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Neuroplasticity - the engine of creativity

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ABSTRACT: Is creativity an innate talent or is it a dynamic skill that can be constantly developed by anyone regardless of age? The answer is provided by one of the most fascinating concepts of modern neuroscience: neuroplasticity. Understanding this phenomenon is relevant to knowing how the brain works and how we can take control of the way we think, feel and innovate. Neuroplasticity is not just a recovery mechanism, but actually represents the dynamic engine of human creativity, transforming the human from a simple spectator into the architect of his own brain.

Thus, in this article we will explore the mechanisms of plasticity at the synaptic level, cognitive development and creativity augmentation through the dynamic collaboration of neural networks, and last but not least, we will suggest some practical strategies, based on scientific studies, for active brain training. In this sense, we will analyze the applicability of neuroplasticity in art, science, continuous learning, or solving complex problems.

KEYWORDS: brain, neural networks, neuroplasticity, creativity

Introduction

As a researcher at the Institute for Multidisciplinary Research in Art at the George Enescu National University of Arts, I am interested in the complexity of the creative phenomenon in the context of rapid technological development, the essential role of neuroplasticity and the cognitive mechanisms involved in the creative act, as well as how technology influences brain plasticity. Thus, in the interdisciplinary research we conduct on creative potential, the emphasis is placed on "the dialogue between disciplines, in which science and art do not exclude but complement each other" (Ștefănescu, 2025, 15). In other words, "the fusion of art and technology opens a new dimension of creativity, in which

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human expressiveness merges with the interactivity offered by data and sensors" (Mavhima, 2025, 103), thereby expanding the meaning of neural communication.

To this end, we have initiated and organized a series of scientific conferences at the Institute for Multidisciplinary Research in Art, in partnership with the Grigore T. Popa University of Medicine and Pharmacy in Iași and the Gheorghe Asachi Technical University in Iași, including: "Neuroscience and Creativity – Neural Connections in Artistic Creation" - 2023, "Neuroplasticity, Cognition, Creativity – Interdisciplinary Perspectives" - 2024, "Neuroplasticity in the Digital Age – The Impact of Artificial Intelligence on Creativity" - 2025, featuring lectures by specialists in the medical, artistic (visual arts, music, theater, choreography) and engineering, through which we seek to understand the depth of the creative process, what lies behind imagination, emotions, and empathy—key elements in resolving trauma—as well as exploring neuroplasticity as a means of enriching forms of artistic expression and the prospect of finding creative solutions to the complex problems of contemporary society.

In fact, the contributions of the experts from the two conferences mentioned above were published in the volume "The Art and Science of the Brain: New Frontiers in Neural Communication"[1], with the aim of providing the interested public with a current interdisciplinary resource on research conducted at the intersection of neuroscience and creativity, which can contribute to the development of an academic and human culture based on collaboration, empathy, and integrative knowledge.

Although the specialized literature abounds with analyses of creativity as a complex process and of neuroplasticity as a biological fact, this work aims to go beyond a mere description of these concepts, presenting them as living instruments of an internal mechanism that we can control, while equally highlighting the human capacity to utilize one's own mental flow to actively reprogram one's neural network.

The system of creative thinking

A major challenge of our time is the relationship between neuroplasticity, creativity, and artificial intelligence. I believe that using generative platforms as tools to accelerate ideas—not as a substitute for mental effort—must be done with great discernment and balance. Of course, the use of artificial intelligence in artistic creation raises philosophical and ethical questions. Is a creation produced by an algorithm considered authentic art? Can AI bring true innovation, or is it merely a replication of what has already been done? These dilemmas are important, but it must be understood that AI, at its core, functions as a tool in the hands of a human creator, and true creativity stems from their interaction with the technology.

Throughout human evolution, the ability to generate new and useful ideas has

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been the driving force behind the progress of civilization. In this regard, we believe it is necessary to address several questions, such as: What is creativity? Is it an innate gift or a skill that can be cultivated through practice by any individual, regardless of age? For a long time, creative potential was considered an innate and unchangeable trait. However, neuroscience research demonstrates that the human brain's architecture is in a state of constant reconfiguration. In this context, we discuss the importance of neuroplasticity—the brain's capacity to remodel neural connections. Understanding this principle is essential for deciphering the mechanisms of neuroplasticity, which acts as a true engine of creativity, enabling individuals to actively shape their intellectual resources and rewrite their cognitive boundaries.

To understand the system of creative thinking, we will adopt a multidisciplinary perspective, in the sense that we will define creativity as an integrative cognitive function rather than an isolated event. Thus, creativity involves a conceptual synthesis through which disparate elements are connected into a completely new logical and functional unity. This ability to think divergently depends directly on the strength and flexibility of neural networks.

The brain is, of course, at the center of these neurological processes. Researchers have "always been fascinated by the human brain, by its ability to process the multitude of information from the surrounding environment, by the variety of decisions and creative ideas, so that technical communication with it has become a subject of engineering study, alongside various approaches in medicine and psychology" (Poboroniuc, 2025, 63). To decipher what lies behind an innovative idea, in the artist's mind during the creative process, or where ingenious solutions come from means to delve behind the scenes of free thought, where science and imagination meet.

Innovation is not an abstract phenomenon; ideas do not appear out of nowhere, but result from the way our nerve cells connect and communicate with one another. The authors of the book "The Runaway Species: How Human Creativity and How Remakes the World", David Eagleman[2] and Anthony Brandt[3] make this point very clear: "Human creativity does not spring from nothing. We learn from our experience and from the raw material around us to reshape the world" (Eagleman and Brandt, 2020, 46).

Research in this field reveals an interesting fact: when we process new information, the connections between neurons multiply and become stronger, constantly adapting to the intensity of our mental effort. For example, when we explore new activities, the brain releases certain substances that have a beneficial effect on the neural system, thereby facilitating the formation of new connections between parts of the brain that previously did not interact. This process enables a vital dialogue between the rigor and discipline of logic, originating in the frontal lobe, and the free flow of memories and associations from

[2] Neuroscientist
[3] Composer

the lateral regions. Thus, through the collaboration between these different "zones," the ideal ground is created for the birth of original ideas and solutions. In other words, "creativity is a critical component of human cognition and behavior, playing an essential role in fostering innovation, problem-solving, and personal fulfilment" (Ștefănescu, Bălăiță, and Fărcășel, 2025, 218).

Another aspect that deserves highlighting is that creative potential transcends the boundaries of art; the creative act does not belong strictly to the artistic sphere. Creativity is a cross-cutting cognitive function that manifests itself in any field, serving as the driving force that enables adaptation in any context. Nevertheless, the artistic dimension remains an essential vector for reconfiguring the neural network, as art compels us to work with metaphors, symbols, and abstractions, which force the brain to create unexpected connections between ideas that, on the surface, appear unrelated. Moreover, this mental process is enhanced by the emotional charge of art, which acts as a catalyst; intense emotions accelerate the formation of new neural circuits, transforming a simple association of ideas into a profound and memorable experience. "Artistic emotion is a profound human experience that transcends linguistic and cultural barriers. Recent perspectives on aesthetics have reaffirmed that emotion is an essential evolutionary dimension of human learning, penetrating the brain's basic functions." (Buzamat, Poboroniuc, Irimia, Ștefănescu, and Mavhima, 2025, 194)

Creativity is linked to a stable structure of neuroplasticity, and understanding how these two components function and interact can enhance innovative thinking and openness to new opportunities. In the book "Power Up Your Brain", authors Dr. David Pelmutter and Dr. Alberto Villoldo state that "neuroplasticity is the brain's ability to reconnect and create new neural networks" (David Pelmutter and Alberto Villoldo 2018, 123), thus, through various mechanisms, neuroplasticity plays an essential role in optimizing creativity, and the more the brain is trained, the more capable it is of generating new ideas. Furthermore, combining "continuous learning, exposure to creative activities, physical exercise, meditation, a healthy diet, and quality sleep" (Ștefănescu, Bălăiță, and Fărcășel, 2025, 219), highlighted, moreover, by the research and personal experiences of the authors of the book "Power Up Your Brain", become sources that "allow you to establish new neural networks that create a sense of joy and a general state of well-being" (David Pelmutter and Alberto Villoldo 2018, 30).

Research has shown that neuroplasticity is the brain's fundamental ability to structurally and functionally reconfigure itself in response to new experiences and learning. "Thus, the brain is not a fixed structure, but a dynamic one, capable of modification and adaptation due to our experiences, thoughts, and activities." (Ștefănescu, Bălăiță, and Fărcășel, 2025, 217) Brain plasticity shows us that every profound thought and every act of creation leaves an internal imprint, transforming the brain's structure from a fixed pattern into a flexible system that is constantly redefining itself. In

the view of researcher Norman Doidge, the brain is not seen as a machine with fixed parts, but as a living organism, capable of continuous growth and adaptation based on mental activities and experiences (Doidge, 2007).

Neuroplasticity is an extremely dynamic field of research. Scientists are exploring a wide range of practical applications that promise to revolutionize the way we acquire new knowledge, form memories, or develop skills. Furthermore, understanding these processes opens new horizons in rehabilitative medicine, offering real hope for recovery from trauma or brain injuries.

An important step in this direction is also represented by the use of Brain-Computer Interface (BCI) technologies, which are used in various research by Professor Marian Silviu Poboroniuc from the Gh. Asachi Technical University of Iași, stating that thus, "the integration of these technologies into neuroscientific research marks a transition from passive observation to active interaction with brain processes, opening new perspectives on how we can influence and shape neuroplasticity" (Poboroniuc, 2025, p. 87).

The neural mechanisms of artistic emotion

Although the discussion of artistic emotions has long been situated within the realm of philosophy and aesthetics, in recent decades neuroscience has begun to offer new perspectives on emotional mechanisms, which are interrelated with neuroplasticity and creativity.

According to neuroaesthetics, a field that "aims to establish a set of guiding principles for understanding how and why people enjoy art" (Stephens, 2023, p. 249), emotions lie at the intersection of neuroscience, psychology, and aesthetics. They are not mere affective responses, but complex processes of empathic and cognitive resonance, triggered by artistic stimuli—viewing a work of art, a choreographed performance, a concert, a play, or a film. Thus, taking Scherer's theories into account, emotions are determined by cognitive evaluations of stimuli: "In the framework of the component process model, emotion is defined as an episode of interrelated, synchronized changes in the states of all or most of the five organismic subsystems in response to the evaluation of an external or internal stimulus event as relevant to major concerns of the organism" (Scherer, 2005, p. 697).

According to research in the field, artistic emotions are not spontaneous but originate from a complex neurobiological substrate, being generated through a process of encoding and decoding artistic intent. The artist, using a specific language (visual, auditory, kinesthetic), incorporates a certain emotional intent into their work. For example, a painter uses strong chromatic contrasts, textures, and broken lines to express tension, or a warm color palette can evoke joy, while for a choreographer or dancer, body movement, space, or rhythm become tools that suggest grace, harmony, or tension and

drama. In both cases, an interdependence is created—a nonverbal dialogue between artist and viewer—through which emotion flows freely.

Regarding artistic emotions, a major role is played by mirror neurons, which represent a neurobiological foundation of empathy and the understanding of others' actions. According to research and discoveries by Giacomo Rizzolatti and his team, these neurons are activated when we are in the presence of a person or group performing an artistic expression. Thus, mirror neurons allow us to feel and understand the emotions conveyed by the artist, creating a form of subconscious empathy (Rizzolatti & Fabbri-Destro, 2008).

As for the reception of artistic emotions, neuroscientific research shows that there is individual variability due to the way the brain processes sensory and emotional information. Past experiences, education, cultural background, and even genetics act as a filter through which each of us perceives the artistic work. Understanding art forms is the result of a long cognitive process, and humans are capable, over time, of developing new forms of perception. In interpreting the expressive and communicative information of artistic manifestations, the viewer requires "a combination of sensory information, artistic experience, intelligence, and emotional attitude, the intensity of concentration, and even physical state" (Knobler, 1983, p. 26).

In this regard, I believe it is important to highlight the research conducted as part of the "STEM. Dance and Neuroscience" project[4], which transformed a contemporary dance performance into a captivating dialogue between the body and the brain, between the artist's emotions and those of the audience, forging a strong connection between the artistic stage and the scientific laboratory. This research, which involved a unique public trial conducted in Iași, brought together dancers, engineers, doctors, psychologists, musicians, and visual artists. Using state-of-the-art systems—Nautilus headsets worn by the dancers and Unicorn Hybrid Black headsets for the audience—a map of emotions was created to quantify the brain's response in real time. We can therefore say that artistic emotion is not only felt but also measurable. "This preliminary study aimed to investigate frequency specific brain activity patterns in delta and gamma bands, inter-subject neural synchronization using ISC and PLV metrics, the influence of performer number on audience neural responses, and differences between audience members with and without artistic backgrounds." (Buzamat, Poboroniuc, Irimia, Ștefănescu and Mavhima, 2025, 194)

Conclusions

We have addressed this complex topic, although it is clear that we cannot cover

[4] Initiated by the George Enescu National University of Arts in Iași, coordinated by the Choreography Department Association - Lecturer Dr. Sandra Mavhima, in partnership with the Gheorghe Asachi Technical University of Iași, the Grigore T. Popa University of Medicine and Pharmacy of Iași, and the National Museum of Romanian Literature in Iași.

it in just a few pages; however, we have summarized the interdisciplinary themes we are exploring (arts, medicine, engineering), linking them to the evolution of contemporary society through scientific conferences, published articles, and the applied research we are conducting.

A major challenge of our time is the relationship between neuroplasticity, creativity, and artificial intelligence. I believe that using generative platforms as tools to accelerate ideas—not as a substitute for mental effort—must be done with great discernment and balance. Of course, the use of artificial intelligence in artistic creation raises philosophical and ethical questions. Is a creation produced by an algorithm considered authentic art? Can AI bring true innovation, or is it merely a replication of what has already been done? These dilemmas are important, but it must be understood that AI, at its core, functions as a tool in the hands of a human creator, and true creativity stems from their interaction with the technology.

Through various tools, neuroplasticity plays a well-established role in enhancing creativity, and the methods are accessible to anyone, but we must be curious, open-minded, and adaptable. In fact, the environment in which we live, our education, and our habits stimulate people's desire to be as creative as possible. It is important to explore, read, learn new things, ask questions, communicate, and be open to the challenges we face in a constantly evolving society; art, culture, reading, travel, and writing activate imaginative networks and enhance creative thinking. In an increasingly technological world, the ability to think freely and find alternative solutions is what truly makes us human.

We can conclude that neuroplasticity is truly the driving force behind creativity, as it is a living process that allows the mind to reconfigure itself beyond its initial limitations; within this universe, the brain continuously builds new pathways of communication, enabling disparate concepts to converge and merge into novel solutions. The brain, therefore, is not a static system; it functions as a dynamic network, where every human action shapes the gray matter, transforming the flow of ideas into lasting traits, with humans serving as their own "builders" of the neural system.

References

Buzamat, A., Poboroniuc, M.-S., Irimia, D.-C., Mirela, S., & Mavhima, S. E. (2025). Audience-performer neural dynamics in live dance: A preliminary EEG investigation. 2025 International Conference on Electromechanical and Energy Systems (SIELMEN), 194–197. https://doi.org/10.1109/SIELMEN67352.2025.11260776

Doidge, N. (2007). The brain that changes itself: Stories of personal triumph from the frontiers of brain science. Viking Press.

Eagleman, D., & Brandt, A. (2020). Specia rebelă: Despre creativitatea oamenilor și despre modul în care ea schimbă lumea. Editura Humanitas. București.

Knobler, N. (1983). Dialogul vizual (Vol. 1). Editura Meridiane. București.

Mavhima, S. E. (2025). Augmentarea experienței coregrafice prin neuroștiință. În M. Ștefănescu, L. Fărcășel, & R. Constantinescu (Eds.), Arta și știința creierului – noi frontiere ale comunicării neuronale (pp. 91–105). Editura Presa Universitară Clujeană.

Perlmutter, D., & Villoldo, A. (2019). Neuroștiința iluminării: Activează-ți creierul. Editura For You. București.

Poboroniuc, M.-S. (2025). Tehnologia actuală și aplicații pentru interfațarea cu creierul uman. În M. Ștefănescu, L. Fărcășel, & R. Constantinescu (Eds.), Arta și știința creierului – noi frontiere ale comunicării neuronale (pp. 63–90). Editura Presa Universitară Clujeană.

Rizzolatti, G., & Fabbri-Destro, M. (2008). The mirror system and its role in social cognition. Current Opinion in Neurobiology, 18(2), 179–184. https://doi.org/10.1016/j.conb.2008.07.001

Scherer, K. R. (2005). What are emotions? And how can they be measured? Social Science Information, 44(4), 695–729. https://doi.org/10.1177/0539018405058216

Stephens, R. (2023). Creierul stâng vorbește, creierul drept râde: O privire asupra neuroștiinței inovării și creativității în artă, știință și viață. Editura Prestige, București.

Ștefănescu, M. (2025). Notă editorială. În M. Ștefănescu, L. Fărcășel, & R. Constantinescu (Eds.), Arta și știința creierului – noi frontiere ale comunicării neuronale (pp. 13–16). Editura Presa Universitară Clujeană.

Ștefănescu, M., Bălăiță, A., & Fărcășel, L. (2025). Neuroplasticity, cognition, and creativity – interdisciplinary perspectives. Symbolon, 26(1), 215–228. https://doi.org/10.46522/S.2025.01.18