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## Neurocinematics and Beyond Imagery of Contemporary Screen Culture

### Актуалізація нейроестетичних досліджень у полі сучасної екранної культури Нейроекранологія

**Abstract.** The paper focuses on the features of emotional perception of screen-displayed videos and images, when the neural response of the viewer is included into the subject field of neuroaesthetics—an interdisciplinary sphere of knowledge at the intersection of art studies, philosophy, psychology of perception, and neuroscience.

The study describes innovative methods of neuroscientific research for studying the reception of a “screen product.” One of such methods is determining the algorithm of evoking certain impressions in the mind of the viewer—“consumer” of the screen culture. Further ways of development of dialectical ties between neuroscience and screen studies are formulated as a research hypothesis. Practical significance of the study is determining the parameters of regulatory/manipulative influence of the audiovisual stimuli on the viewer’s behavior in the contemporary situation when objective and subjective realities are gradually substituted by the virtual reality.

**Keywords:** neuroaesthetics, screen studies, screen culture, interdisciplinarity, multimodality, cerebral activity.

**Introduction.** The early 21<sup>st</sup> century is marked with the new paradigm of studying the functioning of human brain with the innovative instruments and methods. Among other things, active observation of the regularities of how artworks influence the activation of neurons in certain areas of the cortex has started. Interdisciplinary approach that emerged at the intersection of the humanities (art studies, aesthetics, etc.) and discourse of natural sciences (physics, psychology, physiology, neurology) was named “neuroaesthetics.” Features of reception of the screen-displayed moving multimodal objects seem to be an interesting and currently largely unexplored dimension of neuroaesthetics studies. I suggest to name this field of neuroaesthetics centering specifically around screen culture (that makes it a broader discipline than neurocinematics) *neuroscience of screen culture*. Focusing on the viewer as the unity of mind and body, neuroscience of screen culture studies the viewer’s reactions on audiovisual screen stimuli applying empirical and logical-epistemological methods, as well as using the data on cerebral activity obtained with the innovative equipment for measuring brain activity.

Relevance of the research of the targeted influence of virtual screen images on the neuronal system of the viewer, user, or recipient does not need further substantiation since global communication space is now totally dominated by screens (cinema, television, computers, tablets, other

gadgets) in the radically transformed parameters of the present-day reality.

**Literature review.** The term was coined in 2002 by the neurophysiologist Semir Zeki who developed the technique of studying, processing, and transmitting information of five human senses into the brain—the organ which has been a thoroughly and systemically researched by physiologists, neurologists, and other professionals for quite a while. The early twenty first century was marked with the emerging symbiosis of the humanities and neurosciences. Unlike the established aesthetics that operates the trinity of emotional–valuation, sensory–motor, and meaning–knowledge dimensions of perception, development of neuroaesthetics added *intensity of the brain response of the recipient* to this triad.

Methodological approaches of the neurophysiologist Semir Zeki, primarily his brain mapping technique (Bartels & Zeki, 2004a) enabled to determine the centers of cerebral activity which are activated while creating or viewing the works of art (in the first experiments, the James Bond film was shown to the recipients). Since then, neuroaesthetics as a discipline of cognitive neurology gradually has been entering the scientific mainstream.

As for now, steady development of neurosciences gives permits to introduce the *neuroscience of screen culture* into this topical discourse. Screen-displayed films or images appeal

to the brain of the viewer through several channels/sources of receiving information, including visuality/plasticity and the auditory component (sound, music, noise, etc.). The non-trivial task of processing overall amplitude of nonlinear stimuli is addressed in the body of research works. Among them is the “Integration of face and voice during emotion perception” by Gilles Pourtois and Monica Dhar (Pourtois & Dhar, 2013). In the chapter, the authors provide empirical data that allow to view almost 100-year-old cinema events from the perspective of neurometrics. For example, the drama of why some silent film stars could not adapt to the sound films gets a data-backed explanation. What the authors list as one of the reasons for dissociated perception is a “stimulus modality redundancy” (Pourtois & Dhar, 2013).

Pioneering ideas of Vladimir Bekhterev and Ivan Sechenov became a step on the path to modern understanding of the features of perception, as well as to contemporary neurological idea of the space of thinking as the one corresponding with the nonlinear, architectonically complex non-hierarchical rhizome-like system of neural connections.

The montage theories by Sergei Eisenstein should be mentioned in this context, primarily his principle of “montage of attractions” which was a “cinema fist” of sorts that evoked exaggerated emotional reaction. Eisenstein’s contrapuntal principle seems to be no less convincing. As a “fundamental contradiction,” it assumes/substantiates essentially neural reactions/correlations to the unrelated information flows in the channels of different modalities (sound, images) during one event (such as menacing roar of a predator during children’s game or a baby crying amid the scene of a death of the soldier).

According to the methodological approaches, the studying the psychophysiological reactions on a screen-displayed product could be divided into two major periods—empirical and instrumental.

*Empirical experiments* of the twentieth century accorded primarily with the psychological data (reflexology, psychoanalysis). The evidence of the influence of the emotional scenes on the pattern of physiological reactions was measured based on the biochemical data (increase in body temperature, skin moisture, changes in motor activity, impulses of muscles, heart rhythm) or on the startle response, heart rate, change of skin conductance, and other indicators of perception/non-perception of the recipient on the level of comfort and harmonious/pleasant feelings. Direct interviewing of the viewers was another traditional way of obtaining information.

The second, *instrumental period*, starts in the early 21<sup>st</sup> century, when qualitative improvement in the methodology of neurological studies may be observed; eventually, it removed neuroaesthetics from the list of purely descriptive disciplines.

In addition to fundamental and theoretical, the pragmatic grounds of the neuroaesthetics should be emphasized. The subject field of neuroaesthetics encompasses studying the potential for manipulating human behavior through the coordinated provocative stimulation of certain

areas/patterns of the cortex and researching the influence of art on a person while his aesthetic needs are fulfilled. Meeting these needs stands on the top of the Maslow’s hierarchy of needs, while physiological (organic needs) and other fundamental needs of human existence (safety, love and belonging, esteem, etc.) are placed in its bottom (Maslow, 2004).

Soon, the priorities of the Maslow’s hierarchy paradoxically transformed when the neurons—the basic elements for “aesthetic,” conscious emotional perception—were discovered. Discovery of the first evidence that cerebral system creates a “channel” between human perception and activation of the neural network of the brain is linked to the names of the neurophysiologists Hideaki Kawabata and Semir Zeki. The researchers explored two types of neurons, the functions of which seem principal for the conscious emotional perception of information flows coming from different channels. One type of neurons is responsible for compassion, empathy to the emotional states of another person; the second type of neurons establishes a correlation between observing certain action and its eventual repetition. It is up to the mirror neurons—the ones able to create an “interactive loop” in brain (Kawabata & Zeki, 2004).

However, the start of systemic neuroaesthetic studies is most often attributed to the research works of the neurobiologist Vilayanur Subramanian Ramachandran who stresses that all his positions are based on the instinct of self-preservation. However, reducing aesthetic experience to only several “laws” that are superficially neurological in nature seems quite disputable (as well as the scholar’s endeavors in establishing evolutionary grounds for their formation). Also, the spread of pixel art in digital video has evidently intensified the conflict between visually received information and rational thinking. This is a true encroachment upon the inner sanctum of the limbic system—the established stereotypes which helped the mind to “anchor” itself and eventually to navigate in the reality, to avoid danger, etc. Simulated “threads” inspired by the virtual reality on screen evoke a neural response in a recipient which is completely adequate to the reaction to a similar situation in a physical reality.

**Results and Discussion.** By the end of the 20<sup>th</sup> century, “quiet digital revolution” in screen culture changes the status of the real in the sphere of audiovisuality. Dominating pixel images and digital technologies inspired the fundamental paradox: perception of reality becomes more important than reality itself.

Complex projections of images, facts of the external (“solid,” physical) world and modeled, simulative-augmented reality practically are independent of the level of how much “true” the actual reference is. Or of the existence of a “referent” as such. Neither the biochemical data nor the amplitude of the “peaks” show any difference in the waves of neural excitation. The body responds to the events displayed on the screen: flickering pixels evoke quite real reactions—laughter, tears, emotional experience of beauty/ugliness—and produce the whole spectrum of emotions.

Ramachandran formulates a hypothesis: “Hindu artists often speak of conveying the *rasa*, or ‘essence’, of something in order to evoke a specific mood in the observer. But what exactly does this mean? ... what the artist tries to do (either consciously or unconsciously) is to not only capture the essence of something but also to amplify it in order to more powerfully activate the same neural mechanisms that would be activated by the original object” (Ramachandran & Hirstein, 1999, p. 41). If these principles are applied, is it possible to induce a person to see the non-existent reality, to fool the perception (including aesthetic perception) while consciously targeting the chains of brain cells?

Currently, the theoretical basis of the traditional theory of screen influence is successfully adapted to serve the needs of public relations, political science, advertisement, and image making. These and other manipulations with perception are based on the features of suggestive influence that makes “consumer” see the inspired images in the simulative constructs produced by these neuro-conjurers.

Colors, forms, music, visual, plastic, sound, and other stimuli that evoke various emotions during the viewing of the films and videos, constantly activate the areas in brain which produce emotional response to the simulated events, that generate/intensify the desires (to buy, acquire, own, devalue). The programmatic appeals to the neural system push this manipulative entangling up to the level of physiological coercion.

The symptomatic research of the quantitative neurobiological evaluation of the “involvement” of the viewer in perception of the film or of practically any screen-displayed message was conducted by the neurologists from the New York University (Hasson et al., 2008). With the fMRI, the researchers managed to establish a correlation between the significant parameters of the films (content, editing, and directing style) and the algorithms according to which the studied films controlled the cerebral activity of the viewers.

The researchers offered the participants of the experiment to view three fragments of the features films: directed by Sergio Leone, Alfred Hitchcock, and Larry David. To establish the baseline of sorts for the experiment, the research team compared the “ISC (inter-subject correlation) for an unstructured real life event with the ISC for a tightly edited and influential commercial film” (Hasson et al., 2008, p. 2). The researchers tracked the eye movements and measured neural activity of the cortex areas engaged in the basic sensory processing of the visual and auditory input. The result of the analysis proved one films to have less control over the brain while others achieved a “tight control over viewers’ brains” (Hasson et al., 2008, p. 9).

The conclusion of the research group is the following: “Achieving a tight control over viewers’ brains during a movie requires, in most cases, intentional construction of the film’s sequence through aesthetic means” (Hasson et al., 2008, p. 9). “The fact that Hitchcock was able to orchestrate the responses of so many different brain regions, turning them on and off at the same time across all viewers, may provide neuroscientific evidence for his notoriously famous ability to master

and manipulate viewers’ minds” (Hasson et al., 2008, p. 16). Thus, a new method was presented—“inter-subject correlation (ISC) analysis that measures similarities in brain activity across viewers” (Hasson et al., 2008, p. 2).

It is indicative that neuroscientists focused their attention specifically of the montage editing which is traditionally considered a ferment for cinema. The structure of montage editing serves not only for the sensible construction of the plot but also conveys the author’s subjective rhythms (nationality, age, gender, etc.) of perception of the world. Cutting also harmonizes the inner state of continuity and integrity, coordinates with the physiological processes of processing the visual and auditory stimuli, and correlates with affectation of neural connections.

Every viewer has his own individual intensity of reactions and unique rhizome-like map of neural connections. Thus, each individual perceives the reality of screen-displayed information and images in his own personal context. Eventually, his brain “adapts” the sequence of received impulses in a certain way, creating a personal version, adjusted to a certain notion of beauty, perfection, harmony. Or, on the contrary, the images are adapted to be perceived as awful and disgusting—according to the psychedelic interpretation of the aesthetics of ugliness.

The impact of “toxic” audiovisuality, “bombardment” of the neural system with the barely endurable impulses is similar to the influence of narcotic substances: at first, they have “positive” effects (they open mind, increase creativity, strengthen the vessels, etc.). Considering the fact that the beautiful and ugly constitute a dialectic dipole of sorts that correlates with reality full of risks and catastrophes, the perpetual change in ratio between the harmonious and dissonating during the perception of certain artifact is natural. It is quite possible that intentions of the contemporary virtual screen-displayed reality to evoke discomfort in the viewers/audience/“consumers” is linked to the new aims of art and the spread of such adrenaline-producing means of influence as shock, stress, and outrageous behavior.

Erotic films and videos at all times were acknowledged as the one of the most influential means to provoke emotions and neural “response.” Development of communication networks inspired/granted a new status of “computer interactive” to that: now disembodied substances (disembodied “noughts”) meet in the virtual reality (in the ephemeral “nowhere”) turning their confluence into a pure neural reaction. The new computer-based sexuality appeals to thalamus, primarily to such its functions as formation of emotions (limbic system) and sensory and motor skills (bodily sensations). Integrated association areas of the cortex signal about pleasure with producing endorphine.

Thus, the paradox about getting the carnal pleasures while rejecting a bodily shell is easily solved on the level of cerebral activity.

In the similar way, observation of the violent scenes on the screen crosses the limit of a bearable adrenaline threshold. Thus, the shocking images became “bad trips” and according to Sigman, “can easily turn into nightmares, hallucinations

... Almost all of the situations in which the mind wanders and unhitches from reality can easily degenerate into states of suffering” (Sigman, 2017, p. 158).

Such reduction of neuroaesthetics and neuroscience of screen studies to the laboratory measurements may provoke infringement of aesthetic consciousness and reduction of the impressions from the film to some “adrenaline-endorphine equivalent.” Still, the effect of the perceived artwork should not be reduced only to the modulations of neural excitation. Activation of the certain areas of the cortex with quantum impulses evokes quite real aesthetic impressions and emotions: acute fear, admiration, or pleasure.

**Conclusions.** The results of theoretical and empirical research enabled to reveal the dynamics and perspectives of the discourse of neuroaesthetics, including the *neuroscience of screen culture*. I offer to introduce this term that encompasses all forms of contemporary screen culture (but screen arts and everyday videos) into a scientific circulation. That

would open the new horizons in the anthropological sciences and enrich the modern ways and methods of studying the qualitative and quantitative influence of the multimodal screen mediators on the human brain.

Harmonization of the inner dynamic states by the means of consciously managing the signals of the neural network with various external stimuli—color, lighting, movement, rhythm, and other means of influence of the screen products, including aesthetic means—may become a real and foreseeable aim of neuroaesthetics and neuroscience of screen culture. The correlation of the audiovisual pieces with the emotional response of the individual that is studied through the manifestation of cerebral activity of the recipient (user, consumer, interactor of the screen culture) should be acknowledged as informative for the further investigation of connections between the films and videos, the personal aesthetic experience, memory, and intensity of the neural response to the virtual stimuli.

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#### **Зубавіна І.**

#### **Актуалізація нейроестетичних досліджень у полі сучасної екранної культури. Нейроекранологія**

**Анотація.** Розглянуто особливості чуттєво-емоційного сприйняття екранних творів глядачем з позицій нейронного відгуку — в предметному полі нейроестетики як міждисциплінарної сфери знання на перетині мистецтвознавства, філософії, психології сприйняття та нейронауки. Розкрито історичні підступи до оприявлення закономірностей зв'язку перцептуального посилу та нейронної відповіді.

У праці окреслено теоретичне й суто практичне значення нейроестетичного знання та інноваційних методик нейродосліджень у вивченні рецепції «екранного продукту». Зокрема — при виявленні алгоритму формування вражень глядача/реципієнта — «споживача» екранної культури. За наукову гіпотезу визначено можливі вектори подальшого розвитку діалектичних зв'язків нейрологічної науки та екранології.

**Ключові слова:** нейроестетика, екранологія, екранна культура, інтердисциплінарність, мультимодальність, церебральна активність.

Стаття надійшла до редакції 19.08.2022