

PEDRO M. AZEVEDO ROCHA

pedro.ma.rocha@gmail.com

UNIVERSIDADE DO MINHO (PORTUGAL)

PERCEPTION RELATIVITY SIMULACRUM – HOW LIGHT BECOMES PERCEPTION

ABSTRACT

Perception development involves a continuous burst of bioelectrical impulses, in where none of us realizes the time a photon takes to reach the viewer's consciousness state of such speck of light. By then our brain's mechanisms have been working such translation process for a long time – “measured in the time frame of a molecule”, as Damasio put it. By the end of it in a sum of infinite actions related with our social environment we become all local and temporally synchronized to the same referential clock. This article will give a description of the physics that might deal with such transformation. It will be assumed the awareness of something can densify gradually to a pseudo-perception of the true object simulacrum. For the lack of an image that would satisfy a figurative graphic of the perceptual degree of awareness, and for clarification of a thought mimetic action-structure, assuming classical physics notions, a visual representation of consciousness' spatial relationship is presented. This article will also present some research findings (Kant, Locke, Merikle, Dijksterhuis, Lagercrantz, Overgaard, Sergent) to support a relativistic theory of mind-body-object relationship and how communication may be perceptually constructed with, first of all, ourselves.

KEYWORDS

Perception; simulacrum; mind; dimensional relation; relativity

PHYSICS OF THINKING – AN INTRODUCTION

The act of thinking comprises a continuous burst of bioelectrical mental fires of which none of us have no sensation or sensitive perception of such neuronal activity constructions. We simply feel the partial reasoning and mental results of consciousness establishment and personal empowerment that offers concrete feelings of meaning production that is attributed

to all elements, individual and collective, who will be chained, in our territorial space, into logical feelings of pseudo-certainties of sense densification.

Materially, neurons (drawn for the first time in 1873 by Camillo Golgi (1843-1926), physician, and later in 1899 by neuroscientist Ramón y Cajal (1852-1934) – cells responsible for conduction of nerve impulses –, are typically made of cell body (*soma*), of message reception extensions (dendrites), of message transmission extensions (axons) and telodendrons. Signals passing through synapses (the space between a dendrite and a telodendron of different neuron cells), are transferred by chemicals (amino acids, neuropeptides), produced by neurons, designated as neurotransmitters. These structures build a thin tissue of cells characteristic to a dense linked brain making it the cerebral cortex. These network communication pathways serve to support the spread of nerve impulses. Self-impulses or individual neurons cannot project the self-sense of what they are carrying or organizing it in patterns, however the meaning that transcends themselves is mentally imbued with a sign that will mean a sense of an early feeling for a sensation, and our sympathetic and parasympathetic nervous system will aggregate through a conscious dimension thought the fruit of all this unconscious neural activity.

PHYSICAL CONCEPTION OF REALITY'S PERCEPTION

Acceptance of an as-is from what is perceived as reality is daily taken for granted, where's no questioning of its constant creation before our eyes, our senses, and of the immense blind faith we put in from what we retain through them. Reality, or what is called as such, is a continuum of successive submissions of choices of an eternal non-determinism at an atomic level that reveals the building illusion of continuity through the persisting mental blurring, between each second, initiated by an impression on the retina of a sunlight beam.

Consider this, a photon that starts from an angled reflection coming from a specific object 100 meters away reaches the cornea of the eye transducer 3.35 nanoseconds later (given that the speed of light is roughly 300,000 Km/s). This photon passes through the ocular lens filter, then the interior of the globe and stimulates a pigment of the photoreceptor membrane on the retina (classically a cone or rod depending on the wavelength that is received), activating the rhodopsin (a light-sensitive protein) and triggering a phototransduction cascade, lasting this imprinting on the photoreceptor for a few hundredths of a second – on average between 40 ms to

60 ms, as detailed by Cruzeiro (1969) and mainly Haber & Standing (1969), being the latter still quoted, as in Kojima & Kawabata (2012) – before returning to its original state. Then follows a synaptic discharge through the optic nerve, a bioelectric impulse is then conducted through an axon to a neuron located in the occipital area of the brain. In a more extensive extrapolation, by neurologist Damasio words, “neurons are activated and discharged in just a few milliseconds, while events of which we are aware in our minds occurs in the tenths, hundreds and thousands of milliseconds” (Damasio, 2000, p. 154). It would suffice the projection to us of about 25 frames per second (or 25 Hz, corresponding to the above time of 40 ms) so that the illusion, or perception, of continuous movement should be “perfect”. Even if the light source that originated this process ended, just before a new image reached, the former would find itself faded on the surface of our retina.

So, multiply this flash-event by the activation of hundred million photoreceptors allocated at the retina and imagine it happening all at the same time, adding the processing time period and the interpretation of partial and momentary information of the light from the possible visibility of the object exposed side (remember that we are only speaking about the sense of sight, and have not even mentioned what is happening in other senses or the additional sensations that accumulate in parallel), we then find that even if the mental conversion of the signal to its meaning would be instantaneous, we observe that exist a quantity of time (a portion of a second) in such process since the initial time of the original event. Damasio does not fail to point that: “By the time consciousness ‘is given’ to us of a certain object, the respective mechanisms of our brain have been working for an eternity, measured in the time frame of a molecule” (Damasio, 2000, p. 154). Concluding afterwards with a smart remark: “We are always late for consciousness, but as we all suffer the same delay, nobody notices” (Damasio, 2000, p. 154) – as we all relied on the same clock referential synchronization. But all this does not matter when a baby wakes up in the middle of the night or when a motorcycle surpasses us fiercely in the highway, or even when we embrace someone on a summer afternoon in the quiet still vision of a setting sun.

We may observe that we all are local and temporally synchronized to the same clock, to the same reference described by a theory of relativism between each individual and a same dependent coordinate system. Regarding we don’t all think at the same time (or maybe not so), or at the same pace, perhaps we undergo a certain instant perception of sensitive information regardless of the space travelled until itself, or the dichotomous mind-body

present in the same space it's dependent on the same reference inherent to its respective awareness of the perceived material element. Whatever the physical work a cell spends, for the purpose of providing a sense or judgment, it will depend on the same physical reference of the object mentally acquired equivalent to the one broadcasted from its original coordinates.

The time that “a stimulus takes to become aware” (Damasio, 2000, p. 154) has been studied in pioneer researcher in the field of human consciousness Benjamin Libet (1916-2007) experiments from where it he deduced the “idea that consciousness comes late” (Damasio, 2000, p. 154), estimating that the delay would be about five hundred milliseconds. Adding this value to the time taken by the photon (3,35 ns in 100 meters), we found that the processed information material part puts a buffer that takes us to a Zeno's Paradox, where we never caught the exact moment of the original state of a given element but only its past picture. We consider time as a resulting indirect perception of perceived change to the relative references to each object, where from the perspective of Kant and his transcendental idealism, the way we perceive depends on the intuition of the grasped objects, whereas time, in this philosophy, is a sensibility, not an object but a change of perception of the relation between objects. The “reality” we see is not the original but a possible construction of an earlier version, the purest simulation that one can receive from what was and from what the space of the physical medium, in which we participate, allows and which consciousness accepts as a mental state of a dependably stable enveloping, making thus a constructive sense. But it's “curious that we can position our mental self between the cellular time, on one hand, and on the other, the time evolution took to bring us to where we are” (Damasio, 2000, p. 154).

For Damasio “the neurobiology of consciousness faces, at least, two problems: that of how to build the “movie-in-the-brain” and how the brain also builds the sense of the existence of an owner and viewer for that movie” (Damasio, 2000, p. 30). There is much still to undergo in understanding biological and physical perception of consciousness over matter, however, unlike previous centuries, the philosophy of mind and phenomenology cannot be dissociated from which the bioengineer imagination created to observe the brain neuronal activity. It is still amazing to sense the freezing of forces in space around us so we can take a picture of its state of appearances before becoming quantum nondeterministic, so for that brief imperceptible moment we put perception in a standby state.

VISUAL RELATIVITY SIMULACRUM OF MIND PERCEPTION

For the act of thinking thought is built dynamically flowing through the perception level's feeling that each of us has from every element that contributes to its development, that is, it depends on the awareness that we have of each element involved into the semantic construction of evolutionary thinking at every moment in a significant sense sensible presence of it. For this it is assumed and understood that awareness of something passes through several states and degrees of perception that can gradually densify into a concrete awareness of the real object simulacrum.

Neuropsychologist Marie Vandekerckhove from Vrije Universiteit Brussel, in a work published in 2009 about consciousness seen as a continuum of states, declared that the distinction between different states of consciousness becomes gradual relating with ego development levels of identity and memory. In a complementary perspective Petra Stoerig, professor of experimental biological psychology from Düsseldorf University focusing on awareness and functional vision system, developed a survey (1993) on this system and perception levels concluding that “neuronal and perceptual function share a parallel hierarchical architecture which manifests itself not only in the anatomy and physiology of the visual system but also in the normal sense” providing “a basis for a “neuromental” monism where both functions are attributed to a causative role,” and based on this is suggested “a concept of separable levels of perception” (Stoerig & Brandt, 1993).

An article by Dario Ringach, a neurobiology and psychology professor, in Nature magazine in 2003 about the states of mind, wrote that “the cortex seems to show intrinsic patterns of activity that evolve over time, alternating between a specific set of states” (Ringach, 2003). In an article (Kenet et al., 2003) of the biologist and neuroscientist team Amos Arieli (b. 1950) is stated that to understand how the brains perceives the world in real time we should investigate the context in which visual information is received and how it interacts with these signals to produce a behavioural response. However it is still necessary a precise definition of states of consciousness, as emphasized by Patricia Tassi, a clinical psychology professor at University of Strasbourg, and Alain Muzet, medical and applied physiology researcher at the CNRS (Centre National de la Recherche Scientifique), where “consciousness remains an elusive concept because of the difficulty of defining what has been considered for many years as a subjective experience” (Tassi & Muzet, 2001).

The process for better understanding consciousness will pass through neurobiology, and according to the opinion of Jean Delacour, a

cognitive neuroscientist, the “neurobiological approach may, in the discovery of the cellular and molecular mechanisms, improve the general concepts of consciousness, overcome their antinomies and establish the reality of consciousness” (1997). These lines of thought are supported by central principle of “connectionism”, a theory created by the American psychologist Edward Thorndike (1874-1949), where learning takes place through an association process of ideas, focusing more broadly interconnection of knowledge between various research fields (such as neuroscience, artificial intelligence, psychology and cognitive science). Philosopher Dan Lloyd (b. 1953), in its connectionistic manifesto on consciousness (1995) outlined an approach based on distinctions developed by their own supporters, where for instance the most important from the diversity of specific characteristics of empirical personal experience “is the overlay information in consciousness – our ability to realize more than it meets the eye, and seize categorical and temporally complex information in a highly unique look made aware” (Lloyd, 1995).

The whole structure of thought, or of its own construction, it’s scientifically and philosophically very diverse if not complex to describe or characterize. For not having found an image that would satisfy a graphical figuration of awareness perceptual degree regarding the sensitivity of thought, and for clarification of a mental mimetic structure, we will make use of classical physics notions to produce a spatial relationship visual representation of the various sensitivity degrees of perception establishment. Let’s consider a mind-body dichotomy, of a single individual, applied to the concept of gravitational field described in theory of relativity: a three-dimensional view of mind as a mantle of space-time matter is deformed in the mass presence imposed by a bodily element defined by its center (consciousness) and radius (reason). The degree of consciousness levels varies in concentric rings relative to the centered position of the bodily brain (from outside to inside, see the following figure we constructed):

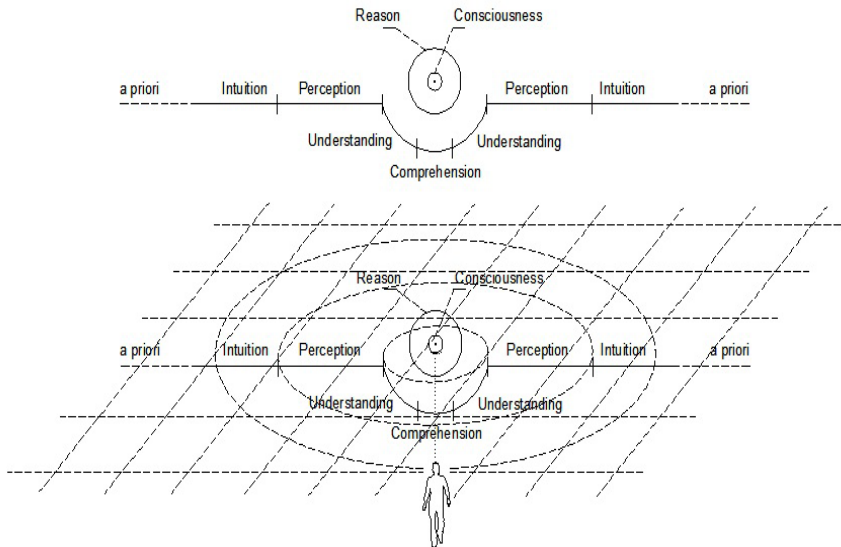


Figure 1: Perception Relativity Simulacrum

As considered in the above figure, we indicate:

- a) “A priori”: apperception, threshold of consciousness, traces of data presence;
- b) “Intuition”: first indications of perceived information, information appearance;
- c) “Perception”: information ideation, form (*morphē*);
- d) “Understanding”: information notion;
- e) “Comprehension”: information densification;
- f) “Reason”: information construction;
- g) “Consciousness”: perception of self, knowledge enveloping.

The reason of ordering this way was due to a significant alignment relationship of each individual definition designation concerning how close each of the real concept would be perceived by subject perception of the idea exposed by distance (shape), or the imaginary of something, into a

mental densification of the perception of that element in the coupling to the thought and the entire treatment of the acquired information. Thus, it was established based on:

- a) The *a priori* as the perception phase farther away, the place of the object thing-in-itself presence to be assumed as a transcendental knowledge (Kant, 2001) or something intangible without a substantial physical definition;
- b) An *intuition* as the “representation that can be given before any thought” (Kant, 2001, p. 131), as a feeling that transports the substance appearance and which dissimulates and escapes the consciousness. According to the husserlian philosopher Susi Ferrarello, in her article “Intuition and perception in the sixth logical investigation of Edmund Husserl”, “intuition seems to be placed on a higher state than the perception, since it seems to translate your *Reinheit* (Purity) in perceived data” (Ferrarello, 2010);
- c) That said, *perception* would follow, seen as the action by which one captures (*percipere*: per (“through”) + *capere* (“capture”), “clings” to the intuited sensation;
- d) Following *understanding*, action to extend into (*intendere*: in (“into inside”) + *tendere* (“stretch”) – “*entendimento*”, in Portuguese), “approaching” the captured for a better observation;
- e) *Comprehension* means the action by which clings closer (*comprehendere*: com (“near”) + *prehendere* (“grab”), “leans” closely to information;
- f) Finally, operate and interpret the information acquired by intervening rationality, that is, *reason*, the reasoning act...
- g) ... reducing it to a knowledge becoming *consciousness*, or conscious.

The sequence of “perception”, “understanding” and “comprehension”, taken together, describe the information coupling movement, or information meaning reading of an observed object, towards mind because at each moment mind – attached relatively and referentially to the body –, “grabs”, “nears” and “leans against” to the information that sensitive senses realized of. Those nouns that once were seen as abilities are now denominations of places in space. This formulation of a representation of the a perception dynamic field constitute figuratively a resemblance to the General Theory of Relativity, in this case a relativistic theory of mind-body relationship, providing a description of the individual corporeal mind as

a geometric dependent point of space-time. Where the curvature of this space-time, or space-perception, will be determined as influenced by the mental builder energy-momentum active presential pair – in a similar reference to the General Theory of Relativity. So, this pair might be composed by “action of reason” (energy) and perception “cognitive distension” (momentum) that characterizes the presence of the indicated builder/constructor corporeal awareness. Following a form of suggestion, the consciousness presence (center of the sphere) would mark the virtual docking place to the real body, and the density of the mental representation of the body (the ball) would be defined by the ratio that would spread its influence in the space allocated to it (the mantle of mind). For representation similar to trigonometric construction of cited physics, the ball would be seen in a three-dimensional simulation on a Hilbert’s Euclidean space by Laplacian graphic expression.

We may consider, in the light of what was characterized and by extrapolation of reasoning expressed by the format of this representation simulacrum, that intelligence would be assigned to the area of the ball surface, one entropic reduced value of reason and of proportional conscience radiation to the spherical radius ratio. The radius of “reason” would be equivalent to the extent of diffusion of the “mass” of a perceptual body, in this case a mental substance. A high value of this ratio would indicate a sufficiently dense mass that would deform its space-perception (mind) and would form the physical equivalent of a *black hole*, thus eliminating the inherent consciousness. A reason-mind ratio limitation would imply an implicit existence of a physical environment inherent to a healthy mental prevalence. The consciousness would depend on the center of the radius value, which would eventually become equivalent to the reason size. Seeing an indifferent dimension of the location, it would be acceptable the corporeal substance movement through the territory of mind regardless of the actual body position. The space beyond the *a priori* degree would be an area of mental unconsciousness – places of transcendence. In fact there would be no unconscious knowledge, only one space of transcendent notion that would fall outside the territory of local consciousness influence.

BRAIN EXPRESSIONS OF A PERCEIVED OUTSIDE WORLD

Kant in his dialectics places at the center the faculty of Reason and elaborates an argument to support it as the “highest unit of thought,” (2001, p. XVI) advocating that knowledge begins by the senses. “Understanding”

right away takes the reins completing the process into reason above which there would be nothing more which makes up the matter of intuition. On the other hand, Locke concludes that for men to come to the knowledge of general truths there's the necessary consideration that they "attain the use of reason" (2010, p. 38), leaving no denying that at that moment be its discovery of such truths. From our point of view we consider plain consciousness the paramount faculty of rationality final stroke, the entropic sensation that expresses the sense of wisdom which results from ribonucleic synthesizing work in which reason's performance executes over acquired knowledge.

At the first instances of reason's training activity in human newborns brain these come imbued with consciousness, through which establishes the structural construction of memories that get to relate concepts and judgments. Hugo Lagercrantz (b. 1945), a recognized Swedish pediatrician (writer of "The brain child", 2012 – fascinating account of the path from the fetus to the conscious human being), in his article on the birth of consciousness points out some of the new criteria of newborns being aware of their own body, themselves and the world. Argues the ability to differentiate between themselves and others, of expressing "emotions and of showing signs of sharing feelings" (Lagercrantz, 2009), of processing "sensory impressions, including pain at a cortical level" (Lagercrantz, 2009) and of remembering "rhythmic sounds and vowels that have been exposed to during fetal life" (Lagercrantz, 2009). He also stresses the discovery in newborns cortex of "spontaneous resting activity" which could "match what William James called 'stream of consciousness'" (Lagercrantz, 2009). Thus, contrary to Locke notion, we are born with a non *tabula rasa*.

Experimental results of a study by neuroscientist Philip Merikle, professor emeritus at the University of Waterloo (Canada), about perception without awareness, indicate that "stimuli are perceived, even when the observers are unaware of stimuli" (Merikle, 2001), thus exposing a graduation of a given level of consciousness. Their finding suggests that "information perceived without awareness both indicates that the stimuli are perceived consciously as influences how the stimuli perceived with awareness are experienced consciously" (Merikle & Smilek, 2001). To substantiate this line of thought we mention the work of the Dutch sociologist Ap Dijksterhuis, creator of the unconscious thought theory, on the theme of "Where creativity resides: the generative power of unconscious thought" (2006) which concluded "that while the conscious mind can be focused and converged, the unconscious mind may be more associative and divergent" (Dijksterhuis

& Meurs, 2006). Thus it's intuited an attraction of consciousness to where the "gravitational force" of the act of thinking converges, where awareness it is drawn to a center and the releasing of that state moves away from assuming primordial structures of the object not observed.

In clear reference to the space-time fabric area drawn from the influence of the rational sphere, in a survey of intuitive perception, Phan Luu (2010), and the group of researchers to who he belonged to, concluded that the "perception process requires not only the reception brain sensitive data, but also the significant data arrangement in relation to the perceptual experience held in memory", taking into account that although results "in conscious perception, the perception process is not fully conscious", before the culmination of perception "the initial representation of essence can support intuitive judgments on the on going process of perception" (Luu et al., 2010). Thus compelling to the argument of the *a priori* perception degree.

"The choice between the cognitive and non-cognitive approaches it's critical to the very conscience of criteria" (Overgaard & Grünbaum, 2011), says psychologist and neuroscientist Morten Overgaard (b. 1975). On the side of the cognitive "consciousness can be associated with controlled processing, working memory, selective attention, or any network of different cognitive processes"; by the non-cognitive "consciousness is a state, a process or a property that is not cognitive" (Overgaard & Grünbaum, 2011). If we consider the validity of the two, not as antagonists or fundamentalists, but complementary, mind's cognition could take a state of active and another of awake (not necessarily passive), since "neither position can be declared in a empirically falsifiable manner" (Overgaard & Grünbaum, 2011). Just some years before, Overgaard, Rote, Mouridsen and Ramsøy (2006) concluded that the "results reported refer to the hypothesis there is more than a perception threshold, but goes further by arguing there are different "levels" of aware perception", intending thus, as in an article, indicated by Overgaard, from the neuroscientist Claire Sergent (2004), to "give experimental support to the thesis that there is a clear transition between conscious perception and unconscious" (Overgaard, Rote, Mouridsen & Ramsøy, 2006).

Intelligence initiates its work in its beginning by direct knowledge reception and accepted without original premises establishing comparing levels with which it will build early senses and meanings – the mind acts so whenever has no implicit reference points. We also start from the lockean principle that the "substantive area of human personality was the conscience" (Locke, 2010 p. XVI), however we consider not the existence of an

unconscious knowledge but a knowledge that transcends locative presence of its respective consciousness even in relation to the possibility of something like innate ideas. Everything what the imagination creates memorizes into a transcendence, providing innate ideas of genetic builders who provided space (the neuronal network that sets the primary connection to what will be the perceptive mind) and non-places (the envelope of perceptions sense that are built) so that it is allowed to exist, thus beginning the tenant place of physics of thinking and give way to the light that remains imprinted in the mantle of perceptive mind.

BIBLIOGRAPHIC REFERENCES

- Cruzeiro, M. R. (1969). *Televisão*. Porto: Edições Salesianas.
- Damasio, A. (2000). *O Sentimento de Si. O Corpo, a Emoção e a Neurobiologia da Consciência*. Lisboa: Publicações Europa-América.
- Delacour, J. (1997). Neurobiology of consciousness: an overview. *Behavioural Brain Research*, 85(2), 127-141. doi: 10.1016/S0166-4328(96)00161-1.
- Dijksterhuis, A. & Meurs, T. (2006). Where creativity resides: The generative power of unconscious thought. *Consciousness and Cognition*, 15(1), 135-146. doi: 10.1016/j.concog.2005.04.007.
- Ferrarello, S. (2010). Intuition and perception in the sixth logical investigation of Edmund Husserl. *Revista de Filosofia UIS*, 9(1), 117.
- Haber, R. N. & Standing, L. G. (1969). Direct measures of short-term visual storage. *Quarterly Journal of Experimental Psychology*. 21(1), 43-54 doi:10.1080/14640746908400193.
- Kant, I. (2001). *Crítica da Razão Pura*. Lisboa: Edição da Fundação Calouste Gulbenkian.
- Kenet, T., Bibitchkov, D., Tsodyks, M., Grinvald, A., & Arieli, Amos (2003). Spontaneously emerging cortical representations of visual attributes. *Nature*, 425, 954-956. doi: 10.1038/nature02078.
- Kojima, H. & Kawabata, Y. (2012). Perceived duration of chromatic and achromatic light. *Vision Research*, 53(1), 21-29. doi:10.1016/j.visres.2011.11.006.
- Lagercrantz, H. (2009). The birth of consciousness. *Early Human Development*, 85(10), S57-S58. doi: 10.1016/j.earlhumdev.2009.08.017.

- Lloyd, D. (1995). Consciousness: A connectionist manifesto. *Minds and Machines*, 5(2), 161-185. doi: 10.1007/BF00974742.
- Locke, J. (2010). *Ensaio sobre o Entendimento Humano*. Vols. I e II. Lisboa: Edição da Fundação Calouste Gulbenkian.
- Luu, P. et al. (2010). Reentrant Processing in Intuitive Perception. *PLoS ONE*, 5(3). p.e9523. doi: 10.1371/journal.pone.0009523
- Merikle, P. M., & Smilek, D. (2001). Eastwood, John D. Perception without awareness: perspectives from cognitive psychology. *Cognition*, 79(1), 115-134. doi: 10.1016/S0010-0277(00)00126-8.
- Overgaard, M., Rote, J., Mouridsen, K., & Ramsøy, T. Z. (2006). Is conscious perception gradual or dichotomous? A comparison of report methodologies during a visual task. *Consciousness and Cognition*, 15(4), 700-708. doi: 10.1016/j.concog.2006.04.002.
- Overgaard, M., & Grünbaum, T. (2011). Cognitive and non-cognitive conceptions of consciousness. *Trends in Cognitive Sciences*, 16(3), 137. doi:10.1016/j.tics.2011.12.006.
- Ringach, D. L. (2003). Neuroscience: States of mind. *Nature*, 425(6961), 912(2).
- Sergent, C., & Dehaene, S. (2004). Is consciousness a gradual phenomenon? Evidence for an all-or-none bifurcation during the attentional blink. *Psychological Science*, 15(11), 720–729.
- Stoerig, P. & Brandt, S. (1993). The visual system and levels of perception: Properties of neuromental organization. *Theoretical Medicine*, 14(2), 117-135. doi: 10.1007/BF00997271.
- Tassi, P. & Muzet, A. (2001). Defining the states of consciousness. *Neuroscience and Biobehavioral Reviews*, 25(2), 175-191. doi: 10.1016/S0149-7634(01)00006-9.
- Vandekerckhove, M. (2009). Memory, auto-noetic consciousness and the self: Consciousness as a continuum of stages. *Self and Identity*, 8(1), 4-23. doi: 10.1080/15298860801961927.