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Science and Art, Epistemological Analysis

Dr. Bonaventure Balla
Associate Professor, Department of English and Foreign Languages, Norfolk State University, Norfolk, USA

Corresponding Author: **Dr. Bonaventure Balla**

Abstract
Some researchers look at others from other fields condescendingly and contemptuously. For instance, some regard poetry, poets, and art in general as useless. They have not yet understood that every epistemic area contributes to the quest for truth and the advancement of knowledge. Truth can be found intuitively, discursively, or both. Art can be viewed as the most dignified expression of the divine signature on creation. The Absolute manifests Himself through art to intuitively achieve masterpieces. Art needs to be triggered by imagination to take flight and produce them. It can thus be inferred that imagination catalyzes creation and is credited as "the most scientific faculty"(Baudelaire). Einstein praises it as well and states: "Imagination is more important than knowledge...Logic can take you from point A to point B. Imagination can take you everywhere." Art itself is governed by imagination, which vouches for its scientific characteristics. So, the goal of this article is to deconstruct, disqualify, and put an end to an unnecessary epistemic war: science against art. This war was fueled by ignorance and a spurious, aporetic, and baseless analysis. Through my article, I will demonstrate that art has scientific characteristics and science can be illuminated by art. They are the two sides of the same coin, teleologically similar, but expressed differently. For the sake of argumentative efficacy, I will use an epistemological approach in this article.

Keywords: Epistemology, Knowledge, Science, Art, Epistemic Fields

Introduction

Epistemology focuses on the diligent and critical analysis of all areas of human knowledge including science and art. It was strengthened and revived by the French philosopher Gaston Bachelard and found its echo in scholars affiliated to logical positivism such as Kurt Gödel, the great mathematician and Einstein's friend, and Rudolf Carnap to mention but a few. The word 'epistemology' itself designates a concept, a notion made up of two components: the Greek root *ἐπιστήμη* (epistēmē, "knowledge") 'episteme' that means knowledge, and the suffix λογία ('logia'/ 'logos') that refers to 'science', 'word', 'study', 'divine word', and 'God'. From this cursory etymological analysis, it can be inferred that epistemology consists in the theory, critique, condition, sources, limits, and status of knowledge. It is one of the main areas of classical philosophy. Indeed, the latter consists of five main fields: metaphysics, ethics, logic, epistemology, and esthetics. Epistemology seeks to answer questions such as: "What do we know?" "What does it mean that we know something?" "What makes justified beliefs justified?" and "How do we know that we know?" Scientists have always been interested in philosophy/epistemology. For instance, Einstein, in his later years, emphasized its value when he wrote: "Science without epistemology is…primitive and muddled." (Pais, 13) Epistemology is very important because it intrinsically enables us to assess the theory, scope, condition, and status of knowledge, to conduct an unbiased, flawless critique of it so that we can establish benchmarks necessary to evaluate how far it has progressed. Within this framework, it becomes clear that epistemology is, linguistically speaking, diachronic because it studies and shows the evolutionary path of knowledge (science) through human history. In this respect, it proves that the last three centuries (18th, 19th, and 20th) have lionized epistemic specialization whereas from the Roman and Greek Antiquity to the seventeenth century scholars used or, at least, tended to be generalists instead of specialists. As a matter of fact, when Plato stated: "only geometers are allowed in this room […]**",** he was not literally referring to geometers or mathematicians, but all those who were involved in the study of knowledge that was intrinsically covering a broad spectrum of disciplines: math, physics, art, botany, chemistry, architecture, astronomy, philosophy, politics, theater, poetry, music, to mention but a few. All these subjects and others were inherently part of knowledge/science, that is, the curriculum of every disciple. Over time, with the presumable will from scholars to deepen their research on one specific area, specialization increased more and more exponentially in such a way that most disciplines expressed the need to exercise their respective full-fledge aspect. In contrast, during the Greek Antiquity, knowledge was functioning as a monolithic and harmonious unity within which all its sub-unities were symbiotically interconnected under the aegis of the human mind, the highest noetic authority that arrogates itself the right to coherently oversee all this interconnectedness.

Today, overspecialization has almost reached its apex; however, most experts forget or are not factually cognizant that knowledge, in its inseity, is one and, accordingly, cannot be divided into bits and pieces. We will examine such oneness through the specific case of science and art, two disciplines that are overwhelmingly opposed to show that it is neither logic, not epistemologically befitting to oppose them. Moreover, this very opposition can be detrimental to progress and the advancement of knowledge. Such will be the substance of this analysis.

Materials

Science and art seem to be two opposite epistemic fields and are even generally opposed by several researchers. The "gap" between these two areas was significantly broadened at the end of the seventeenth century when most fields of human knowledge started functioning motu propio. However, nowadays, it is proven that there are hidden links between most disciplines and most elements in the universe abide by the same laws. One of the most irrefutable pieces of evidence of such connectedness is provided by Heisenberg and Schrødinger, two pioneers of quantum physics, and summarized in this formula: "The total sum of the minds in the universe is one". As a matter of fact, the modus operandi of sub-atomic particles attests to the fact that everything can be connected to everything. De facto, several sub-atomic particles can be far apart, but still be interconnected in such a way that the very motion stemming from one affects all the others instantaneously regardless of their distance. This principle known as 'quantum entanglement' and inherent in the quantum level can be extended to the galactic level by virtue of the law of correspondences. That is why Hermes in the Emerald Table corroborates this law and asserts: "So above, as below." In *Les Fleurs du Mal* the proto-symbolist poet Baudelaire also acknowledged such interconnectedness and stated: "God has created the universe as an indivisible and complex totality." (7). When we explore this canon and apply it to the realms of science and art what do we realize? What is science? What is art? Are they factually, intrinsically opposite? Are they governed by the same or different laws?

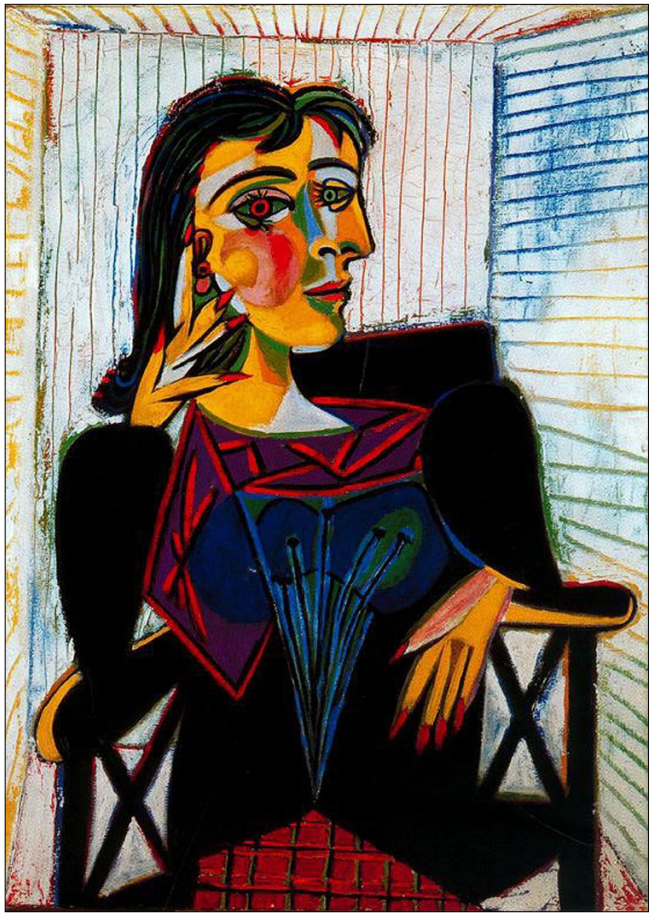
Science is an epistemic field aspiring to reach the truth through logic, empirical verification and driven by rigorous principles so that we, as human species, can harness the arcana of the universe and assert our supremacy over it by diligently applying those principles. The foundations of scientific lore were laid by several scholars: Francis Bacon, René Descartes, Claude Bernard, Albert Einstein, Gaston Bachelard, and the proponents of logical positivism (Kurt Gödel, Rudolf Carnap). Even though they did not live at the same era, they subscribed to the same core tenets of the scientific method. This method subsumed the hypothetico-deductive sub-method specifically made up of three benchmarks: the observation of a phenomenon (1), building of hypotheses (2), and empirical verification (3). The most important stage of the process was the empirical verification conceived to vouch for the truth, corroborated by the litmus test. Accordingly, whenever a phenomenon had stood and passed the rigorous test of empirical verification, it became factual and could be applied and duplicated ad nauseam everywhere, under any circumstances and conditions, independently and objectively. Therefore, in the light of its ubiquitous and unbiased applicability, researchers were endowed with the pragmatical framework to create laws out of it. Observable phenomena, through this process, can lead to credible facts. Generally, science operates through the causality principle, a deterministic pattern nurtured by the fact that the same causes, under the same conditions, necessarily lead to the same effects. It follows that when a phenomenon is observed, a hypothesis is built and experimentation has come to fruition, one can find its etiology or cause based on its effects. For example, Dr. Pierre Broca, a brilliant French medical doctor and researcher was working on the human brain in the nineteenth century when a patient was brought to his attention. He was suffering from syphilis. Dr. Broca noticed that he could not speak but the only words he could proffer were "tan". When they asked him a question, whatever it was, he just replied 'tan'. Accordingly, he was nicknamed 'Tan'. Every expert tried to unravel the mystery enshrouded in its inability to speak and strange demeanor, but of no avail. Dr. Broca used his expertise and tried different types of experiments, but he could not decrypt the cause of his ailment. Unfortunately, at that time, brain surgery was unknown and brain scanning devices such as Positron Emission Tomography (P.E.T.) or Magnetic Resonance Imaging (MRI) were not invented yet. Consequently, he could not figure out what was going on inside Tan's brain. Subsequently, Tan died, which gave him the opportunity to open his brain and check what was wrong inside of it. To his greatest surprise, he thus realized that the whole left hemisphere of Tan was damaged whereas the right one was completely normal as well as the corpus callosum (the membrane that links the left hemisphere to the right). Then, he eventually found out that the left hemisphere of the human brain controls language. From that discovery he could infer that when the left hemisphere is damaged or affected (cause), a patient will suffer from aphasia or, at least, have serious linguistic problems (effect). Dr. Broca's finding turned out to be true because, afterwards, it was repeated many times and it was recurrently proven that a lesion of the left hemisphere led to transient or irreversible aphasia or, at best, caused serious linguistic problems to the subject. That is a classical case of a scientific fact and its likelihood to be applied, reiterated, and provide the same outcomes on an infinitesimal scale, independently and objectively. Thusly, it becomes possible to solve the problem because by eliminating the cause (repairing the left hemisphere), the effect is, by the same token, eliminated as well (recovery of the faculty of speaking). These considerations provide us with a lapidary, but clear picture of what science is and how it functions. How about art?

Art is a field of knowledge whose ambition is to tame the absolute and concomitantly reach the truth. Regardless of their myriad of forms: music, painting, literature, dancing, architecture, drawing, sculpture, cooking, etc…, most arts have similar characteristics: eminently high expression of the beautiful, highly sophisticated structure, formal rigorism, striking parallelism, perfect symmetry, meticulous sense of proportion, very high degree of balance, absolute lack of randomness, possibility to measure, quantify, classify their elements, among several others. In *Transcendental Esthetics*, Kant declares: "a work of art is not the representation of a beautiful thing, but the beautiful representation of a thing." In this definition, Kant emphasizes the signifier, that is, the formal expression by which the object is represented while he de-emphasizes the signified, that is, the very essence of the thing represented. This means that through a work of art, the signifier overweighs the signified, which means the way the object is represented is by far more important that its very

essence because art is so highly sophisticated that it finally becomes an epistemological challenge. This will require the special hermeneutic expertise of the critic to make it comprehensible. Its high level of sophistication, rigoristic formalism will shake and move the observer/viewer down to the inner core of his/her soul. In the process, it will induce strong emotional satisfaction in him/her. Given these considerations, we can view music, for example, as an art because it subscribes to the canons inherently associated with art itself. Indeed, a piece of music is endowed with the possibility to shake and move the listener down to the very inner core of his/her soul (outstanding arrangement of harmonious sounds). Additionally, it does have criteria pertaining to art: rigoristic formalism (very precise recurrent patterns/utter absence of randomness), eminently high expression of the beautiful (sounds are meticulously selected by virtue of the metrics of specific frequencies (specific number of hertz, no room for randomness, taxonomizing, precise measurement), creation of eurhythmy (optimal type of rhythm to perfectly fit a specific mindset and specific chords), injection of poetry into the text to set up a perfect agreement between sounds themselves (rhyme scheme) and between specific sounds suggesting specific mental states (Cratylism) to create a universal language (language whose sounds and materials are so meticulously and perfectly modulated that they suggest the meaning of the piece of music itself). It dawns upon us that a piece of music can be viewed as art. However, since the intrinsic canons associated with a piece of music are the very ones typical to science, it can be inferred that music can be viewed as science as well. Moreover, nowadays, research proves that music can be utilized to heal brain injuries/damages. De facto, it has scientific qualities: vibrations, frequencies, sound waves, a wavelength, harmonics, which confers upon it the unique possibility to be measured, assessed, quantified, and used for specific purposes. Precisely, the medical field proves to be one of them. As a specific illustration, we have the case of Arizona Congresswoman, Gabrielle Gifford who was shot in the head by a gunman in January 2011. The bullet hit her brain causing a serious injury, but through a brilliant therapy symbiotically combining surgery and music with specific frequencies, it became possible to cure her. Dr. Sanjay Gupta, a neurosurgeon and journalist at CNN, confirmed the therapeutic procedure in an interview with Anderson Cooper. In a January 2011 interview, Dr. Gupta stated to Anderson Cooper, “Music can have an amazing effect on the brain. Just hearing or reminding sounds crossing from the left side of the brain to the right side can truly harness the brain.” This can be explained by the fact that music is also part of science. As such, it is endowed with the same principles that we find in science: specific frequencies, wavelength, energy, vibration, harmonics that are used to heal a patient. De facto, it can synergize with neurology to positively impact the brain through a technique called “brainwave entrainment” or “brainwave synchronization,” a practice that aims to cause brainwave frequency to fall into a step with a periodic stimulus having a frequency corresponding to the intended brain-state (for example, to induce sleep), usually attempted with specialized software. The brain itself is a mass of muscles, that is, matter. Since sounds and appropriate frequencies can affect matter, music (essentially organized, rhythmic and coherent sounds) with relevant frequencies can affect the brain as well and any other form of matter. The most common instance of this causality principle (sound over matter) is demonstrated whenever soldiers prepare to cross a bridge. Prior to crossing it, they must stop marching rhythmically to reduce the intensity of the frequencies generated by their march (sound and vibration/frequency and its underlying energy). Failure to do so will cause the bridge to break and collapse. Nurtured by this observation and empirical verification, brilliant minds such as Nikola Tesla and Einstein stated: “If you need to find the secrets of the universe, think in terms of energy, frequency and vibration.” In *The Universe the way I see it*, Einstein even went further to say, “the medicine of the future is the medicine of frequencies.” Moreover, to refer back to music, in a concert the conductor's presence is there to remind us that the musicians must act in perfect synchronicity in terms of the way they play their instruments, organize and arrange the sounds on the keyboard. Every instrument should be meticulously tuned, every musician should be in optimal unison with all the others because there is absolutely no room for randomness. Every sound must be uttered with mathematical accuracy, which can be achieved through plenty of assiduous rehearsals to attain quasi-perfection because a minor mistake or error can wreak havoc to the whole set and nullify or compromise the whole performance since the success of the whole set is preconditioned by the perfect unison between each performant and all the others. All these considerations clearly demonstrate that music can be viewed as science as well. Consequently, the relationships between these two areas can be explored in terms of complementariness, instead of opposition. They can be equated with the two sides of the same coin because both undergird the same ontological reality and are mutually inclusive. Another example of complementariness between science and art can be illustrated in quantum physics and Picasso’s painting/cubism. Cubism reflects on the perspective of physicality and how we view the universe. Every human being perceives reality differently. Let us call it "physicality". Physicality itself is not static, but ceaselessly mutating. That is precisely how artists and philosophers realized it. Heraclitus, Plato's Master used to say: "One cannot bathe twice in the same river" because physicality is constantly changing. Likewise, the way we perceive it changes. It is factually perceived or viewed according to the viewer. That is what cubism has discovered. As a matter of fact, cubism and the realms of sub-atomic particles seem to have nothing in common, but at a deeper level they share subtle links. Just as sub-atomic particles can be viewed in different aspects as particles or waves and exist at different locations at the same time (perspectivism through wave-particle duality and quantum entanglement), an object scrutinized by a cubist painter can be viewed differently and from several different angles (perspectivism). Scholastic philosophers summarize that in this axiom: *Quidquid recipitur ad modum recipientis recipitur*, or “Whatever is perceived is perceived according to the view of the perceiver/how it is perceived by the perceiver.” Cubism thus peeled off the layers of the mysteries enshrouding quantum physics. That is why Bohr acknowledged that Picasso and cubism factually helped him to decrypt and understand the arcana of quantum physics. In *Quantum Physics and the Power of the Mind* Nancy Patterson validates perspectivism and vicariously vindicated Cubism in these terms:

"Quantum physics confirms that a thing can only exists if it is observed (that is, perceived, viewed by the observer-added by me). The 'quanta' are organized according to the influence

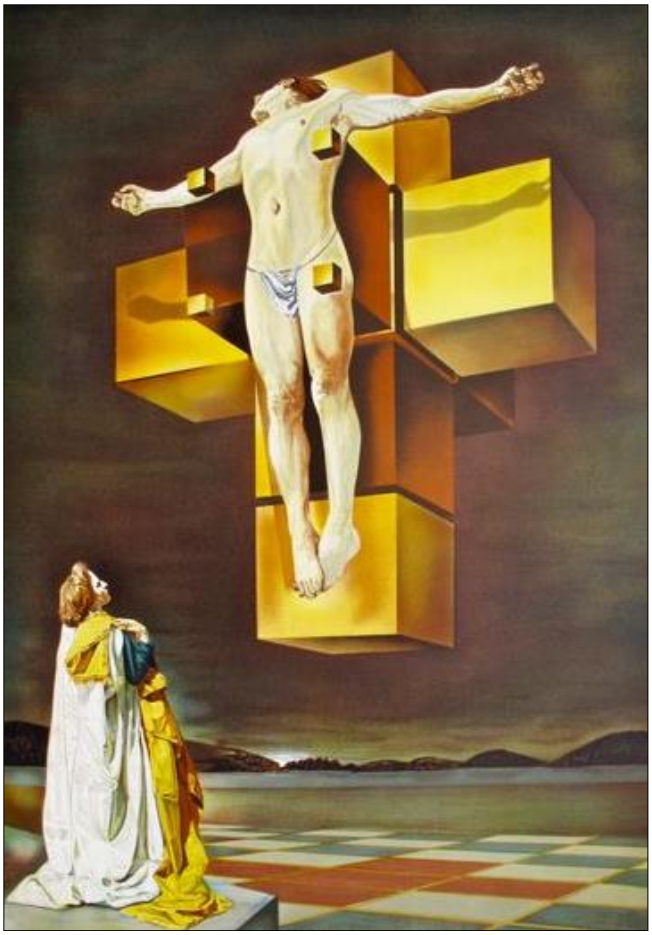
of the mind of the observers. When something is observed, the quanta merge into subatomic particles and then into atoms, followed by molecules, until finally something in the physical world manifests itself as a localized temporal space-time experience that can be perceived through our five physical senses. This leads to something that appears to be reliable and it is part of what people usually understand as physical reality." In addition to enlightening us on the modus operandi of quantum physics, cubism has also contributed to unravel the fourth dimension studied by Einstein's special relativity. In *Hyperspace* Dr. Michio Kaku elaborates on that. He says: " This Cubist "revolt against perspective" seized the fourth dimension because it touched the third dimension from all possible perspectives. Simply put, Cubist art embraced the fourth dimension." Picasso's painting Dora Maar is a neat attestation of the understanding of the fourth dimension by Cubism, a concept typically explored in Einstein's relativity, which factually demonstrates that art undergirds science and its concepts and contributes to illuminate them rather than clashes with them. Dr. Kaku comments further on this: "It (Cubism) tried to view reality through the eyes of a fourth-dimensional person. Such a being, looking at a human face, would see all angles simultaneously. Hence, both eyes would be seen at once by a fourth-dimensional being, as in Picasso's painting Portrait of Dora Maar." The following is the Portrait of Dora Maar:



Dora Maar

Besides, Surrealist painters also attested to the existence of a fourth-dimensional universe. De facto, Dali's painting of *Christus Hypercubus*, showing Christ crucified on a tesseract, an unraveled cube, is a testimony of art viewed from the fourth dimension. Astrophysicist Dr. Michio Kaku gives the following explanation in *Hyperspace*: "The shadow of a hypercube is a cube within a cube. If the hypercube is rotated in four dimensions, the cubes execute motions that appear impossible to our three-dimensional brains" (73).

Christus Hypercubus



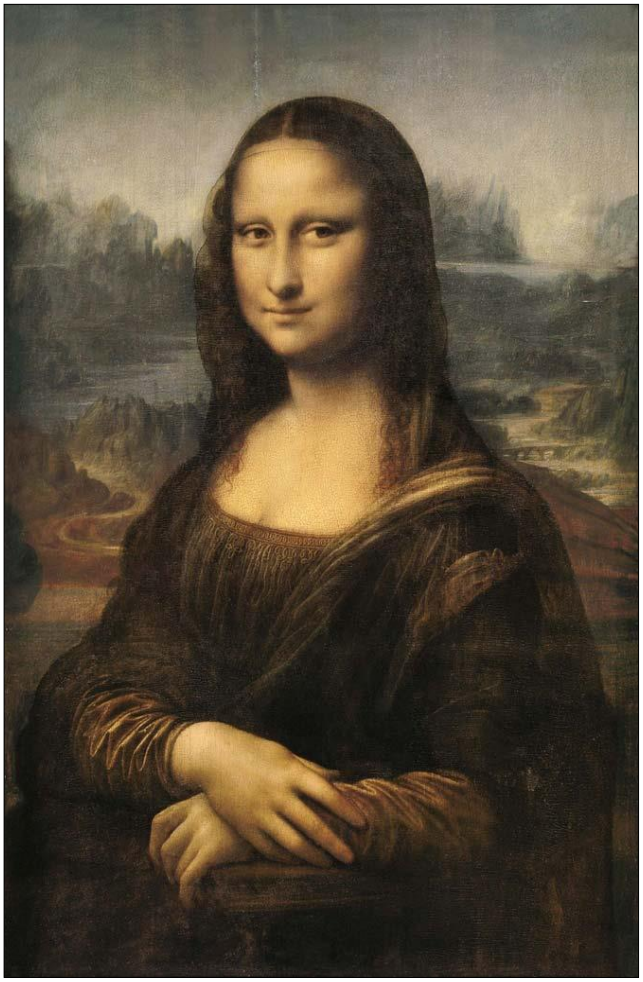
Results, findings and discussion

These instances clearly demonstrate that painting/art has illuminated physics. Other areas that actualize such interconnectedness are music, acoustics, and cymatics (branch of physics dealing with frequencies and vibrations).

The union of Christ and the tesseract reflects Dalí's opinion that the seemingly separate and incompatible concepts of science, religion, **and art (added by us)** can in fact coexist. Upon completing Christus Hypercubus, Dalí described his work as "metaphysical, transcendent cubism". Such union explains why and how most great minds of the past were concomitantly scientists, thinkers, and artists. De facto, they found out that science and art are neither divided, nor opposed ontologically, but complementary. For instance, Thales, Pythagoras, Plato, Aristotle, Plotinus, Leonardo Da Vinci, Leibniz, Descartes, Pascal, Diderot, Rousseau, Jules Verne, to mention but a few were outstanding scholars whose works magisterially and indistinctively covered science, philosophy, and art. Let us just take the cases of Plato, Aristotle, Da Vinci and Jules Verne. The first was a philosopher, dramatist, and great mathematician. Plato's contribution to the field of geometry was enthralling, but nowadays most people are not cognizant of his expertise as a mathematician. The second (Aristotle, a real, bona fide genius) was at home in every epistemic field: physics, mathematics, chemistry, medicine, astronomy, botany,

philosophy, drama and dramatology, poetics, and grammar (he also invented a methodology enabling children to learn spelling effectively and efficiently: paronymic derivation). The third (Da Vinci) was a scientist, musician, military engineer, strategist, and futuristic painter. He was the author of a special painting where he was showing 'flying iron-birds' at the time when nobody had even the slightest idea of what planes were, let alone the fact that they would be a factual reality several centuries later. Likewise, Jules Verne was a scientist, engineer, and futuristic novelist. In his novels, he talked about strange and amphibian, sub-aquatic machines moving under the sea at the time when submarines were not even designed and invented yet. These instances among so many others clearly attest to the fact that art is not truly opposed to science, but complementary to it and can also function as its precursor (Da Vinci is the precursor of planes, Verne is the precursor of sub-marines). The former (art) is a different expression of the latter (science), but viewed from the angle of its purely epistemological sophistication. To formulate this in the language of the Superstring Theory, we can say that art and science are but two different harmonic resonances of the same superstring. The following is Mona Lisa by Leonardo Da Vinci. Is it a work of art or a scientific masterpiece?

Mona Lisa



How about Picasso's *Dora Maar*, Dali's *Christus Hypercubus*? After a very meticulous examination of these three works (let us carefully revisit these abovementioned three works) can we apodictically decide whether they are works of art or scientific achievements? The answer depends on the epistemological paradigm and framework we adopt. One the one hand, if we consider that they comply with eminently rigorous criteria, such as symmetry, higher order, coherence, mathematical accuracy, and lack of any form of randomness, they turn out to be scientific masterpieces. On the other hand, if we consider that they subscribe to eminently rigorous criteria of refinement, complexity, higher sophistication, and higher organization/order, then they prove to be works of art. At that stage, they confer upon the artist the ability to sublimate nature.

Conclusion

Consequently, Mindful of all these considerations, we realize that the distinction between art and science is spurious, erroneous, and illogical. Both epistemic fields are just the two sides of the same coin whose synergy can help us to comprehend and explain the arcana of the universe. They are truly complementary, not opposite. A common mistake is to oppose them. Art is an adjuvant of science. It provides us with the vantage point and analytical and noetic framework to predict the future of science. It can truly function as the precursor of science. Additionally, it refines science by granting it higher sophistication and higher order to sublimate nature. Therefore, opposing art to science can be detrimental to progress and the very advancement of knowledge. It follows that such opposition is epistemologically flawed. Moreover, nowadays, we live in the Aquarian age, an era when transdisciplinary approach to knowledge becomes more and more crucial and vindicated by the existence of hidden connections between most areas of human knowledge. Discoveries in one field can solve problems inherently associated with another or others. Such are the cases of music healing brain injuries (synergy of music/art and neuroscience), and that of Riemannian differential geometry (mathematics) helping to cogently formalize Einsteinian theory of general relativity (physics). The latter is physics (the study of gravity) based on pure mathematics (the geometry of spacetime curvature -> synergy of physics and mathematics). Dr. Montagnier, the French Nobel Prize Winner for Medicine and his team (composed of physicists and mathematicians) have discovered that it is now possible to heal patients with waves and specific vibratory frequencies in an article titled *DNA Teleportation* (synergy of music and medicine, acoustics/physics and medicine). This clearly gives us a post hoc rationale of the fact that human culture should not be divided but unified. That is why in his book *The Quark and the Jaguar* Dr. Murray Gell-Mann, Nobel Prize Laureate for physics said: "What has always impressed me is the unity of human culture, with science being an important part. Even the distinction between nature and culture is not a sharp one; we human beings need to remember that we are part of nature. Specialization, although a necessary feature of our civilization, *needs to be supplemented by integration of thinking across disciplines*" (12).

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