

ART ^ NEUROSCIENCES

SEMILLA 07: Meta-ASTER

0. CONTACT DETAILS

0.1 Surname and first name

Jorge Tirado Caballero

0.2 Contact e-mail address

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0.3 Let us get to know you a little bit through your participation in websites, blogs, social networks, etc.

[Jorge Tirado-Caballero \(researchgate.net\)](#)

[Jorge Tirado Caballero - Google Académico](#)

[\(29\) Jorge Tirado Caballero | LinkedIn](#)

0.4 What is your background and in which institution do you work?

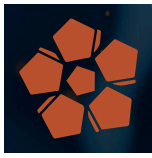
Bachelor's Degree in Medicine from the University of Sevilla

Specialist in Neurosurgery at the Intercenter Neurosurgery Unit, Virgen Macarena Hospital – Virgen del Rocío Hospital.

Associate Professor of Health Sciences at the Faculty of Medicine, University of Cádiz (2022-2023).

0.5 Gender

Male



ART ^ NEUROSCIENCES

0.6 Age range

31-40

1. ESSENTIAL DIMENSION

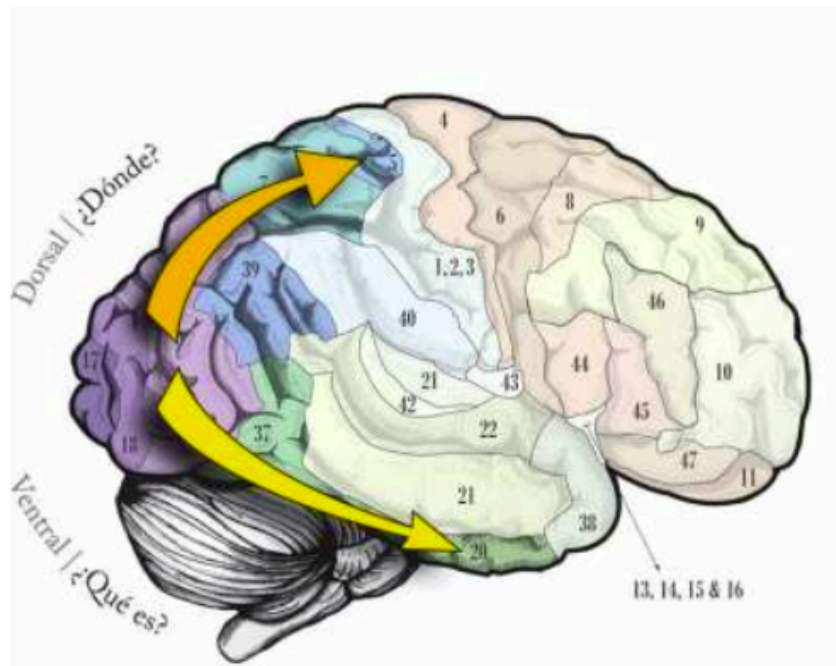
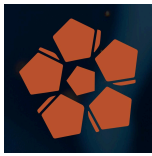
1.1 Seed name

Meta-ASTER: The Brain as Convergence and the "True Reflection" of the Artist.

1.2 Seed summary

Neuro-art or neuro-aesthetics is the discipline that studies the brain processes underlying artistic creation, ideation, and interpretation. The observation and execution of an artwork involve a complex network of neural circuits associated with perception, emotion, memory, psychomotor skills, and cognition. These circuits not only allow us to objectify and discern the shapes, colors, and movements of an artwork, but they also enable us to ascribe emotional and aesthetic meaning to them.

The interpretation of an artwork begins in the visual cortex, located in the occipital lobes of the brain. There are eight hierarchically differentiated areas in the visual cortex (V1 to V8), each of which is interconnected with the others through neural circuits.



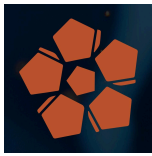
Fuente imagen: Desarrollo Neuropsicológico de las Habilidades Visoespaciales y Visoconstruccionales. Roselli, M. Revista de Neuropsicología, Neuropsiquiatría y Neurociencias.

These neural circuits are referred to as "pathways." The ventral visual pathway, also known as the "what" pathway, is one of the primary visual pathways in the brain. It includes areas such as V1, V2, and V4, and is primarily responsible for observing the form and color of objects, as well as depth perception. Once the information reaches the temporal lobe, semantic recognition of the artwork takes place, identifying symbols that allow for its later interpretation.

The dorsal visual pathway is referred to as the "where" pathway, as it particularly deals with aspects such as motion and spatial localization. This pathway predominantly links the visual area V5 with the parietal lobe of the brain. The dorsal pathway becomes particularly relevant during the creation of a work of art, as its visuospatial ideation depends on the parietal lobe.

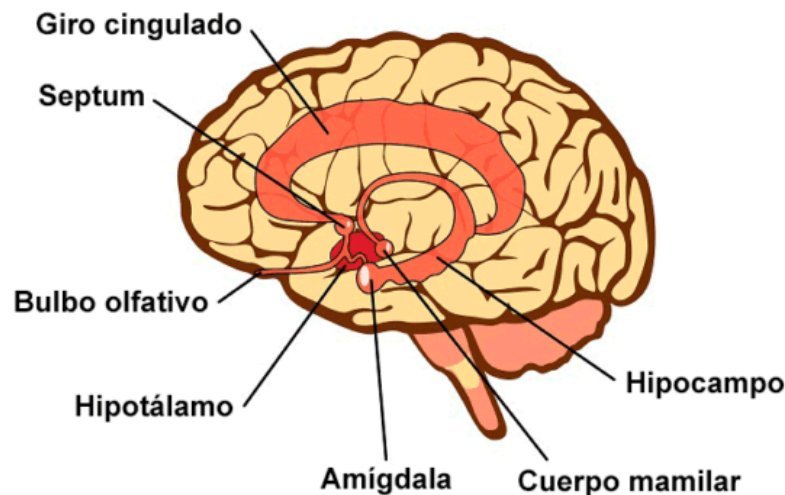
After receiving the visual information, the brain encodes and processes it from both emotional and cognitive perspectives. These two concepts are closely intertwined, constructing the brain's holistic vision of the artwork. However, there are specific anatomical areas closely involved in both interpretations.

Regarding emotional interpretation, the limbic system is undoubtedly the main structure involved. The mesolimbic system is strongly connected to motivation and pleasure mechanisms. The amygdala, located in the temporal lobes, is responsible for the emotional ideation of the artwork, handling intense emotions such as fear, joy, anxiety, and even orgasms.



The hippocampi, limbic structures related to memory, can associate that emotion with previous memories, causing the artwork to resonate in a personal and subjective manner.

SISTEMA LÍMBICO

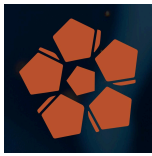


The cognitive interpretation of an artwork takes place in the prefrontal cortex. This area of the brain analyzes the symbolic meaning, historical context, or aesthetic intention behind the work. This process can be prolonged and requires a deeper analysis, involving the activation of networks dedicated to critical thinking and reflection. During the conception of a work, the prefrontal cortex defines its purpose, imbuing the artwork with artistic intentionality.

Thus, neuro-art studies the creative and interpretative processes of humans scientifically, helping us understand the motivation behind art and contributing to a better understanding of this essential aspect of human development. Neuro-art also examines the brain patterns that artists develop in their work, enabling a better understanding of their style and creative process. Knowledge about the effects of art on the human brain forms the scientific foundation for therapies such as art therapy, where the emotional and cognitive processes associated with art are put to use for mental health.

The convergence of science and art is the cornerstone of the ASTER project, which is why the seed title "Meta-ASTER" and the human brain as the point of convergence for both fields is so fitting.

1.3 Metaphor



The Invisible Canvas. The brain is the first place where a work of art is conceived. The ideation of a piece, the search for a purpose, is the task of the prefrontal cortex, which works with the variable architecture of memories and personal experiences that build artistic inspiration. It represents the invisible canvas where the work begins to develop before bringing it into the material world.

The Brain Interpreting Itself. The creation of a work of art, the pictorial formalization of an idea or concept, involves an immensely complex cerebral process. The brain creates, intuitively deduces, and reasons in order to conceive works of art to which we assign symbolic meaning.

The True Reflection of the Artist, referring to the cerebral process that defines artistic creation. The artistic construction of a work is defined by the ideational and psychomotor capabilities of the nervous system of those involved. It constitutes an intimate process of material and personal development.

1.4 Keywords

Neuro-art, Neuroaesthetics

1.5 Scientific field (general)

Neurosciences

1.6 Scientific subfield (specific)

Neuro-art, Neuroaesthetics

1.7 Resources (File)

Shared folder

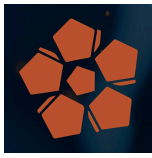
1.8 Resources (Links)

2. ADDITIONAL DIMENSIONS

2.1 SYNAESTHETIC DIMENSION

This dimension seeks to associate certain sensory characteristics to the seed.

2.1.1 What colours does this seed suggest to you?



This seed suggests to me the entire chromatic range, the entire spectrum visible to human beings, since it seeks to recreate artistic ideation by conceiving it as a holistic element.

2.1.2 What sounds or music does this seed inspire you?

An immersive, multi-instrumental sound, like an orchestra with hundreds of instruments that resonate harmoniously, then chaotically, and then harmoniously again.

2.1.3 What aromas would you associate with this seed?

Oxygen, like a torrent of fresh air entering the lungs.

2.1.4 What flavours does this seed avoke in you?

A sweet and umami flavor.

2.2 EMOTIONAL DIMENSION

This dimension seeks to explore the personal meaning of the seed.

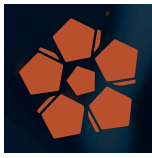
2.2.1 What was your motivation to dedicate yourself to this field of research?

What are your personal reason to suggest this seed?

Artistic inspiration and motivation are universal elements in human beings. It is a form of language, a way of transmitting ideas, exposing your intimacy and, also, a way of building a legacy.

The artistic intention of scientists is one of the driving forces behind the group of neuroscientists who propose the seeds. This meta-seed seeks to collect that inspiration and also reflect the invaluable work of the artists who will develop the ASTER project this year.

Within neuro-art, I find the use of art in art therapy in psychology interesting. Art therapy is based on the stimulation of dopaminergic reward circuits (neurotransmitter linked to motivation), and can help in the treatment of psychological disorders such as depression or anxiety. Understanding how art affects the behavior of our brain opens up the possibilities of using it to heal our mental health. I think it is a field that will gain relevance in the future, and studies



in neuroart will help provide a scientific basis for the benefits of this type of therapy.

2.2.2 What metaphysical reflections does this seed provoke in you?

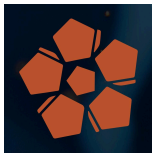
The feeling that science and art, despite having different intentions, come together in the most complex organ of the entire human body. How both ideas grow and reproduce, with common neural anatomical elements. The same visual and psychomotor pathways that an artist uses to sculpt are used to carry out surgery. I believe that this seed involves understanding the brain as a nexus, as a confluence of paths.

Art constitutes a window to the being, a reflection of our imagination captured in the earthly world. It involves capturing infinite concepts in a finite work. Artistic representation constitutes a representation of human consciousness, of its intention to transmit an idea, a concept or reproduce something beautiful. Neuro-art investigates one of the highest qualities of the human being, the capacity to be inspired and imagine, the capacity to create something genuine and personal.

2.2.3 What ethical reflection or challenges would you associate with this seed?

The main ethical challenge I face is about the brain's recognition of "beauty" and "ugly" in art. Being able to understand the ethical foundations and prejudices that build the observer-artist's gaze and that subsequently condition the ideation processes. Understanding what drives a certain stimulus to be processed by the brain as something "beautiful" is an ethical challenge for me in this field. After all, knowing how our brain works is a way of knowing ourselves and the transcendence of our moral principles in the vision of art.

Another ethical challenge I face is the privacy of the neural data extracted in these studies. All scientific studies that cover brain activity involve in themselves an invasion of the neural privacy of that person. While it is true that the people exposed to these studies are always volunteers who have consented to participate, there is an ethical dilemma related to the knowledge of the brain activity of the same and the disclosure of this same.



Currently, social networks and other applications study behaviour patterns, including eye movements, to achieve greater adherence to these applications. Likewise, artificial intelligence applications try to reproduce the functioning of the brain's neural networks to generate texts or paintings.

Knowing the neural data of a human being means in itself having access to the most intimate functioning. The main ethical challenge that I aim for in any study that deals with neural data is precisely related to the privacy of this data and its use for economic purposes.

2.2.4 What aesthetic dimensions does this seed suggest to you?

Cables, connection, light, sound, electricity. Art understood as an enormous circuit of information that builds, creates, conceives and gives form.

2.3 PROCEDURAL DIMENSION

This dimension seeks to explore the scientific processes that are usually followed when investigating this topic.

2.3.1 Description of the research process

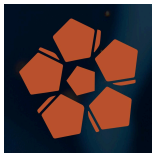
Functional MR (functional magnetic resonance imaging)

Functional magnetic resonance imaging of the brain is the main tool used to study neuro-art. This tool allows us to obtain a live image of the individual's brain, detecting the activation of its different areas and graphically reproducing said stimulus on the screen.

The detection of the activated brain area is based on the increase in oxygen or local arterial vasodilation that occurs when the brain is electrically stimulated. The increase in the level of oxygen in an area is associated with an increase in neuronal activity in that area due to the hemodynamic response generated by neurovascular coupling.

In this way, we can visualize live how the individual interprets an artistic work in his brain. The images obtained from functional magnetic resonance imaging mark the hyperactivated area with colors, thus allowing us to locate the circuits involved in artistic observation and creation.

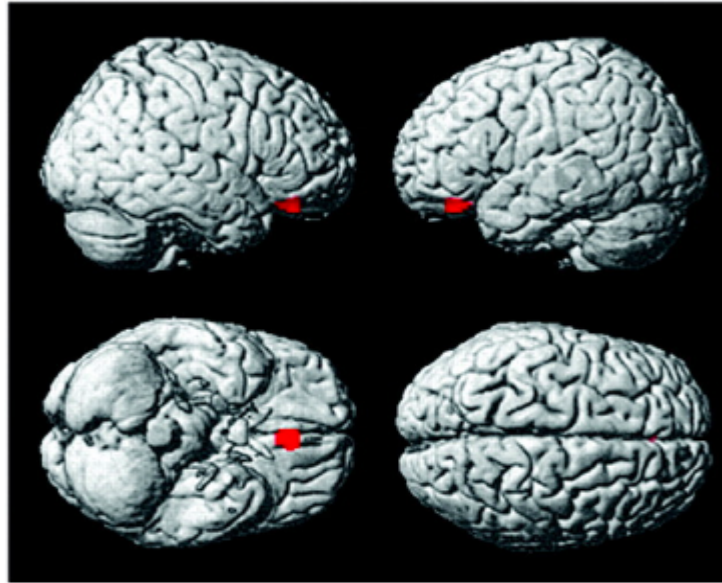
In one of the experiments carried out in this field, individuals are exposed to artistic images that must be classified into three groups (beautiful, neutral and



ugly). The objective of these experiments is to find out what changes in brain behavior are observed according to the personal perception of the individual.

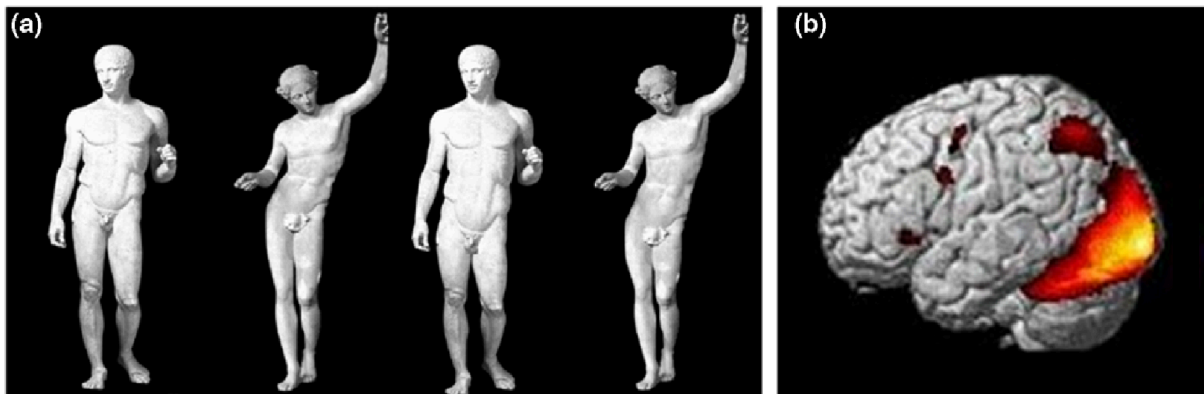
In this way, Kawabata, Zeki et al. determined that the orbitofrontal cortex is the most stimulated in the evaluation of “beautiful” or “ugly”, observing a hypoactivation of said cortex in the face of artistic works defined as “uglier” by the individuals in the study.

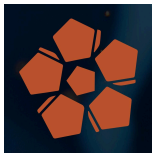
A Beautiful vs Ugly



Fuente: Kawabata H, Zeki S: Neural correlates of beauty. J Neurophysiol 2004, 91:1699-1705.

Another component under study is visuospatial vision. This vision coordinates the activity of the occipital and parietal lobes. The activation of this area allows the artistic interpretation of the dimensions and depth of a work, understood as its spatial distribution. This is especially important in the observation of three-dimensional works such as sculpture or installation. Di Dio et al. demonstrated the activation of this neural circuit in the dimensional interpretation of Renaissance sculptures. The models were represented in the following image:





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Fuente: Di Dio C, Macaluso E, Rizzolatti G: The golden beauty: brain response to classical and renaissance sculptures. PLoS ONE 2007, 11:e1201.

2.3.2 Research process diagram

2.3.3 Link to the descriptive video of the process

2.3.4 What tools are typically used in this field of research? Whether instruments, technologies, hardware or software.

Functional magnetic resonance

3 PERSONAL SUGGESTIONS

4 INVOLVEMENT OF THE SCIENTIST IN THE CREATIVE TEAM

4.1- What role would you like to play in the co-creation process of the SciArt work?

Participate punctually in the conceptual discussion and co-creation of the work