

Creativity and Imagination: kingdom of Innatisms or Learning Domains? The Answers of the Neuro-Aesthetics and the Consequences on Teaching

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My personal nature has always led me to try to understand, especially when I struggle to understand both my cognitive limits and the confusion with which a simple or complex concept is expressed. Similarly I have always believed in the importance of clarity and simplicity in reasoning and language to unravel false problems related to the misuse of language, as the philosopher of language L. Wittgenstein, in his famous *Tractatus Logico-Philosophicus* would say, or to understand what seems to go beyond our cognitive abilities.

Now, in order to deepen the themes of creativity and imagination (themes that certainly, in my last 5 years of my teaching at the Liceo of Arts "F. Casorati" of Novara, touched my philosophical sensitivity), I would like to focus on the understanding of those concepts that seem to exceed the boundaries of what we think to know. In fact, the domain of these concepts is, in my opinion, a very fruitful and stimulating point of contact for (neuro)science and philosophy, as the English neurobiologist Semir Zeki of London University has well deepened with his "neuro-aesthetics" that I intend to analyze later, and that the famous philosopher I. Kant considered as the field of "noumenon" They were the Ideas of Pure Reason (Soul, World and God), thinkable, imaginable, but not knowable.

After all, is not this the field of imagination and creativity, in which the artist "immerses", in a sublime way, creating his music or his poetry or his paintings, or in which the philosopher of the mind imagines the "possible worlds" of thought and reality (e.g., the famous mental experiment of the "Twin Earth" of the philosopher of

mind H. Putnam docet!), or, finally, in which the believer feeds with his prayer for a God Creator, who will save the souls of the right people and condemn those of the bad ones in a spiritual world?

Kant calls this domain of investigation, considered as peculiar to the pure use of our reason when it moves before the use of experience and at its roots, "transcendental aesthetics", the science of all the a-priori principles of sensibility, including "a-priori forms" of space and time. In this sense Kant refers to the concept of "aesthetics", a term coined in the first half of the 18th century by the philosopher A. Baumgarten, referring to the original Greek *aisthesis*, which means "sensation". But Kant intends aesthetics also in another meaning, that is, as a theory of judgments not determining knowledge, but linked to the perception of "beauty" or to the finalistic reflection on it, or to the imagination. I'm talking about the "Critique of the Judgment", in which the philosopher of Königsberg focuses his attention on the aesthetical or teleological judgment, after having analyzed the determining judgment in the "Critique of the Pure Reason" and the behavior in his "Critique of the Practical Reason".

From what has been said, it seems clear to me that these two meanings of aesthetics, understood by Kant both as a science of the a priori of sensibility and as a theory of non-cognitive judgments, but linked to imagination, allow us to fully understand how much imagination and creativity take with you both a a-priori mental aspect (which we would now say "innate" and "neurological") and a "creative-imaginative" aspect, also linked to the techniques of the various arts, and therefore at least partly through learning and exercise.

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Moreover the same romantic philosophers and poets emphasized in a significant way this peculiar and distinctive coexistence in the art of natural-instinctive and spiritual-intellectual aspect, as imagination and creation, "Spirit" and "Nature". This is what the idealist philosopher F. Schelling would say.

The extraordinary developments of the sciences and, in particular, of neurosciences, starting from the end of the 19th century, with the research of Sherrington in the field of neurophysiology (introducing the concepts of synapses, proprioception, sensory-motor reflex and moto-neuron), the discoveries of Broca and Wernicke of the homonymous language areas of the brain, up to the description of the motory and sensory homunculus of Penfield and the discovery of the inter-hemispheric lateralization of Sperry (to name some of the most famous neuroscientists who lived and worked in the 19th-20th century), allow us, now, to understand how the aesthetic theories (in the broad sense of the term, as theories of perception and imagination) of the philosophers analyzed above, anticipated, particularly, the close link between innatists and cognitive faculties, including imagination, in order to understand the spark of creativity.

The neurobiologist Semir Zeki in numerous specialist articles and in some scientific essays (particularly, in *The Vision From Within: Art and Brain*) clearly supports the close link between neurological aspects in our brain and the perception and imagination involved in aesthetic activity. The way in which the artist imagines and produces art and the way in which the spectator perceives, sees, interprets this artistic product sheds light on the mechanisms of perception and cognition of man, giving rise to a new discipline of investigation of the faculties human, the "neuro-aesthetics". It, following the words of Zeki in *The vision from within. Art and brain*, means the work of art as a sort of physiological and behavioral test to be submitted to the patient-observer in order to understand the biological mechanisms underlying the emotions triggered by aesthetic appreciation. Therefore, neuro-aesthetics proposes the investigation of the perceptive mechanisms underlying the vision, analyzing the way in which the artistic product stimulates the visual brain.

These studies and researches in the field of the perception of the artistic product naturally connect, in my opinion, both with my research in the interpretative debate on the discovery of the so-called "mirror neurons", during my PhD in Cognitive Sciences at the University of Siena (ay 2008-2011), both with my experience "in the field" of the teaching of philosophy and history to students of a high school of arts that I have been doing for the last four years.

We begin to analyze the first point, that is the link between artistic perception, as an interpretative and imaginative act, and neural activation. As the many recent experiments on so-called "mirror neurons" show, when we observe a work of art we automatically identify with it, through an involuntary simulation mechanism that the neuroscientist V. Gallese would call "motor resonance", in how much the motor neurons involved are activated as if we performed the observed action. In this regard, a recent experiment of 2014 by F. Ticini, cognitive neuroscientist at the University of Manchester and president of the Italian Society of Neuroaesthetic "Semir Zeki", which investigates the neural mechanisms and brain structures that mediate aesthetic appreciation is particularly interesting and creativity, and, therefore, try to explain what exactly happens in the brain when we are faced with a painting, a sculpture, etc.

The experiment conducted by Ticini (reported in "L'Espresso", August 2014), in collaboration with a French research group, published on "Frontiers in Human Neurosciences", served to answer precisely this question: since the creation of a work of art requires motor activity (think of a musician playing or a painter painting), to what extent the fact that we like it or not is related to the movements that the artist performs during the creation, thus involving mirror motor neurons, related to resonance or motor simulation?

The starting hypothesis calls into question the mirror neurons as if, looking at the famous "Starry Night" by Van Gogh, we mentally simulated the movements of the arm necessary to trace those broad strokes typical of the painter and very evident in that work. So Ticini and his colleagues asked some volunteers to observe ninety paintings, preceded by images that stimulated the involuntary simulation of a motor act, precisely through the activation of mirror neurons. This simulation could be compatible or incompatible with the artist's movements. Then the researchers asked the volunteers to aesthetically evaluate the same paintings in these two conditions. Ticini writes about the outcome of the experiment: «we observed that when the image that preceded the painting was congruent with the brushstrokes on the painting, the judgment of the work increased significantly». In short, the work was appreciated more if its observation was preceded by the simulation of the movements made by the artist.

This experiment makes us understand that, beyond factors such as education, the historical context and the nature of artistic stimuli, which certainly influence and condition our perception and interpretation of the work of art, when the brain automatically assigns, in a pre-cognitive and involuntary way, an aesthetic value to a work

of art brings into play interior mechanisms such as the activation of the motor areas. But not only that: an important area of future research open from these studies will be the one concerning the neural mechanisms involved in some social and communicative deficits connected to the simulation, such as autism. The same applies to diseases of the brain such as Alzheimer's, as claimed by the American neurologist Anjan Chatterjee in a recent article published in "Trends in Cognitive Sciences".

Furthermore, as noted by S. Cappa, Professor of Neuropsychology at the Faculty of Psychology of the "San Raffaele" Life-Health University of Milan, in "Art and body image: neurological considerations" (in *Images of the mind*). Neuroscience, art, philosophy, edited by G. Lucignani and A. Pinotti, Raffaello Cortina Editore, Milan 2007), that "The representation of the human body that characterizes the works of some figurative artists from different eras can only evoke" assonances " "In the mind of a neurologist. In fact, some of the modifications of the image of the body that can be observed in the human pathology, specifically in the field of neurological and psychiatric diseases, seem in some way to follow the forms of representation of the human body that can be found in famous works of art »(p .121)

This evidently means that the imagination and creativity at the base of the visual artistic work - and I would add it in the other perceptual modes - is closely linked to our representation of the body, that is to the concept of image or body diagram that Penfield clearly identified with the his motor and sensory homunculus. This link between imagination, creativity and representation of the body is due to the fact that the map or body schema is not attributable solely to the mode of visual perception, but represents a synthesis of perceptual data of multimodal origin, whose central role is played by information coming from from the body itself, that is to say "somoesthetic" and "proprioceptive" information. How can one not remember in this regard the famous metaphor of the "homme plant" of the French materialist physician and philosopher La Mettrie, according to whom man, like the thick branches of a tree, has an intricate network of afferent and efferent nerves that bind every organ and apparatus for material body unity?

C. Sinigaglia (Professor of Philosophy of Science at the Department of Philosophy of the University of Milan and founder of the research group of "Neurophilosophy", of which I myself took part, together with the "Phenomenology Lab" of the University of Health "San Raffaele", in conclusion of my PhD in Cognitive Sciences), together with

Rizzolatti, decided to call this multimodal representation of the body "phenomenal understanding", following the phenomenological tradition of M. Merleau-Ponty. Thanks to the so-called "mirror system", consistent, as previously stated, in the automatic and involuntary activation of bimodal, motor and perceptual neuron groups, it is possible, therefore, to give a neurobiological foundation to the distinction between "cognitive comprehension", through inferential processes, "from the outside", and "understanding from the inside". It is evident that this "understanding from within" is at the basis of mental dynamics such as empathy, affective-emotional animal and human consonance, and evidently also of artistic imagination and creativity.

Finally, A. Attanasio (Associate Professor of Moral Philosophy at the University "La Sapienza" of Rome) and A. Oliverio (Psychologist at the Faculty of Science of the "La Sapienza" University of Rome), in "Empathy and social cognition. A Darwinian reading of the mirror neuron system" (on the *Journal of Philosophical Critique Paradigm*, year XXX, n. 3, new series, September-December 2012, argue that the theory of "embodied simulation" of Gallese, which we saw was at the root of the "mirror system" and, therefore, also of aesthetic perception and imagination, as operations of identification in the work of art and in the actions that produced it, it is part of a totally naturalistic and Darwinian reading, that is, within the multiple evolutionary strategies of the different species in a social context, in order to favor their understanding, cohesion and, therefore, survival.

I conclude this article of mine by trying to draw some reflections on school teaching, referring to my experience "in the field", as previously mentioned. I can confirm, personally, that the mode of perception and visual-motor learning, endorsed by the functioning of the mirror system, finds exemplary application in the teaching of artistic disciplines by my colleagues in the field. The habit of pupils attending such a Lyceum of Arts to use them, then perfects them in such skill, than in other high school addresses, more related to cognitive learning in linguistic and conceptual-theoretical mode (such as the Liceo Linguistico and Licei Classico e Scientifico), it is not very cultivated, for the benefit of cognitive learning.

Consequently, it is clear that teachers of scientific, cultural and linguistic disciplines, whose task is to convey conceptual and linguistic content and methods of knowledge, are better able to communicate such contents and modalities to the students of a Lyceum of Arts, making leverage on the mode of visuo-motor learning, through a

teaching that preferentially uses maps and schemes, reducing the use of particularly abstract and complex concepts and languages.

As I usually say, both for a teacher and a pupil the fruitful “contamination” of different and complementary teaching and learning methods, about which training and refresher courses are hoped for, is a source of cultural and personal growth, and therefore I hope that these two types of cognitive and visuo-motor teaching and learning modalities are increasingly integrated, in the direction of a global education of the richest and most complete person, within a school that is receptive to the latest investigations and scientific discoveries.

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