

Lighting Design: The Result of a Visual and Non-Visual Architectural Reflection

Lighting design as a visual and non-visual architectural reflection consists, not in throwing light upon objects but in throwing light upon a subject¹. Just like The art of architecture studies not structure in itself, but the effect of structure on the human spirit², it deals with our brain, with our mind and with our body. In “Human-centric lighting: Myth, magic or metaphor?” published in Lighting Research and Technology, Houser et al, confirmed that the primary function of lighting design is the setting up of a reflection process about the visual and non-visual human functions within the architectural project in correspondence with the definition of the Integrative lighting CIE has proposed, underlining that:

- *Under the visual point of view, lighting design is decisive in the attributive process of visual stimuli that brings to the assignment of meaning to objects, shapes, colours and environments.*
- *Under the non-visual point of view (also called Human Centric Lighting), it deals with the body clock which is primarily synchronized by the light-dark cycle, carrying on a chain of consequences on the sleep/wake pattern, on waste elimination, DNA replication and repair, metabolism, etc.*

From both these points of view, the aim of lighting design is to build up and manage the conditions or the human fundamental wellbeing, just like architecture does. Visual function, through every component of the visual perception process (either photobiological, neurobiological or socio-cultural), is a crossroad for the exercise of many important processes that determine our essential functions. Each of these processes mark a step in every move, every observation, contemplation, functional or emotional analysis, even shifty ones, we might apply on the environments we constantly meet or live in. In this context lighting design deals with the light gradients and shadows on surfaces and volumes, organizing a pertinent visual landscape with a semantical and aesthetical significance³. These gradients are distributed between the right proportion of focalization devoted to our foveal vision⁴, and the variable values of visual uniformity which ultimate expression is when Brightness or luminosity will appear as properties of the object itself⁵. Eventually it is necessary to develop an approach of darkness, respectful of the night, should it be from a meditative or a point of view as much as from the point of view of the human sleep/wake function and the positioning of the biological clock.

Keywords: *lighting design, visual perception, architecture, circadian, visual studies*

Introduction

The comprehension of the professional lighting designer’s skills and duty is conditioned by a certain amount of *easy-going and starry-eyed considerations*

¹Jones E.R. (1969) Chap.6, p.119

²Scott G. (1914) Chap.IV, p.120

³Lam W. M. A. et al. (1992) pp. 01-70

⁴Zeki. (1999) Chap..1, p.17

⁵Arnheim R. 1974. Chap.VI p.395

1 carried out from the hasty enunciation of what appears to be, at first sight, the
2 pillars of his/her practice, and is usually enclosed within the terms of “technique”
3 and “light” and eventually in the notion of engineering. As we already wrote
4 precedingly, more often, *lighting design is understood as a step in the*
5 *architectural project taken over by some sort of technicians or engineers*, which
6 main purpose to respond to *illuminance standards*. The consequence is that our
7 practice, suffers a misguided comprehension which consequence is a *lack of*
8 *authority*. That’s one of the main reasons why an approximative understanding has
9 been built and remains a standard about a discipline that, for its *teaching, is still an*
10 *experimental* one. Its consequence is a massive comprehension that remains rooted
11 within a *normative and technical comprehension* of the practice.

12 Another reason for such an extended amount of imprecision is the world
13 “light”. Its fascinating and poetical content, as much as its *metaphysical*
14 *connotation*, carries on a high level of imprecision when we reach the point where
15 we must apply a lighting project within an architectural environment. It is a great
16 help in maintaining a huge distance between the general idea of light in all its
17 various acceptation and the practice which thinking aims to *distribute luminances,*
18 *surface reflectance, colour, spectral distribution, correlated colour, chromatic*
19 *restitution, balancing and hierarchising the origin, the direction, the intensity and*
20 *the dispersion of the light emission* according to human’s perceptual needs, or
21 should we call them behavioural, aesthetical and functional needs. Obviously not
22 forgetting the environmental impact⁶.

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25 **Lighting Design in its Visual and Non-visual Dimensions**

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27 For Houser et al, Human-centric lighting: Myth, magic or metaphor?
28 Lighting Research and Technology, the primary function of lighting design
29 appears to be “a reflection process about the visual and non-visual human
30 functions within the architectural project”⁷. Such a demonstration also appears to
31 be supported by CIE Integrative lighting definition that happens to re-elaborate
32 lighting designer’s duty in similar terms. In synthesis we can say that

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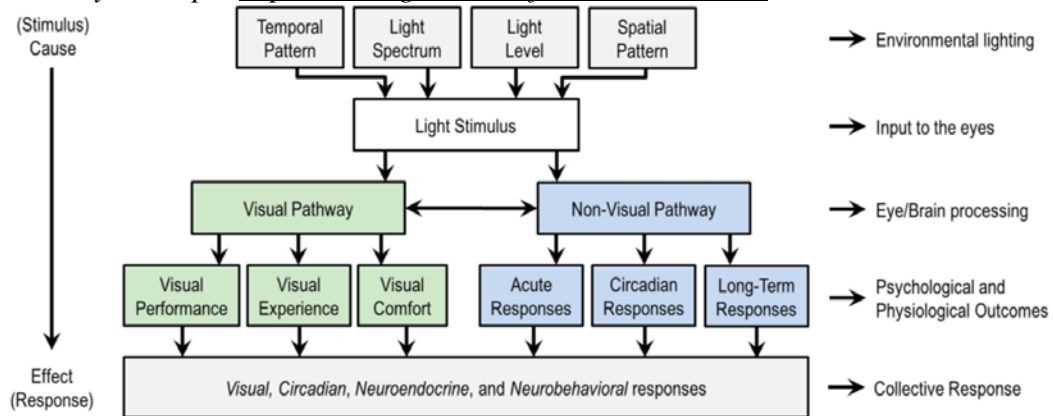
- 34 • Under the visual point of view, lighting design is decisive in the attributive
35 process of visual stimuli that brings to the assignment of meaning to
36 objects, shapes, colours and environments.
- 37 • Under the non-visual point of view (under the title of Human Centric
38 Lighting), it deals with biological repositioning, with the body clock that is
39 primarily synchronized by the light-dark cycle, a phenomenon that carries
40 on a chain of consequences not only on the sleep/wake pattern, but on 80%
41 of the genes ensuring essential functions like waste elimination, DNA
42 replication and repair, metabolism, etc.

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⁶Cf. Caratti-Zarytkiewicz R. & Ezrati J.J. (2022)

⁷Houser K. W. et al. (2020) p.2

1 **Table 1.** *Light stimuli according to visual and non-visual pathway* – Source:
 2 Kevin W. Houser, Tony Esposito. *Human-Centric Lighting: Foundational*
 3 *Considerations and a Five-Step Design Process*, *Frontiers in Neurology*, 27
 4 *January 2021*, p.1 <https://doi.org/10.3389/fneur.2021.630553>



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7 The concern about the lighting conditions within the project is decisive, either
 8 in the attributive process of visual stimuli that brings either to the assignment of
 9 meaning to objects, shapes, colours, and spaces, or within our physiological
 10 regulation. In other words, lighting design thinking appears to be the result of a
 11 visual and non-visual architectural reflection.

12 This brings us to take into consideration the architectural lighting designer's
 13 duty as the building up and managing of the conditions for the fundamental
 14 exercise of human functions. An inventory of these functions starts from sleep and
 15 wake, under the non-visual point of view, and then, from the visual one we might
 16 quote as a consequent its immediate consequences in terms of observation,
 17 recognition, consciousness, movement and displacement, activity, creativity,
 18 working, thinking, creativity, socialization, all important duties within human
 19 every day life which are the bases of the fundamental well-being, among the
 20 architecture within the highest acceptance of the term. That's the reason why we
 21 have already defined *lighting design thinking* as a *visual and non-visual*
 22 *architectural reflection*. This finds a confirmation in the simplest description of the
 23 fundamental situation in which *the reflection that brings lighting in an*
 24 *environment constructed or modified by human develops all along the*
 25 *architectural thinking*.⁸

26 These considerations would have found an ultimate support during the
 27 Renaissance in the occasion of the re-reading by the "artefici del disegno"⁹ of
 28 Vitruvius's *De architectura* that will mark the beginning of modern architecture
 29 they used to relate to "the greater cosmic harmony", "that regulated the universe".
 30 The Vitruvian man, Leonardo's illustration of "Vitruvius's *De architectura*" has
 31 clearly symbolized the idea "that the question of proportion was...nothing less

⁸Caratti-Zarytkiewicz R. & Ezrati J.J. (2022)

⁹Chastel A. (2002) p.255, "Giorgio Vasari dedicated his work [Le vite de' più eccellenti architetti, pittori e scultori italiani NdR] to the *artefici del disegno*, that's to say to the 'practicians of the visual arts'" (My translation of André Chastel's very interesting French original's one: "praticiens des arts visuels")

1 than a reflection the nature of the universe itself, with Man at its center.” In a
 2 comprehension where light, celestial light, according to Marsilio Ficino, innervates
 3 either the material or the immaterial analysis, the shapes, the bodies, the dreams as
 4 much as our inner creative mind¹⁰. A more contemporary synthesis has been
 5 expressed through Le Corbusier’s formula that defined architecture as “The
 6 masterly, correct, and magnificent play of forms in light.”¹¹

7 To be perfectly respectful of every day reality, we will finally consider the
 8 fact that, in a specular way, architectural reflection will also develops all along the
 9 lighting purpose when it deals with natural lighting, and under a lighting thinking
 10 when, Man’ creativity, must interpose and bring artificial light, in every nocturnal,
 11 or interior situation where daylight can’t play a role.

14 **The Further Stakes of Architectural Lighting Design Theoretical Thinking**

16 At the beginning of the school year I am used to introduce my first lesson
 17 quoting a 2014 interview of Charles G. Stone, president of New York City lighting
 18 design practice Fischer Marantz & Stone to Mondo Arc magazine. In this
 19 conversation he delivers a very interesting illustration of the difference between
 20 architectural and theatrical lighting design: “...The fundamental difference in the
 21 two sides of our studio is, that in the theatre you sit in a chair and the scene
 22 changes in front of you or around you. In architecture you move through the
 23 ‘theatre’. Understanding this difference is important for an architectural lighting
 24 designer.”¹². Making such a parallel Charles G. Stone appeals to very important
 25 notions.

28 **The Prediction and Anticipation of Movement and Displacement**

30 Precious notions describing the perceptual function of lighting design and the
 31 way it interacts with the persons that will live within the architecture have been
 32 inventoried many years ago in *Perception and Lighting as Formgiver for*
 33 *Architecture* by William MC Lam (1924-2012) a lighting designer and an architect
 34 published in 1982. He also described the role of lighting, in terms of stimulation.
 35 From this stimulation we elaborate within our mind an anticipation of the path we
 36 to follow within the space we will have to move in, while we are constantly
 37 deciding and predicting where our ambulation will lead us, among a range of
 38 visual messages. Gradients of luminance on surfaces, volumes, shapes, colours or
 39 objects, will determine our orientation, elaborating a prediction of our
 40 displacement according to our functional and “affective” expectations, eventually
 41 screened through our “experience filter”¹³. The combination of those anticipations,

¹⁰Cf. Ficini M. (2017) pp.20,21

¹¹Davies C. (2011) Chap.3, § Harmonic proportion, pp.50, 51, 53

¹²Cf. Mondo Arc 2014 h

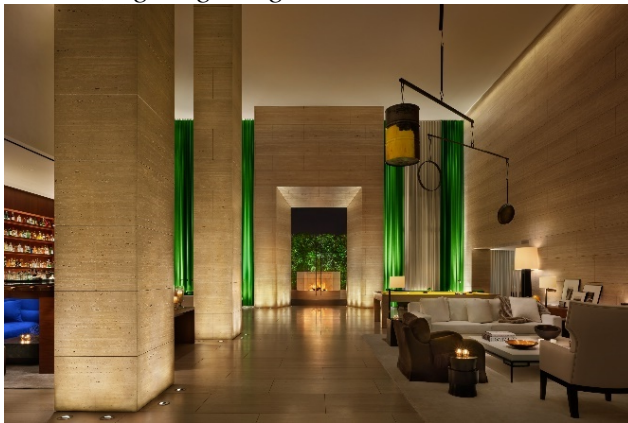
¹³Cf. Lam W. M. A. (1992) pp. 01-70

1 expectations and stimuli conditions our ambulation under the influence of the
2 lighting.

3 If we take the example of the Figure 5 we will notice a very frequent lighting
4 situation all along an ambulatory path in an hotel lobby. Quite in the same way as
5 by dipping a piece of steel within a hardening or a tempering bath we change its
6 mechanical characteristics, this atmosphere will immerge our mind in what I
7 usually call a “visual bath”. This very delicate general lighting situation, made of
8 widespread or diffused light will essentially address to the less precise area of our
9 visual field, the more peripheral one dedicated to movement (the one generated by
10 our moving), colours or signs. In this case it will work as a preparatory situation to
11 another visual activity, a much more demanding one of “visual extraction” which
12 is already anticipated trough the door surrounded by the green fabrics. There,
13 through our foveal vision (in other words our central vision) we will have the
14 opportunity to collect a much greater quantity of contemplative observations, of
15 very precise information, in terms of shapes, distribution of colours, quantity of
16 details and nuances to a “relatively large” to area of the visual brain, “the primary
17 visual cortex”, linked to other visual areas and to the “visual association cortex” a
18 “central post office” for this big quantity of visual signals¹⁴. Foveal vision is the
19 instrument of our choice to isolate and elaborate a representation of a portion of
20 the environment, a selected fraction of the architecture, as a definite idea, a definite
21 image within the space, within time. This operation will be eventually assisted by
22 some components of what we are used to call “accent lighting” that has been
23 elaborated for this very purpose all along the history of lighting design. This is an
24 illustration of how to the effective comprehension of the lighting designer’s
25 practice starts with a perceptual analysis of the architectural environment in terms
26 of functionality and aesthetics.

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28 **Figure 1.** *Hotel The West Hollywood Edition in Los Angeles, architect John*
29 *Pawson, lighting design Isometrix*

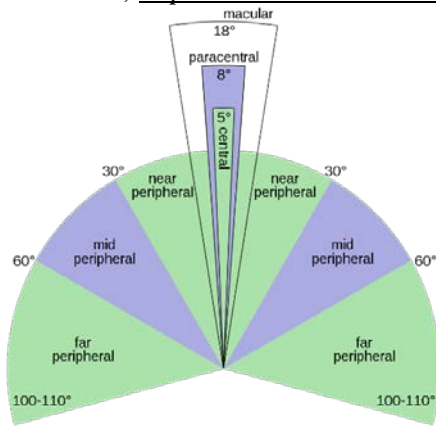


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¹⁴Zeki. (1999) Chap..7, pp. 58-60

1 **Figure 2.** Human field of view (FOV) for both eyes showing far, mid- and near
2 peripheral vision, macular, paracentral, and central (foveal) vision, as well as
3 range of foveola and foveal umbo (foveal reflex). By Zyxxwv99 - Own work, CC
4 BY-SA 4.0, <https://commons.wikimedia.org/w/index.php?curid=37052186>



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8 **Figure 3.** A focused light over the tower allows a visual extraction out of the night
9 during the lighting trials of the projet. Barbarossa Tower of the Castle of Gruissan
10 (France), architect F.Martorello, lighting design R.Caratti-Zarytkiewicz



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14 **The Attribution of a meaning**

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Moving through what Charles G. Stone called the “theatre” (in other words the architecture), and still following the “gradients of luminances”, we will successively discover and evaluate volumes, spaces, shapes, colours and objects, composing the environment, by analysing, and recognizing, the way they reflect light (and this attenuated expression of light we are used to call shadow). This will lead us to a further comprehension of the location we are moving in. It will occur, once again in the terms used by W. M.C. Lam, first of all through an “attributive classification of visual stimuli” expressed in terms of colour temperature, or even colour through spectral power distribution, provenance, direction, concentration, or dispersion of the light. Successively we will decide, from the same lexicon, the

1 “assignment” of a definitive or alternated functional and emotional “meaning”¹⁵.
 2 Finally we will be able to decree from the cumulated reading of the environment,
 3 and from its functional or aesthetical destination, for which reasons and in which
 4 occasions we will dedicate some more time to interact more intimately with more
 5 specific areas of the architecture.

6 Either we are talking about an imaginary moving or a physical one, the
 7 hypothesis of this all ambulatory path leads to the question of the architectural
 8 environment as an “image” which, from the very moment we decide to stride it up,
 9 might be called a “landscap”e. Fabio Quici in “Architettura e cultura visuale”,
 10 quoting the Hungarian artist Laszlò Moholy-Nagy, a painter and photographer
 11 who taught at the Bauhaus in Weimar and in the New Bauhaus in Chicago,
 12 remarks how Moholy-Nagy warned those who, among the architects, only were in
 13 search of a functional solution instead of an architecture able to elaborate
 14 “practicable spatial relationship”. According to Quici, Moholy-Nagy’s aim was to
 15 ad to the ritual of perception, a dimension able to solicit and stimulate the user, or
 16 the beholder, not only in visual terms, but also in terms of acoustic or locomotion”.
 17 This way, the architecture of the time would have been “called, together with
 18 cinema and photography, to contribute to an optical functional revolution”¹⁶, see
 19 Figures 4&5.

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21 **Figure 4.** *An architectural image and path in Mario Botta’s architecture.*
 22 *Residential district in Novazzano, Switzerland (1988-1992), architect: Mario*
 23 *Botta, Photographer: Pino Musi. Coutesy of Mario Botta architetti.*



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¹⁵Ibid. pp.01-70

¹⁶Quici F. (2023) p.19

1 **Figure 5.** *A cinematographic image and path. Bernardo Bertolucci, The Last*
2 *Emperor, cinematography: Vittorio Storaro. Courtesy of Vittorio Storaro*



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5 A little bit further Fabio Quici quotes Richard Williams, an art historian and
6 a Professor of Contemporary Visual Culture in the University of Edinburgh.
7 Williams, according to his own angle of vision dedicated to the "... reception of
8 architecture rather than his production (...)"relates the question of the image to the
9 communication of the architectural intent to a non-specialized population as,
10 according to him, "...visual culture, as an approach, might have a lot more to offer
11 in terms of the comprehension either of the buildings or of the urban
12 phenomenon"¹⁷. Obviously this visual aspect of the architecture is also frequently
13 recalled by practicing architects themselves like in the case of French architects
14 Alain Moatti and Henry Rivière when, introducing their monography "La
15 promesse de l'image" they illustrate the question of the visual question of the
16 ambulation and image when they declare "We are in fact trying to translate the
17 symbolism of a place into images through an orchestration of the path of each
18 person's imagination. Physical lines and routes thus become the path for
19 memory."¹⁸A little bit further asserting that "The transformation of the matter is
20 ...(their) principal tool for passing the imaginary on to the real" they give us the
21 confirmation of an approach which fundamental ground is that architecture's
22 destiny is to become the physical demonstration of the imagination. What a better
23 formula to define, from a slightly different point of view, the fundamental role of
24 lighting.

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27 **Laying Down Light along our Visual Ambulatory Process**

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29 In order to summarize such a visual process we will suggest a further parallel
30 with cinema. At first we might consider the construction of a visual path to be
31 followed in order to reach the settlement of various scenes. This visual path
32 characteristics can be compared with those of movie images. In the cinematographic
33 context, images taken in the occasion of distant shots, or continuity shots, or

¹⁷Ibid, p.26

¹⁸Nisak N. 2009 p.5,6

1 travelling, tracking, even pan shots will lead the observer to the various “scenes”,
 2 or “sets” were he (she), will occasionally stop and decide to spend a moment of his
 3 (her) life. Wim Wenders with his brief reflexion about the “movie shot” through
 4 its German translation with the word “Einstellung” (which, at first sight, is very
 5 close to the notion of setting), might help us to qualify these moments that take
 6 place in the middle of our architectural ambulation. This allows him to add to the
 7 technical definition of the action, a more moral one “a moral category” as he
 8 qualifies this supplement of meaning¹⁹. Having a look to a German dictionary we
 9 will then be able to read this word as the clear indication of an angle of vision, of
 10 an attitude, an opinion, a mindset, even a photographic focusing.²⁰²¹ Crossing
 11 such an analysis with a photographer’s one we might add Paolo Roversi’s
 12 consideration in a letter he wrote to Italian philosopher Emanuele Coccia, where
 13 he explains that photography implies “a framing, a positioning, a choice, an
 14 opinion, and above all a subjective and personal vision”²². A other lever of
 15 comparison between architecture and cinema might lead us to remark how the
 16 reaching of the perfect architectural harmony, which absolute aim is to build up a
 17 microcosm that will be the most accomplished image of the macrocosm²³, finds a
 18 convergence within the definition an important film director like Andrei
 19 Tarkovsky gives us when he declares that image “...tends to infinity”²⁴. And this
 20 architectural image, just as those elaborated by photographers or cinematographers,
 21 is originated within the architect’s imaginary. Then in a second time, it is modified
 22 and completed by the lighting designer’s one, who in an approach very similar to
 23 what painters usually do on their canvass, will lay down luminances on the
 24 surfaces, the volumes or the objects. The result will be the delivery to the user who
 25 will give the final touch through what Ernst Gombrich called the beholder’s share
 26 that will elaborate his own perception of it within the beholder’s creative mind,
 27 building up his(her) own interpretation and his own gaze.²⁵
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¹⁹Wenders W. (2023) chap. Deux entretiens avec Peter W. Jansen, *La vérité des images* p.80

²⁰Giacoma L., Kolb S. Zanichelli (2024)

²¹Mattutat H., Nugue C. (1986)

²²Roversi P., Coccia E. (2024) Lettre Paolo Roversi à Emanuele Coccia, Paris le 19 juin 2021, p.20.

My translation

²³Davies C. (2011) chap. III, § « The problem of perspective ».

²⁴Tarkovsky A. (1989) Chap. De l’image au cinéma, p.122

²⁵Gombrich E. (1989) Part 3, pp154-224

1 **Figure 6.** *Le Havre, France, médiathèque, arch. Niemeyer, lighting design Sarah*
2 *Castagné-Concepto*



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6 **Visual Studies as a Further Stake for the Architectural Lighting Design** 7 **Thinking**

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9 All along the previous paragraphs we have tempted to elaborate elements of
10 analyses of the process of scouting the environment under a perceptual angle. Such
11 a comprehension of the lighting designer's reflection draws on what we'll be
12 calling a specific mindset we've chosen to set up with the help of the visual studies
13 field of investigation (also called visual culture). As we have precedingly exposed
14 in our article "Visual studies, a new opportunity for the theoretical thinking of the
15 architectural lighting design"²⁶, visual studies brings us new opportunities in terms
16 of language, method, and conceptual analysis in order to inventory and categorize
17 either our conceptual elaboration, the narration of the project, or any kind of
18 afterward re-elaboration or analyse, by scholars, teachers or journalists, or even by
19 ourselves as far as a synthesis of our past projects can be needed.

20 In terms of language such an analysis send back to a vocabulary that takes
21 into account some important notions that have been developed in the visual
22 studies, I am talking about the dichotomy between *vision* and *visuality* in a first
23 time, but also between *image* and *picture*, and finally about the notion of *gaze*.

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25 *Vision and Visuality*

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- 27 • *Vision* it is the physical vision and perception, when *visuality* defines the
28 meaning we attribute to the image according to the current socio-cultural
29 value in a specific moment, space, or/and in a specific cultural context.

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²⁶Caratti-Zarytkiewicz R. (2023)

1 *Image and Picture*

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- 3 • *Image* stands for our inner mental representation of intentions, actions,
4 objects, or spaces, the mental representation, the idea, Plato's or Aristotle's
5 "idea" or "ἰδέα" or "eidos" "εἶδος",²⁷.
- 6 • *Picture* the physical, the effective representation : the picture itself as an
7 object or a fact.

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9 *The Gaze*

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- 11 • The evolution of the gaze will be conditioned by the contextual
12 interpretation of the image, of the signal, of the sign, and of what makes
13 the identity of the architectural or lighting concept, within our socio-
14 cultural perception, in a specific moment.

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16 In the case we a we have chosen to describe the visual process, where our
17 *vision* is involved according to the codes of a cinematographic *visuality*. This is an
18 opportunity to examine and contemplate every visual message, comparing it in our
19 mind with a theatrical or movie set. It means that we will turn alternatively our
20 *gaze* either to a cinematographic one, more propitious to feed our imagination
21 eventually stirring memories of the past, and some of our emotional expectations,
22 and alternatively getting back to a more functional one.

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25 **Conclusions**

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27 All these considerations around movement and perception open the lighting
28 design practice as much as the architecture to the taking into consideration of new
29 knowledge which exploration is nowadays in the hand of neuroscientists. I have
30 named the question that might be dispatched between neuroaesthetics and what is
31 also called the brain-body or the embodied experience as an the interaction
32 between our visual, our cognitive brain and our movement and displacement²⁸²⁹³⁰.

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34 How lighting within the architecture appeals to our imaginary comprehension
35 of the environment, depends on our visual function which is straightly associated
36 to potential and effective movement conditioning the beholder's fundamental
37 wellness in the terms once defined by Ettore Sottsass when he regretted that two
38 rarely he had the opportunity to meet the architecture, "the one that tries to
39 enshroud my body and my own fragile soul". As a matter of fact when we lightly
40 brush such the duty art historian Geoffrey Scott had indicated writing tha *The art
of architecture studies not structure in itself, but the effect of structure on the*

²⁷Cf. Panofsky E. (1968

²⁸Coburn A. et al. (2017) pp. 1521–153, <https://pubmed.ncbi.nlm.nih.gov/28493809/> last access
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²⁹Freedberg D. Gallese V. et al (2007), pp.197,203, ^h

³⁰Kandel E. (2014) ^h

1 *human spirit*³¹, we finally understand the far-reaching meaning of the word
2 “subject” in Robert Edmond Jones statement *Lighting a scene consists, not in*
3 *throwing light upon objects but in throwing light upon a subject.*³²
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ONLY FOR REVIEW

³¹Scott G. (1914) Chap.IV, p.120

³²Jones E.R. (1969) Chap.6, p.119