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A History of Art Involving dna

In the third scene of Shakespeare's *The Winter's Tale* a young woman, Perdita, rejects "streakt gillyvors", that is, highly bred dianthus, as "nature's bastards," and declares that she will never grow such unnatural plants. Polixenes, the king of Bohemia, comes to their defense. "This is an art" he says, "Which does mend nature—change it rather—but the art itself is nature."¹ This may be the first recorded instance of the idea that living things can be art. That the idea was not already commonplace needs explanation, since by the 17th century ornamental plants had existed for 3,000 years, and pets even longer. They were difficult to recognize as art because ignorance about heredity and organic evolution almost completely obscured the role that human choice plays in determining the forms, colors, patterns, and textures of living things.

Beginnings

Plant and animal domestication, which began at least 10,000 years ago, initially may have had more to do with aesthetics than utility. Contrary to popular belief, humans almost certainly did not domesticate plants or animals to alleviate hunger. Hungry people would not have had the time or energy to undertake longterm, uncertain experiments in selection, and consequently domestication probably began among people who were well-fed. The first domesticated animals may have been animals used in religious ceremonies, and the first domesticated plants ones that yielded magical substances, dyes, musical instruments, or accessories to ritual.² The geographer Carl Sauer drew particular attention to turmeric, a tropical plant in the ginger family. Turmeric grows only in association with humans. Its origins are unknown, although Southern Asia may have been its original home. Sauer suggests that it was domesticated in the remote past to provide coloring for bodies, clothing, and food. Its use as a spice came later. In Southern Asia many people still believe that turmeric has the power to enhance fertility. This power arises from its intense yellow color, the color of the sun.³

Color may have played a role in the domestication of animals as well. Sauer suggests, for example, that the first chickens to have been domesticated were rare black variants with black bones, which were used in magic.

Purely ornamental plants, that is, those cultivated only for their aesthetic qualities, go back at least to Assyria, where kings had hunting preserves and park-like tree plantations. The practice of growing pure ornamentals seems to have arisen also in China, Mexico, and Western South America. From these centers, the practice spread to other areas. According to the social anthropologist Jack Goody, ornamentals were first cultivated as luxuries that denoted class. Entrenched class systems encouraged an elaborated consciousness of flowers.⁴ This consciousness produced new ways of describing flowers, and new opportunities for plants. Beginning about 2,500 years ago double flowers, which are rare in the wild and ill-suited for survival, began to proliferate in cultivation. By the time of the Caesars double roses were common. Pliny the Elder, in what may be the oldest surviving example of ornamental plant criticism, faulted one rose for having too few petals, another for being too small, and several others for lacking perfume.⁵

In many non-Western cultures art was considered part of nature. However, even in China and Japan, where selection produced extraordinarily refined expressions, organisms were not recognized as art. Just as in Europe, ignorance about heredity and evolution made claims to art almost unthinkable.

Plants and Animals as Components of Art

Some pets and sporting animals are aesthetic creations, and performing animals used in theater play roles in art. However, the first animals analogous to ornamental plants, that is, creatures kept solely for their aesthetic qualities, were probably birds like peacocks, or menagerie animals. Such creatures existed in ancient Eurasia and in Mexico. Fanciers' animals bred only for aesthetic effects did not arise until after the Renaissance.

The idea that landscape gardens are fine art appeared in the 18th century, most famously in Kant's *Critique of Judgment*. Two obvious implications of this idea are that plants can be components of art, and that works of art can consist largely or entirely of living things. However, Kant stopped short of recognizing individual plants as fine art. To do so would have been radical, even heretical, in spite of Shakespeare's gillyvor. Kant maintained that nature was one thing, and art quite another. This view was deeply rooted in Western culture. We find it, for example, in the book of Genesis, in which god creates humans separately from "the beasts," and in his own image, while animals and plants exist only in their own, earthbound images. The message is clear: an unbridgeable chasm separates us from the rest of life.

Humankind's absolutely privileged place in the universe became a key Christian tenet, reinforced by borrowings from Greek philosophy. Until the late 19th century most aesthetic theory echoed church doctrine by arguing that art arose from the human mind or spirit and was therefore outside of nature.

Darwin's Contribution to Art

Challenge to that dualism came not from philosophy, but from biology and animal breeding. The *Origin of Species* begins with descriptions of fanciers' pigeons—Jacobins, tumblers bred to resemble finches, and pouters with inflatable crops which "excite astonishment and even laughter."⁶ From pigeons kept for aesthetic pleasure, Darwin confirmed evolutionary processes that affect all life.

Darwin does not divide creatures into those with souls and those without, nor does he claim special dispensation for human beings. Domesticated and wild creatures are parts of a single whole that is dynamic, orderly, and intricately connected. Darwin's reaction to wild nature was much the same as his reaction to fanciers' pigeons: he viewed both with a mixture of disciplined curiosity and intense wonder. He described nature as if it were an authorless and boundaryless artwork symbolizing nothing and manifesting divine order.

Darwin's main interests appear to have been science and aesthetic pleasure. The word "art" occurs only two times in the book⁷, but the words "beautiful," "wondrous" and "astonishing" occur repeatedly. In what is perhaps his most famous passage, he describes nature as a realm in which "from famine and death the most exalted object which we are capable of conceiving [...] directly follow [...] From so simple a beginning endless forms most beautiful and wonderful have been, and are being evolved."⁸ Joy and suffering, beauty and terror flow in and out of one another. His vision of evolution is classically sublime.

With publication of the *Origin of Species* Biblical accounts of life lost their stranglehold on Western culture, and species took on the plasticity of paint or clay. Well before the end of the 19th century several influential writers claimed garden plants as art. Thomas Huxley, Darwin's most famous defender, argued that ornamental plants were art, although not fine art. The French novelist Joris-Karl Huysmans, or rather his character Des Esseintes in the novel

Au Rebour, so admired bizarre horticultural plants, that he declared that "in these present times, the gardeners are the only and the true artists."⁹

Luther Burbank went considerably farther. Speaking in San Francisco in 1901 he said that "plants can be more readily molded into more beautiful forms and colors than any sculptor can ever hope to equal [...] The fundamental principles of plant breeding are simple. The practical applications of those principles demand the highest and most refined efforts of which the mind of man is capable."¹⁰ With none of Huysmans' irony, Burbank affirmed plant breeding as inherently superior to painting and sculpture. Plant breeding was the supreme art.

Developments in Europe added some credence to his claim. In 1900 three botanists independently rediscovered Mendel's laws of inheritance, which elevated genetics to a science, and undermined the strongest post-Darwinian argument against recognizing ornamental plants as fine art: their aesthetic attributes did not sufficiently reflect human choice to qualify.

Ornamental Plant Breeding as Fine Art

Plant breeding and the consciousness that attends it move at a slow pace, so it is perhaps not surprising that the first full-length book about plants as fine art did not appear until 1939. In spite of its pedestrian title, Sacheverell Sitwell's *Old Fashioned Flowers* is a brilliant work. It is also perverse, asserting that highly bred ornamental plants are fine art because they "represent a direct and conscious attack upon Nature." Some ages and individuals prefer ornamental plants that evoke wild nature. Sitwell preferred artifice, which he saw as fidelity to an indisputably conscious, human order. "It is better to be ugly," he wrote, "than only to be wild."¹¹

The first artist to do work that directly involved genetics was probably the photographer Edward Steichen, who, from the 1920s until the outbreak of World War II, hybridized delphiniums, cleomes, nicotianas, poppies, and sunflowers at his country home in Connecticut. In 1936 the Museum of Modern Art held an exhibition of his delphiniums, an event that he believed confirmed plant breeding as an art.¹² Steichen compared plant hybrids to poetry, and named delphiniums for poets, but the process of plant breeding reminded him more of photography, because both arts involve working with variations on a theme, and both are potentially democratic. He dreamed of selling the seeds of his finest delphinium hybrids for twenty-five cents a packet.

The Repercussions of World War II

During the twentieth century, the art world has embraced one new or previously unaccepted form of expression after another, so Steichen's belief that his show of delphiniums had confirmed plant breeding as a fine art was not unreasonable, especially considering the Museum of Modern Art's prestige, and the favorable critical response that his hybrids received. However, in the six decades since the show, the Museum of Modern Art has not held any other exhibitions of hybrid plants. Nor has any art museum.

The primary reason for this was the Holocaust. It created forbidding barriers between genetics and art. Before World War II public opinion, especially in the United States, held that the new science of genetics would play an extremely important role in human affairs, and was therefore everybody's business, including artists. Following World War II, genetics was cordoned off from the larger culture, and became the de facto property of experts in science,

medicine, agriculture, and business. To understand this change it may help to look in some detail at another important spokesman for genetic art from the period between the wars, Olaf Stapledon. In his work plant and animal breeding mingle with eugenics.

Stapledon took the implications of Darwinism much farther than Steichen. When Steichen brought delphiniums into the Museum of Modern Art he realized a fairly obvious implication of *The Origin of Species*: domesticated organisms with significant aesthetic appeal might be fine art. However, Steichen did not question whether the traditional museum was the best setting for his hybrids, and he did not attempt to explore Darwinism's more radical implications. Olaf Stapledon's 1930 novel, *Last and First Men*, looks at some of these. *Last and First Men* is simultaneously an epic, one of the world's greatest masterpieces of science fiction, and a meditation on human destiny. The book is a history of the next two billion years, during which time some 18 different human species rise and fall. Evolutionary dramas so pervade *Last and First Men* that it can be read as an exploration of how Darwinism affects perception of the future.

Sometimes art plays a role in Stapledon's evolutionary dramas, sometimes not, but nowhere does it play a greater role than with the third human species, which appears 40 million years hence. The third men, as they are called, are cat-like and covered with red-gold hair. Over eons their civilizations come and go, but all revolve around plant and animal breeding. The culminating and most brilliant civilization develops "plastic vital art", which rejects every kind of utilitarian breeding, and aims to "evoke the full potentiality of each natural type."¹³

In this culture almost everyone is an artist. Most seek beauty and natural order, and produce expressions such as new species to occupy empty ecological niches. However, a few breeders deliberately produce monsters, or create beautiful creatures with flaws. These might express tragic visions, or merely reflect the vanity or cruelty of individual artists. Art eventually encompasses entire ecosystems, until earth is organized as an intricate system of zoos, botanical gardens, and wild parks. The ultimate aim of vital art is to heighten, or, in its negative expressions, to undermine all life.

Stapledon's account of the third men reads for the most part like imaginative contemporary speculation about the longterm effects of the biological revolution. However, his treatment of eugenics situates his vision clearly in the period before World War II. Throughout their existence, the Third Men practice eugenics. They usually emphasize "improvements about which there could be no two opinions" such as eliminating hereditary diseases, but some societies breed for physical beauty, while others seek cat-like agility, or exceptional perception in vital art. Occasionally manias burst forth. One society breeds for human mediums to enter into contact with divine forces. Another carries breeding for musical ability to such an extreme that persons hearing music not to their taste might run amok and kill the performers. Each of these crazes runs its course and leaves no permanent damage. But one genetic experiment proves disastrous. In secret, a group sets out to craft a super-intelligent man. The final result is a limbless, sexless superbrain. It is the first of the Fourth Men, a new human species. Initially this living computer brings great benefits to the cat-like people, but before long it enslaves, and then exterminates them.

The third men provide a cautionary tale about eugenics. When Stapledon wrote *Last and First Men* he was almost certainly aware that eugenics was being used to further racist, xenophobic, and class-biased programs, all of which he abhorred. However, he did not believe that it had no merits whatsoever, which is why he could also write that there were "improvements about which there could be no two opinions." Like many people of his time he

associated eugenics with a range of possibilities, mostly bad, but some good. He seems to have hoped that the new science of genetics might be used to lessen suffering, and perhaps to improve humankind physically and intellectually. Many people still have this hope, of course, but relatively few identify it with eugenics, and today no informed person can assume that there might be no two opinions about even a single genetic "improvement" in the human species.

With the rise of Nazism, a period of naive but fluid genetic imagination closed. Genetic imagination received another blow from Lysenkoism in the Soviet Union. Lysenko rejected Mendelian genetics as bourgeois, and revived the view that inheritance is modified by environment. Stalin lent his support to Lysenko, and many Mendelian geneticists, including Vavilov, whose work on the origins of cultivated plants had won him international acclaim, died in prison. Soviet genetics was set back a generation.

Meanwhile in the West atomic testing drew public attention away from the benefits of genetics to the dangers of mutation. From 1945 to 1960 genetic monsters overran science fiction. The idea of genetic art was forgotten except as an absurd joke. In Kurt Vonnegut's *The Sirens of Titan*, for example, an extraterrestrial robot named Salo is marooned on a moon of Saturn, where he takes up plant breeding to while away the time. "When Salo arrived on Titan in 203,117 B.C., the blooms of Titanic daisies were tiny, star-like, yellow flowers barely a quarter of an inch across. [Now] [...] the typical Titanic daisy had a stalk four feet in diameter, and a lavender bloom shot with pink and having a mass in excess of a ton." ¹⁴ Salo is an ingenious artist, but his intervention in evolution only highlights evolution's utter pointlessness—and the futility of art as well.

Land Art and Ecological Art

Plants and animals returned to art in round-about ways in the late 1960s with land art and ecological art. Many earthworks were so gigantic that they provided habitats for small organisms, although no land artist explored the implications. A few artists deliberately used living things as components of their work. For example, Alan Sonfist's *Time Landscape*, begun in 1969, recreates natural landscapes from New York City's past. On several sites he reintroduced plants that had grown in the area prior to European settlement. As long as Sonfist's reconstructions survive, the plants and animals that comprise them will undergo selective pressures from the city and from larger environmental forces such as weather, as well as from interactions among organisms that make up the work itself. Still, Sonfist did not emphasize the genetic aspects of this work.

Helen and Newton Harrison's life chain proposals—most of them not realized except on paper—encompass biological systems that would be preserved, or in some cases created through art. *Trümmerflora on the Topography of Terrors* is typical of their approach. This work was to consist of rubble from two large piles that already existed on a site in Berlin near the Gropius-Bau, at the bureaucratic center for the death camps of the Third Reich. Along with the rubble were *trümmerflora*, or plants that spring up in disturbed places. The rubble was to be dispersed over sites used by the Gestapo to plan the concentration camps. *Trümmerflora* would from then on inhabit those sites, and compose a living memorial to those who had suffered in the camps. The Harrisons designed this work to maintain an already existing biological process with genetic elements that would be destroyed unless sanctioned by art.

Some of the Harrisons' proposals span watersheds and bioregions. *Sacramento Meditations* (1976—77) evaluated and proposed changes for the watersheds of California's two largest rivers, the Sacramento, and the San Joaquin. *Meditations of the Great Lakes of North America* (1978) proposed a new nation to coincide with the watershed of the Great Lakes. *The High Ground* (1990 to present) presents a plan for the reforestation of Tibet. All of these projects favor genetic diversity.

The Harrisons told me that they consider genetics central to their work. However, they have never focused audience attention on genetics, even in their best known work, *The Lagoon Cycle* (begun 1972), which involved breeding crabs. *The Lagoon Cycle* emerged from a search for edible organisms that could survive exhibition in art galleries. From a biological perspective, galleries are extremely inhospitable environments where few nonhuman organisms can survive for long. The search led the Harrisons to Sri Lanka, where they studied the crab *Scylla serrata*, which is an important food source in some parts of Southern Asia. After returning to the United States, the Harrisons raised these crabs in a studio and discovered how to breed them, something that had never been done before in captivity.

1980 to the Present

In the last 20 years, many artists have produced projects to purify water, restore degraded sites, build community gardens, establish urban forests, and create habitats for wildlife. Works such as *Seven Thousand Oaks* by Joseph Beuys, *Leonhardt Lagoon* by Patricia Johanson, Dominique Mazeaud's *The Great Cleansing of the Rio Grande River*, and *Revival Field* by Mel Chin have genetic dimensions somewhat similar to those of Sonfist's projects, or the Harrisons'. Genetics is implicit in such work but is not its focus.

Some contemporary artists incorporate imagery of DNA or other genetic elements into their work. Approaches vary. Suzanne Anker, for example, explores resemblances between chromosomes and hieroglyphics. Kevin Clarke paints what he calls portraits in which base sequences serve as key aspects of individual identity. Kevin Moore uses images of DNA as symbols of fate. In the *G-Nome Project* Andrew Leicester borrowed imagery from an impressively wide range of sources to explore the historical, ethical, and social implications of genetic engineering. And many artists use genetic imagery for social criticism.

Alexis Rockman paints plants and animals in a style that also draws on diverse sources including Dutch flower painting, nineteenth century landscape painting, science fiction movies, and natural history dioramas. Nature in Rockman's work is a Hobbesian spectacle in which ants devour butterflies, flowers drip sinister nectars, and human creations proliferate amid feces, traps, and evolutionary cul-de-sacs. An atmosphere of luxurious decay pervades not only the subject matter, but color and use of materials. Rockman favors sickly greens, lurid reds and golds, and deep shadows. His glazes are so heavy that some canvases glisten like hams. Rockman's most blackly humorous works synthesize genetic engineering and pornography. In *The Trough* (1992) a pig mounts a duck; *Barnyard Scene* (1991) shows a racoon sodomizing a rooster; and in *Jungle Fever* (1991) a preying mantis mates with a chipmunk.

In the "Biosphere" paintings horror overwhelms humor. *Biosphere: Laboratory* shows a laboratory orbiting Saturn. The laboratory contains two-headed cows, a goat-cow-pig hybrid, and a dog with a puppy grafted onto its neck. The scene recalls *The Island of Dr. Moreau*. Both Wells and Rockman explore secret worlds, where under the rule of science, pathologies play themselves out. The most striking difference between Rockman's vision and Wells's is

that while Dr. Moreau had to leave civilization in order to pursue his experiments, Rockman's space station does not depart far from official practice. True, the station is modelled after the rebel station in the movie *Silent Running*, but *Biosphere:Laboratory* is not about rebellion. Space stations express dominant forces of contemporary civilization, and Rockman takes imagery directly from government-sponsored research. The grafted dogs, for instance are based on actual experiments carried out in Moscow. Rockman's rather 19th century style, and the similarity of his warnings to those that H. G. Wells issued more than a hundred years ago, suggest that fantasies about biology may have changed much less in the last century than we like to think.

Until very recently, few artists or writers have done work as bold as the experiments in genetic art that preceded World War II. The idea that humanly bred organisms can be art did not really return to public discourse until the late 1980s, spurred by the biological revolution. Vilém Flusser, writing in *Art Forum* in 1988, predicted that biotechnics would become an instrument of artists who someday might create wheat with the power of sight, photosynthetic horses, and "an enormous color symphony [...] in which the color of every living organism will complement the colors of every other organism." In what seems like a distant echo of Stapledon, Flusser also wrote that the new artists would lay the "foundations of mental processes that have never before existed." ¹⁵

The previous year Peter Gerwin Hoffmann exhibited *Mikroben bei Kandinsky* in Graz. *Mikroben bei Kandinsky* consisted of cultures of bacteria scraped from the surface of a Kandinsky painting. In the catalog to the exhibition, Hoffmann wrote that "gene technology has put ... an end [to] [...] the polarity nature-art. The living organisms [...] that surround us [...] can only be understood and interpreted as works of art." ¹⁶

By the the mid-1990s several artists were using genetic engineering to manipulate DNA. Joe Davis engineered a strand of DNA to code for the Germanic rune for life. Jon Tower, in a somewhat similar project, arranged the four components of DNA, adenine (A), cytosine (C), guanine (G), and thymine (T) in sequences that spelled words. Both of these projects are invisible under ordinary circumstances, so in the context of art they function as conceptual works—the primary concept apparently being that genetic engineering can be a tool for art.

A few contemporary artists breed larger organisms, or use genetically altered microorganisms to create patterns visible to the unaided eye. David Kremers paints genetically-altered bacteria on agar-covered acrylic plates where the bacteria interact with dyes to produce complex stains. Kremers then seals out moisture to arrest growth, and the works become stable, but remain alive. My own work has been with irises, streptocarpuses, and other plants, which I hybridize and exhibit, along with documentation of the selection process. Eduardo Kac is developing plans for a genetically engineered luminescent dog. *GFP K-9* may be the first proposal by an artist to genetically manipulate an animal, which brings up an important ethical issue: what are our responsibilities to the creatures that we help create? Some artists who work with plants or microorganisms ask this question, but it is especially relevant in Kac's project, and for any artist who would work with sentient creatures. Whether or not *GFP K-9* is ever fully realized, it is a project to watch, in every sense of the word.

There are major obstacles to presenting plants and especially animals as art, but today these obstacles are less philosophical than ethical and architectural. I have already mentioned anxieties about eugenics. Any exhibition that engages genetics and selection may awaken those anxieties for some, and those anxieties need to be addressed. Architectural obstacles can be quite difficult to overcome. Full exploration of genetic art will require new kinds of

museums, spaces that welcome rather than exclude diverse forms of life, and provide habitats. We can imagine traditional gallery spaces combined with gardens, zoos, and wilderness areas. Still, enough artists have exhibited living things in existing spaces to have made the presence of nonhuman organisms in galleries a fairly common occurrence today. As for genetic engineering, no one needs to prove that it can be a tool for artists. What remains to be proven is whether this tool can produce art that is more than conceptually interesting.

The most important question is: what kind of consciousness does art involving DNA serve? To what extent does it aestheticize the biological revolution, speed commodification of life, and encourage the transformation of living things into consumer culture trivia? What kinds of genetic art can help remind people that plants and animals were not made for our sake, and that they create their own kinds of value? In the community of life, can we play some role other than self idolator?

I hope that acceptance of ornamental plants, fanciers' animals, and various other organisms as art will encourage greater awareness in selection, which in turn will produce more wonderful organisms, and perhaps even exalted ones. But above all I hope that art involving DNA will bring us closer to other living beings, who after all are our kin. Only as respectful kin are we likely to develop a true art of evolution.

References and Notes

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