was dedicated to Cézanne's frequent visits to the Louvre, to the studies he carried out in the museum and to the influence of those visits on his work as a whole: Judith Gesko (ed.), *Cézanne and the Past. Tradition and Creativity*, exhibition catalogue, Museum of Fine Arts Budapest, Budapest, 2012.

59. Raphael Rosenberg, "Dem Auge auf der Spur. Blickbewegungen beim Betrachten von Gemälden – historisch und empirisch", *Jahrbuch der Heidelberger Akademie der Wissenschaften für 2010*, 2011, p. 76-89.