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Photosynthesis, one of the most important chemical reactions occurring in nature, is explained to children as early as in elementary school. Thanks to light energy, simple inorganic compounds (carbon dioxide and water with mineral salts) are transformed into complex organic compounds and oxygen. Behind this unprecedented evolutionary success are green plants containing chlorophyll. The importance of this process for the existence of biological life on earth is obvious – organic compounds (sugars) constitute building blocks and food for living organisms, while oxygen, a key constituent of the atmosphere, is indispensable for breathing.

However, an awareness of the primary bond and interdependence between humans and plants is not fully present in our personal and collective consciousness. Its meaning is gradually being lost as a result of common, standard processes in which plants are converted into products, raw materials and commercial goods. Indeed, the biblical injunction to “subdue the earth” has for centuries been

interpreted too literally and thus served to legitimize activities involving the manipulation of living organisms and their purely functional treatment. The relationship between humans and plants in fact developed at the interface of the theological concept of the hierarchical order of nature and the classical definition of nature as something located “outside of and in opposition to [...] human space.”<sup>1</sup>

The visual arts have for a very long time reflected this order of things. Lavish compositions filled with fruit and floral motifs functioned, similarly to their prototypes, as signs of luxury, social position, wealth, sophistication, a substitute for the exotic or a testament to the mannered and decadent taste of the owner, characterizing, for example, the protagonist of Joris-Karl Huysmans’ novel *À rebours*. Plants in still lifes, interior scenes or visions of paradise functioned as ornaments, as well as tools, used to convey symbolic, philosophical and moral meanings. Plants were predestined to play this role due to their variable nature and passing beauty.

Things changed in the late 1960s with the advancement of Ecological Art and the use of actual living plants for artistic purposes. Illusion, artistry and expertise, praised by Pliny the Elder in a famous anecdote about Zeuxis, who painted grapes with so much precision that birds flew to peck at them, were made redundant by the materialization of elements of nature in art.

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1 G. Böhme, *Für eine ökologische Naturästhetik*, Frankfurt am Main 1989, p. 96.

This new phenomenon developed on the basis of social radicalism and a countercultural volte towards nature. It was also brought about by several artistic trends which had developed since the early twentieth century, including an experimental trend which, in the spirit of Duchamp, treated all materials as useful for art; artistic endeavors in the 1950s and 1960s that sought to cross the boundary between art and everyday life; and criticism of Art & Technology, a trend triumphant in the late 1960s, which used the achievements of modern technology to develop a heuristic, ahistorical and asocial model of art. In its analysis of the relationships and dependencies that exist between humans and their environment, Ecological Art began to experiment with living biological materials and specific ecosystems. The rejection of the mimetic model led to a confrontation with an entire biological spectacle extending from birth to death: growth, nutrition, reaction to stimuli, metabolism, reproduction and atrophy. As Hans Haacke observed in his manifesto, written in Cologne in 1965, and then brought to life in his project *Grass Grows* in 1969, living plant material introduces elements of changeability, instability, indetermination and impermanence into art. Organic forms are ruled by their own biological laws and, as non-linear systems which develop in rather unpredictable directions, they restrict the artist's creativity and his authority over the work. In the 1960s, few artists were ready to take such a radical step, one that would entail deconstructing the avant-garde discourse of originality.<sup>2</sup>

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2 R. Krauss, *The Originality of the Avant-garde and Other Modernist Myths*, Cambridge, Mass. 1986.

Helen and Newton Harrison's *Portable Orchard* (1972) is certainly recognized as a pioneering bio-ecological project. The work involved moving several trees from their contaminated environment into a gallery space, which was transformed in order to provide the trees with optimal conditions for growth, blossoming and fruiting. Another noteworthy project is Alan Sonfist's *Time Landscape*. Although the concept was developed as early as 1965, the project could only be completed in 1978. The work involved planting a forest on a rectangular square in Manhattan, at the corner of La Guardia Place and West Houston Street. Trees, bushes, grasses and flowers growing in the forest were historical species native to New York in the days before the arrival of the first Dutch settlers. *Wheatfield - A Confrontation* (1982) by Agnes Denes is also one of the most well-known eco-art projects. Denes decided to reclaim a two-acre plot of land, a former landfill, located near New York's World Trade Center. With the help of a group of volunteers, the artist cleared the plot, brought fertile land, installed an irrigation system, and then planted wheat. As if by magic, urban wasteland transformed into a vibrant and familiar farmland. And golden fields billowing in the shadow of New York skyscrapers raised questions about the priorities and values of humanity today.

*Wheatfield - A Confrontation* summarizes the general principles of Ecological Art very well. In Ecological Art, nature, defined as primal and autonomous, always stands in opposition to culture, civilization, technology, and sci-

ence. However, revolutionary discoveries in the field of molecular genetics in the second half of the twentieth century and a spectacular development of genetic engineering and biotechnology force us to reconsider the relationship between nature and culture. Indeed, as the aesthetician and philosopher of nature and science Gernot Böhme points out, with the advent of the era of biotechnology<sup>3</sup> and in the face of its achievements, dichotomies on which the traditional idea of nature is based lose their power. The development of science and the resulting radical new possibilities for “technical reproduction of nature”<sup>4</sup> allow humans to create entirely new evolutionary processes. In light of these facts, nature ceases to be “that what is given; it is rather that what is generally possible to be produced.”<sup>5</sup> Because humans, as an integral part of nature, constantly transform it, one could assume that the introduced changes are an inherent, and not an “alien,” part of nature. One could in fact further assume that through these manipulations humans fulfill evolutionary dynamics to which they are also subjected. Thus, today we can no longer speak of an alternative between the manipulation or non-manipulation of biological life. What is more, the belief that we still have such an alternative turns out to be false, which is bound to be confirmed by facts. The only real alternative offered to humanity today is the choice between the total instrumentalization of nature and approaches and practices which resist it, emphasizing the subjectivity of all biological life.

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3 J. Rifkin, “The Biotech Century. Genetic Commerce and the Dawn of a New Era”, [in:] *LifeScience. Ars Electronica 99*, eds. G. Stocker, C. Schöpf, Vienna, New York 1999.

4 G. Böhme, *Für eine ...*, p. 144.

5 *Ibid.*, p. 154.

In the 1990s, many artists joined this wider cultural debate and began to seek answers to the question of how to build a new relation between humans and nature. Richard Lowenberg's *The Secret Life of Plants* (1976) blazed a trail for similar artworks created in the 1990s. *The Secret Life of Plants* refers to the idea of a symbiotic relationship between humans and plants. This concept was materialized and symbolically reflected by means of imaginative graphics and music. These were generated by computer and based on electrophysiological impulses recorded in living plants in reaction to light, temperature and human movement, as well as neurological and muscle signals registered in people involved in the project. A similar concept, the building of a complex and nuanced network of interdependencies between humans and plants, can be found in Christa Sommerer and Laurent Mignonneau's installation *Interactive Plant Growing* (1993). The motto of this work – that an organism's form is an event in space-time – comes from the writings of the English biologist D'Arcy Thompson, the author of *On Growth and Form* (1917), which became a source of inspiration for many twentieth-century artists. Sommerer and Mignonneau placed five living plants on five columns in a small dark gallery room. Each plant was connected to sensors reacting to touch, motion and the proximity of visitors. The collected data was then transmitted to the computer in real time and synchronously processed by genetic algorithms. The data served to generate virtual counterparts of living plants which were displayed on a big screen. The key element of this project, and also

its main goal,<sup>6</sup> was a sensitive and emphatic interaction between humans and plants. The nature and intensity of this relation determined the control the viewer had over the development, color, shape, pace and direction of the virtual plants' growth.

Another two art projects carried out in the mid-1990s confirm the importance of questioning the nature of the relationship between the human world and the world of plants. In 1995, Ken Goldberg in collaboration with a group of engineers from the University of Southern California and Ars Electronica team began constructing a tele-robotic installation entitled *Telegarden*. From 1996 to 2004, *Telegarden* was exhibited in the Ars Electronica Center in Linz. The project was in fact a small round garden filled with different plants. What was unique about it was that the garden was not planted by a human. The gardener in this garden was an industrial robot equipped with a camera. Its actions were initiated and controlled by online users. Indeed, project participants could monitor the growth of plants and decide when they should be watered. Users could also plant their own seed after fifty mouse clicks, which reflected the level of their involvement, and after agreeing to join the online *Telegarden* community. In its first year, 9,000 registered users tended the garden and more than 100,000 people visited the project's website during nine years. Visitors could meet online and interact with each other. The project initiated communication processes and above all united Internet users around a shared

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6 This installation is in the permanent collection of the ZKM Media Museum in Karlsruhe.

sense of responsibility for the plants, even though the garden was miles away from them.

Almost at the same time, in August of 1996, Eduardo Kac's telecommunication project *Teleporting an Unknown State* was initiated as part of *The Bridge, The Siggraph '96 Art Show* in the Contemporary Art Center in New Orleans. Biological processes were integral parts of the project, and the Internet was used as a tool to support them. It all started with a single small seed planted in a pedestal filled with earth in a completely dark room. From time to time, a ray of light emitted by the projector through a round hole in the ceiling spotlighted the seed. The projector displayed photographs sent by people from all over the world via the Internet. It was not important what these photos showed, but how much light necessary for plant growth and photosynthesis they generated. The process of sending digital photos turned into a process of transmitting light necessary for life: this act was both symbolic and had consequences in real life. Collaboration between anonymous users allowed the plant to grow. At the end of the exhibition, the plant was in fact about 46 centimeters tall and could be planted at the entrance to the Contemporary Art Center.

The three projects described above share the theme of control exercised by humans over plants balanced by a sense of responsibility, concern and empathy for them. This issue takes on special importance in the context of genetic engineering and biotechnological shifts in species boundaries, which are highlighted in Amy Youngs' *Rearm-*

*ing the Spineless Opuntia* (1999). The artist equipped a living plant with powerful armor, as a means for compensating for genetic changes that have left the plant, a species of prickly pear cactus, lacking its glochids, or fine, sharp spines. Troublesome and unnecessary from humanity's point of view, glochids constitute a natural defense mechanism for the prickly pear cactus. Youngs decided to "fix" this change, and equipped the plant with armor made of two large spiked shells which opened when ultrasonic sensors did not detect any movement and closed to protect the plant when the sensors registered the presence of humans.

Youngs' work brings us to Biological Art (BioArt) which not only works with living biological material, including plants, but also uses the research methods of biology and genetics, genetic engineering tools and modern biotechnological tools to intervene directly in fundamental life processes by means of genetic manipulation and the modification of biological structures. Natalie Jeremijenko's *One Trees*, completed in cooperation with a team of scientists, is an example of such a radical transgression from the sphere of what is natural and biological to the sphere of what is artificial and cultural. *One Trees* involved cloning one thousand *Paradox Vlach* walnut trees and building from them a biological network which would provide information about the state of the environment. Genetically identical tree seeds were initially grown under the same conditions at Modesto's Burchell Nursery.<sup>7</sup> When

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<sup>7</sup> J. Travis, "Genes on Display: DNA Becomes Part of the Artist's Palette", *Science News*, 15.11.2004, <https://www.sciencenews.org/article/genes-display?mode=magazine&content=272>.

they reached the size of saplings, they were presented at the 1998 *Ecotopias* exhibition in the Yerba Buena Center for the Arts in San Francisco. It was the only opportunity to see one thousand clones together and note that despite their genetic identity, the trees differed from each other in some morphological respects. The next phase of the project began in spring 2001. The cloned trees were planted in public sites around the San Francisco Bay Area, including Golden Gate Park, two hundred and twenty private houses, San Francisco schools, the BART station, the Yerba Buena Performing Arts Center, Union Square, and many other places.<sup>8</sup> Identical at the genetic level, as the cloned trees developed, they were meant to show differences due to external factors such as climatic, environmental and socioeconomic conditions. Indeed, the fact that the trees were cloned was not decisive for their existence. What mattered were their diverse experiences with their environment. The *One Trees* project showed that genetic modification in itself is not the same as full control over biological organisms. Genetic modification in fact does not necessarily constitute a threat to what is authentic and individual in plants. There is always a margin of freedom and indeterminacy. And within that margin humans can build a symbiotic, non-hierarchical and non-instrumental relationship with plants based on the acceptance of the fact that in the biological world of living organisms humans do not have any unique or privileged position. They interact with and alter biological organisms, but they also

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8 Z. Sardar, "Society's signposts", *San Francisco Chronicle*, 23.10.2004.

become the object of various interactions, modifications and influences.

Plants have gone a very long way in art: from aesthetic objects and prototypes for technically excellent paintings or sculptures to objects of human empathy and concern. The contemporary art projects devoted to plants discussed above not only exceed the aesthetic paradigm of art and reject the universal concept of “the aesthetic nature of art”<sup>9</sup> which consists of “a creative act, individual expression, unique artistic object, and its aesthetic value,”<sup>10</sup> but also seek to constitute a practice endowed with an ethical dimension. Its hybrid character is accurately defined by Annick Bureau, who calls it “an esthetics of attention and responsibility.”<sup>11</sup> This esthetics emphasizes the continuum of life, and not its dichotomy, and strives to rebuild a marginalized, though primary, bond between humans and plants.

**translated by Małgorzata Olsza**

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9 B. Dziemidok, *Główne Kontrowersje Estetyki Współczesnej*, Warszawa 2002, p. 308.

10 Ibid., p. 159.

11 A. Bureau, “The Ethics and Aesthetics of Biological Art”, *Art Press* 276/2002, pp. 38–39.