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ARTS AND NATURE: THE CONTRIBUTION OF ARTISTS TO UNDERSTANDING OF THE WORLD AND THE DEVELOPMENT OF NATURAL SCIENCES

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*This paper summarises the results based on the hypothesis that art had real and tangible merit in shaping man's more profound relationship with nature to understand the natural environment better. The paper summarises the basic facts gathered in the early stages of the research. It presents some illustrated examples of some artists and outstanding products of their creative careers that justify this assumption. **Method:** Key method of the investigation was gathering information from the available literature. **Results:** The paper's main result is a unique topic; the facts carefully collected from the available sources are organised chronologically. The report summarises the basic facts gathered in the early stages of the research. It presents some illustrated examples of some artists and outstanding products of their creative careers that justify this assumption. **Conclusion:** The objective of this study was to review the available literature on the contribution of art to a better understanding of the world and its unique biosphere, to accurately map the extensive scientific interest in art and the lasting and irreplaceable work added to its development. Contrary to expectations, significantly less scientific research and writing were discovered in the study's first phase. However, the results so far also seem to support the hypothesis that there are verifiable facts and sources with which artists have contributed to scientific discoveries and a better understanding of the world. The author intends to continue the research.*

Keywords: art history, scientific discoveries, environmental art, botanic art, human anatomy, medicine

THE ROOTS OF ART IN THE REPRESENTATION OF THE NATURE

The earliest examples of artistic representations of the natural world historically recognised and respected within art societies are the Paleolithic Cave paintings of our ancestors, which depicted animals and human figures and other aspects of nature that are important to them. [2] Figure 1: (Left) Cave Paintings in Santillana del Mar, Cave of Altamira, Cantabria, Spain, c. 36,000 years ago: Bison, (right) Lascaux Cave Painting, France, Upper Palaeolithic. Figure 2: Cave paintings in the Chauvet Cave 30,000 to 32,000 years ago (Left) Group of rhinoceros (right) Cave hyena



Figure 1. (Left) Cave Paintings in Santillana del Mar, Cave of Altamira, Cantabria, Spain, c. 36,000 years ago: Bison, (right) Lascaux Cave Painting, France, Upper Palaeolithic



Figure 2. Cave paintings in the Chauvet Cave 30,000 to 32,000 years ago (Left) Group of rhinoceros (right) Cave hyena

Early examples include the ‘landscape frescoes’ from the ancient Roman period. For example, the fresco in Painted Garden on which a lush garden full of numerous flowering plants, shrubs and trees was carefully represented. Plant species carefully depicted include oleanders, pomegranates, laurel, apples, palms, strawberries, myrtles, acanthus plants, umbrella pine, oak, red fir, quince, pomegranate, laurel, holm oak, boxwood, cypress and ivy, as well as roses, poppies, chrysanthemum, chamomile, fern, violet, and iris.

Numerous birds are perched on the trees, while others fly high in the blue sky along with the upper band. (Figure 3) [3]

INTEREST IN NATURE IN THE CENTURIES OF ART

The natural world has always inspired artists, both in the background and in the central focus, and its beauty gives it an ever-present sense of awe weaving through the centuries.



Figure 3. Painted Garden in the Villa of Livia Drusilla, (detail) Prima Porta, fresco, 30-20 B.C.

The Uomo Universale: Relationship of the Renaissance Man with the Nature

The European High Renaissance artists celebrated the harmony of nature in their artworks and searched to reiterate its balance. The cultural movement of Humanism, which weaved through the period, led artists to return to classical Roman and Greek philosophies about the Universal Man (Uomo Universale) and his place in the world.

Renaissance humanism blurs the line between art and science. Artists such as *Leonardo da Vinci*, *Michelangelo*, *Raphael* and architect *Donato Bramante* are undoubtedly the most remarkable legends of

the era, exemplifying the term ‘renaissance’ man by being proficient and mastered in several subjects and interests – especially in understanding the laws of nature.

Leonardo da Vinci, widely considered one of the greatest painters of all time, was the first prime exemplar of a "Renaissance man" – a person immersed in the comprehension and accomplishment of varied interests, represents that moment when the artist and the scientist became interdependent. His specific personal interests led to his mastery of multiple fields.

The use of *sfumato* on the *Mona Lisa* creates a sense of soft calmness and infuses the background landscape with a profound realism (Figure 4, left). But Leonardo’s natural science work and engineering studies are as impressive and innovative as his artistic work. One of Leonardo’s works from his first Florentine period (1472–c. 1482) is a 1473 pen-and-ink study drawing “*Arno Valley Landscape*”, made in 1473. This study is essential because,

According to Vasari, the young Leonardo was the first to suggest making the Arno river a navigable channel between Florence and Pisa. [4] The purpose of making the “*Plan of Imola*” was to build a dam from the sea to Florence to provide a water supply to maintain the canal in all seasons.



Figure 4. (Left) Leonardo da Vinci: The *Mona Lisa* (*La Gioconda*), 1503. Louvre, Paris

Along with his groundbreaking and priceless research work on human anatomy. (Figure 5, right), Leonardo studied horses and wrote a treatise on horse anatomy. (Figure 5, left)

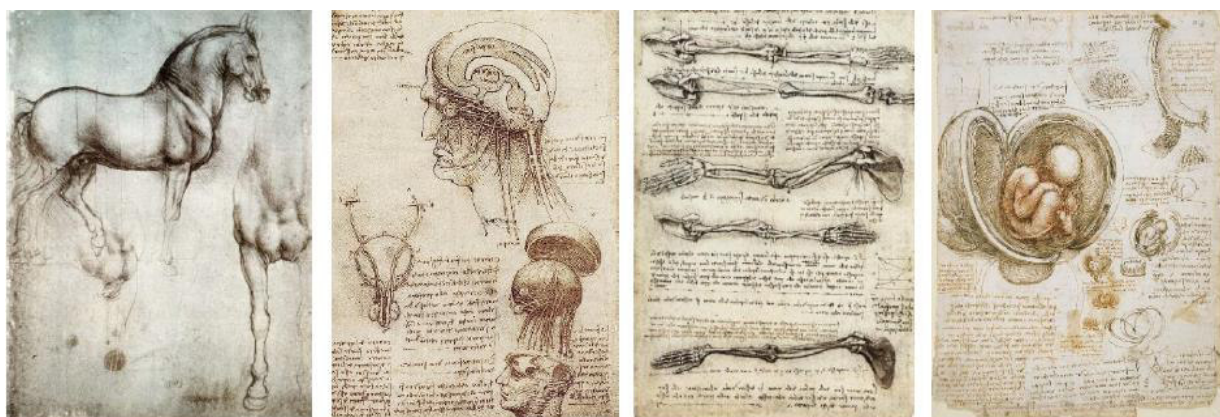


Figure 5. (Left) Leonardo da Vinci: study in silverpoint for *The Horse*, c. 1488, 1503. Louvre, Paris

Pharmacology, as an enhancer of scientific approach and realism of the artistic depictions

On the properties of herbs, the doctors used the meticulously and thoroughly compiled book *De Materia Medica*, published by Dioscorides in 77 B.C. It was copied and redrawn for fifteen hundred years until the 16th century, supplemented by poetic inserts and notes in different languages. With the beginning of the Renaissance, the book of Dioscorides did not lose its relevance. Still, the world changed drastically: Gutenberg invented the printing press. New continents and islands appeared on the Map of The World, along with the different plants and herbs that have unexpectedly proved to be a solution for the diseases.

The first authors of botanical illustrations were artists. Nearly every second page of Leonardo da Vinci and Albrecht Dürer's albums contained botanical sketches. The renaissance artists created their depictions by cognitive following the reality.

Leonardo was the first scientific illustrator who considered drawing a kind of visual thinking. "*Nature fascinated Leonardo as a mechanism and as an organism. (...) He made and accepted only those statements that he could prove through his eyes.*" As a result, "*degree of likeness to reality never before received.*" [8] Leonardo, the scientist, used his drawing skills to help him to see.



Figure 6. (Left) Leonardo da Vinci: Star of Bethlehem and other plants, 1505 and 1507. Royal Library, Windsor Castle, London; (middle) Botanical study, c. 1490; (right) Codex Atlanticus, c. 1478-1519

During the first decade of the sixteenth century, *Albrecht Dürer* (1471-1528) depicted plants in all his artworks with a new note of botanical correctness. In the age when the plant world was introduced to exotic oriental bulbs, and botany, as a subordinate discipline of science, broke away from medicine, he made several studies of the botanic and animal world. His watercolour painting entitled *The Great Piece of Turf* (Figure 7, left) depicts the plants precisely as seen growing in the field. His observations would have a lasting influence on the interpretation of flowers in art well into the seventeenth century.



Figure 7. Albrecht Dürer: (Left) *The Great Piece of Turf*, 1503, Albertina, Vienna; (middle) *Celandine*, 1526; (right) *Tuft of Cowslips*, 1526, National Gallery of Art, Washington

Herbal art of the 16th-18th century

German herbalist and artist *Leonhart Fuchs* (1501-1566), with the publication of *The New Herbal* (1542), also became a noted and vital author, which took Fuchs over 30 years to be completed. He claimed: "*There is nothing in this life pleasanter and more delightful than to wander over woods, mountains, plains, garlanded and adorned with flowers and plants of various sorts, and most elegant to boot, and to gaze intently on them.*"



Figure 8. (Images from left to right) Portrait of Leonard Fuchs; The botanical artists involved in creating images for the Great Herbal, History of Science Collections, University of Oklahoma Libraries; Mandragora (Mandrake) plant from 'De Historia'; Leonhart Fuchs: *Lilium bulbiferum*, 1543

In the 17th century, artists such as botanical and natural history artist *Maria Sibylla Merian* (1647-1717), Italian artist *Giovanna Garzoni* (1600 – 1670) and French artist *Nicolas Robert* (1614-1685), the number of recognised botanical artists emerged.



Figure 9. (Left) Two apples with a Gypsy Moth (crop) by Maria Sibylla Merian; (middle) Giovanna Garzoni: Plate with White Beans, ca. 1650–1662, Galleria Paletina, Florence; (right) Georg Ehret: Drawing of a Cedar

The 18th century was a period of excavation that brought the popularity of botanical illustration. Among them was the art of *Georg Dionysius Ehret* (1708-1770), one of the most influential botanical artists of all time and a prodigious artist. They produced many high-quality illustrations for various botanical publications and plant collectors to be highlighted. (Figure 9, right).

Other botanic artists of the period: *Franz Bauer* (1758 - 1840), the British *Elizabeth Blackwell* (1707 – 1758), Australian artists *Sydney Parkinson* (1745 - 1771) and *Ferdinand Bauer* (1760 - 1826), French artists *Pierre-Joseph Redouté* (1759 - 1840), *Claude Aubriet* (1665-1742) and *Pierre Jean François Turpin* (1775 – 1840), *Mary Delany* (1700-1788), and many more. [9]

Featured botanical art and natural illustration in Hungary

Vera Csapody (1890-1985) was a Hungarian botanist, author, and botanical illustrator known for studying and painting the flora of Hungary with Sándor Jávorka. Her over 11,000 illustrations held by the Hungarian Natural History Museum are among the most precious treasures of the Herbarium. Her watercolours are of high artistic and scientific value. (Figure 10) [10]

Other important botanical artists are *Gizella Gyurkó*, biologist, botanical illustrator, and botanical illustrator *Erika Urai* and *Magdolna Csépe* (Figure 11), whose work is also high quality and significant. [11] [12] [13]



Figure 10. Vera Csapody: Botanical illustrations for book *Flowers of Forests and Fields*, 1958 [14]



Figure 11. (top row) Botanical illustrations of Gizella Gyurkó; (bottom row) Insect illustrations of Erika Urai

Study of nature and atmospheric events: The Landscape Paintings of the 17th-19th century

The classical painter *Nicolas Poussin* (1594-1665) produced an essential painting in art history. He is notably the inventor of the “ideal landscape” where man is intimately linked to nature, portrayed

majestically and gloriously. In the 18th century Rococo period's romantic and poetic idealistic artworks depicting the beauty of the countryside landscapes, a great movement started toward the idealised representation of the beautifulness of nature.

The inhomogeneity of space on Earth manifests in the different intensities of landscapes, the complexity of places, the unevenness of terrain, vegetation and climate. (Figure 12, left) Rococo painter *Jean-Honoré Fragonard* (1732-1806) depicts nature as an idyllic setting.



Figure 12. (Left) Nicolas Poussin: *Le printemps*, 1660-64; (right) Jean-Honoré Fragonard: *The Swing*, 1767. Wallace Collection, London

English naturalist painter *John Constable* (1776-1837), best known for his natural landscapes and images that idealise living in connection with the land and nature, revolutionised landscape painting in the 19th century—moving away from the highly idealised landscapes to realistic depictions of the natural world created through close observation. English painters *John Constable* and *J.M.W. Turner*, German painter *Caspar David Friedrich* and the American *Thomas Cole* held a more grounded appreciation for the natural world and our human dependence upon its atmosphere and sheer power. In addition to the conditions perceived as constant, they perceive landscape as beautiful or majestic, depending on the weather, lighting, and atmosphere composition. They are concerned with capturing rare constellations and unusual interplay of atmosphere, water, and light, which man sees only once in his life. [15] Constable is most clearly remembered for his landscape oil paintings, famous for capturing the effects of fundamental change on the countryside. He was fascinated by changing patterns of clouds, weather and light. He sought to capture these moments in his artworks with large, loose brushstrokes that allowed him to create expressive depictions. (Figure 13)



Constable deepened his scientific knowledge of the weather by reading booklets published by meteorologists *Luke Howard* and *Thomas Forster*. [16] In collaboration with Howard, experiments with new aesthetic forms in response to the climate's challenges to representation were done. Efforts to stably depict England's climate are shaped in parallel with the polluted atmosphere of industrial, imperial London and the disciplining visuals of the modern state.

John Constable's fascination with weather and its ability to change a landscape greatly influenced his scientific approach to painting cloud formati. It was an open space with a vast expanse of sky. Constable upgraded his artwork by painting in the same place at different times of the day or in various weather conditions; he would be returned on numerous occasions to his favoured location. He quickly sketched the same landscape to demonstrate differing states' dramatic effects on light and colour. [17]

Constable's artistic practice highly influenced the art of his age. Painters from the French Barbizon School strove to represent real life in and amongst nature; the picture shown on Figure 14, left, was shown in an exhibition held in Paris in 1867 and was dedicated to *Théodore Rousseau* (1812-1867), a French painter of the Barbizon school.



Figure 14. (Left) Théodore Rousseau: A Morning in Early Summer in the Forest of Fontainebleau, 1861; (right) William Turner: Dutch Boats in a Gale, 1801, National Gallery, London

English Romantic painter *William Turner* (1775-1851) was known for his expressive colourisation of imaginative landscapes. Violent marine paintings have been campaigned by the leading English art critics, such as John Ruskin. (Figure 14, right)

Ideology, art and environmental consciousness of John Ruskin

The great Victorian writer, philosopher, artist and art critic of the Victorian era, *John Ruskin*, whose ideas shaped British attitudes to culture and nature in the 19th century, believed all beauty comes from the heart; the loveliest piece of art has its roots in the natural world. Ruskin argued that all architectural ornament should represent nature, and it is ugly, terrible and immoral to have an example of anything but nature. (Figure 15)

Ruskin is considered the first artist who paid attention to climate change and became an artist on the front line of global climate change; the aquarelle study he created was based on some of the first known alpine photographs taken by the nineteenth century's esteemed art critic. Using the early daguerreotype process, he captured more than forty views of Switzerland between 1849 and 1858. Even Ruskin feared that photography would negatively impact art; he appreciated its practical function. (Figure 16, left)



Figure 15. (Left) Portrait of John Ruskin, 1863; (middle) Study of a Kingfisher, 1871, Ashmolean Museum, Oxford; (right) Watercolor study of plants

His followers, such as Sir Richard Owen, founder of the Natural History Museum in London, believed that nature is God's work, making him a fierce opponent of Darwin. Artists began worshipping the greatness and beauty of nature, believing that humans should remain connected to it.

In the painting visible in Figure 16, left, Swedish painter Elias Martin wants to depict the power and beauty of nature. The rugged terrain forces the trees to grow in irregular patches of land and branch off in different directions. The height of the mountains reinforces the immense strength that nature has over man.



Figure 16. (Left) John Ruskin: Mer de Glace-Moonlight, 1863, Alpine Club Photo Library, London; (right) Elias Martin: Romantic Landscape with Spruce, 1768/1780, Nationalmuseum Sweden

The 19th-20th century art movements' contribution to understanding the nature

The nineteenth-century artists had great faith in the world of nature. In the 19th century, Impressionists (Claude Monet, Vincent Van Gogh, Pierre-Auguste Renoir, Edouard Manet, and Claude Monet) were challenged to capture snapshots of a moment. The *Plein air paintings* notably captured the artists' relationship with his immediate surroundings and the environment. The art was obsessed with the air and light, and one key goal was to understand momentary visual stimuli reaching the retina. (Figure 17)



Figure 17. Paul Cézanne: L'Estque, (right): The Sea at L'Estaque, 1876, The national gallery, London

Art Nouveau artists went to nature as a significant source of inspiration and were often careful botany students. The French artist *Emile Gallé* (1846-194) studied natural science at the Lycée Imperial in Nancy. As an assistant to his father, he made floral designs and emblems for faience and glass. He became an accomplished botanist and wrote scientific articles on horticulture. He collected plants from

the region and made numerous drawings of plants, flowers, animals and insects, which became the main subjects of his art. (Figure 18).

Grasset realised the applications of plant study for the new 38 ornament, and Obrist started his career as a natural scientist. Ernst Haeckel, the German biologist and explorer who



Figure 18. Emile Gallé: (Left) Designs of two vases by Gallé, 1885, Musée d'Orsay; (right); Begonia rose flower cup, 1894, Musée d'Ecole de Nancy

ENVIRONMENTAL ART: DRAWING ATTENTION TO THE PROTECTION OF THE NATURAL ENVIRONMENT

Environmental art – also known as Ecological art, is a range of artistic practices encompassing the historical approach to nature in art and recent ecologically and politically motivated works. *Agnes Denes* (Dénes Ágnes), a Hungarian-born American conceptual artist, is one of the best-known Environmental artists, producing work that pushes the boundaries of art into disciplines such as activism. One of her most famous artwork is "Wheatfield - A Confrontation" (Fig 19, left), consisting of two acres of wheat planted and harvested in Manhattan's financial district, Battery Park landfill, downtown Manhattan, the year 1982. A masterpiece by British artist *Andy Goldsworthy* reverses the English agricultural tradition of building stone walls to demarcate areas. Its wall embraces and protects the trees instead of marking the space required by a man where they could otherwise be destroyed. (Figure 19, right)



Figure 19. (Left) Agnes Denes: Wheatfield - A Confrontation, 1982; (right) Andy Goldsworthy: Storm King Wall, 1997-98

Nature as a Work of Art

Today's anticultural civilisation has become alien to nature. Contemporary artworks from all around the world draw attention to the continuous connection between man and his environment. Art is looking to research the signs of life-giving nature in the world. Art explores the characters of life-giving nature in the world, and artists want to indicate that it is a living quality. So artists see the resource in their depiction of nature and want to draw attention to its rehabilitation and the need for healing. Artists draw attention to the rights of nature and the need for wildlife to survive; they indicate that it is a living quality

as ancient as natural art is, and culture is given its name as a significant branch of the fine arts. Artis is related to the physical and environmental art that carries the work alone while also being open to other ideas. From the point of view of philosophy, the sciences meet the problems of cultures and the environment. In our age of hyper-technologies, we are fundamentally part of nature and the ecosystem. In *Yolanda Gutiérrez's* (Mexico) artwork, the branch's shadow is significant because "*whatever has a shadow is alive*" – the shadow supports the living. *Ferenc Varga's* artwork draws attention to the beauty of the trees and pays attention to them. [18]



Figure 20. (Left) Yolanda Gutiérrez: Prayer, 2016; (right) Ferenc Varga: Hundred thousand of leaves 2016

CONCLUSIONS

The objective of this study was to review the available literature on the contribution of art to a better understanding of the world and its unique biosphere to accurately map the extensive scientific interest in art and the lasting and irreplaceable work added to its development. Less scientific research and writing were discovered in the first phase of the investigation. However, the results so far also seem to support the hypothesis that there are verifiable facts and sources with which artists have contributed to scientific discoveries and a better understanding of the world. The author intends to continue the research.

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