A state of the art of Bio-Art

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For the purpose of this paper, I am defining Bio-Art as an art practice in which the medium is living matter that has been cultured or grown or produced in some way by the artist. So here artworks, such as Damien Hirst's animals immersed in formaldehyde in glass cases is not considered because while the artist uses biotechnology to aid presentation, the biological was not affected by the artist while it was living.
I've chosen to focus on bio-art works where there has been some manipulation in living organisms because this aspect is what distinguishes Bio-Art most from other media used by artists. Also, issues of manipulation, whether it is breeding, genetic engineering, growing the organic or the creation of new life forms either by implants or manipulation, tend to evoke strong responses by the media.

GFP Bunny (2000)
by Eduardo Kac (1962-)

www.ekac.org/gfpbunny.html

One example of a bio-artwork is "GFP Bunny" which is a living albino rabbit created in a genetics lab with an enhanced EGFP (a synthetically mutated green fluorescent gene protein developed from the original wild-type green fluorescent gene found in the Aequorea Victoria jellyfish) [1].

The rabbit, Alba, born in February 2000 at the INRA Institute in Jouy-en-Josas, France, only glows slightly when illuminated with the correct light [2] so the image (on the left) which the Brazilian American-based artist Eduardo Kac distributed for the media, is an exaggeration of the effect and - because of its impact - an important aspect of this bio-art work. His website[3] states that the rabbit's "*formal and genetic uniqueness are but one component of the "GFP Bunny" artwork.*" The second aspect of this artwork, he says, is "*the ongoing debate, which started with the first public announcement of Alba's birth, in the context of the Planet Work conference, in San Francisco, on May 14, 2000.*" The third would be when "*the bunny comes home to Chicago, becoming part of my family and living with us from this point on.*"[3]

Eduardo Kac with Alba, the rabbit created with the fluorescent gene in 2000.

"*The "GFP Bunny" project is a complex social event that starts with the creation of a chimerical animal that does not exist in nature (i.e., "chimerical" in the sense of a cultural tradition of imaginary animals, not in the scientific connotation of an organism in which there is a mixture of cells in the body) and that also includes at its core: 1) ongoing dialogue between professionals of several disciplines (art, science, philosophy, law, communications, literature, social sciences) and the public on cultural and ethical implications of genetic engineering; 2) contestation of the alleged supremacy of DNA in life creation in favor of a more complex understanding of the intertwined relationship between genetics, organism, and environment; 3) extension of the concepts of biodiversity and evolution to incorporate precise work at the genomic level; 4) interspecies communication between humans and a transgenic mammal; 5) integration and presentation of "GFP Bunny" in a social and interactive context;*

6) examination of the notions of normalcy, heterogeneity, purity, hybridity, and otherness; 7) consideration of a non-semiotic notion of communication as the sharing of genetic material across traditional species barriers; 8) public respect and appreciation for the emotional and cognitive life of transgenic animals; 9) expansion of the present practical and conceptual boundaries of artmaking to incorporate life invention." [3]

So Kac's image of the fluorescent bunny was as much part of the creation of a "*chimerical animal that does not exist in nature*" as was the "*transgenic*"[4] artwork (the actual rabbit). Kac argues that transgenic art "*offers a concept of aesthetics that emphasizes the social rather than the formal aspects of life and biodiversity, that challenges notions of genetic purity, that incorporates precise work at the genomic level, and that reveals the fluidity of the concept of species in an ever increasingly transgenic social context.*"[3] His "Paris Intervention" of lectures, posters and other use of public media reinforces, perhaps even foregrounds, the potential for social engagement with this work.

Eduardo Kac, "GFP Bunny - Paris Intervention", 2000, 11 x 17" (43 x 28 cm) each. In gallery exhibitions Kac hung the images in diverse locations to mimic the way the public on the streets would encounter the image "in different places and at different times, slowly perceiving the multiplicity of meanings associated with the work" http://www.ekac.org/albasix.html

Between December 3 and December 13, 2000, parallel to radio (Radio France and Radio France Internationale), print (Le Monde, Libération, Transfert, Nova, Ça M'intéresse), and television (Canal+, Paris Première) interviews and debates, Kac posted these images on the streets in an effort to intervene in the context of French public opinion and gather support for his cause to bring Alba home for the third part of the art project, to include Alba as the family pet into his home. However the INRA institute refused to discharge the bunny to the artist. It was claimed that the rabbit belonged to the research institution and was a research object. "That the entire bunny glows under a certain kind of blue light is of no use to scientific research. The trait might render it aesthetically more appealing or visually stimulating, but these considerations belong to the arena of art, not science." [5]

Kac emphasizes that the point of this bio-art is mainly the context of the transgenic subject.

"As a transgenic artist, I am not interested in the creation of genetic objects, but on the invention of transgenic social subjects. In other words, what is important is the completely integrated process of creating the bunny, bringing her to society at large, and providing her with a loving, caring, and nurturing environment in which she can grow safe and healthy. This integrated process is important because it places genetic engineering in a social context in which the relationship between the private and the public spheres are negotiated. In other words, biotechnology, the private realm of family life,

and the social domain of public opinion are discussed in relation to one another. Transgenic art is not about the crafting of genetic objets d'art, either inert or imbued with vitality. Such an approach would suggest a conflation of the operational sphere of life sciences with a traditional aesthetics that privileges formal concerns, material stability, and hermeneutical isolation." [3]

Kac's attempt to turn a laboratory rabbit into a house pet failed because the laboratory refused to release the rabbit to him. This highlights some of the problems surrounding genetic research. *"What the artist sees as a potential pet, the scientific establishment regards as an inert "research object" or a packet of DNA to be experimented upon."*[5] However Kac's *GFP Bunny* project increased public awareness of genetic technologies. For example, *"one of Kac's most passionate critics applauds him for drawing attention to what is now being done in genetics research. "It kind of turns the searchlights back on scientists," said Stuart A. Newman, a professor of cell biology and anatomy at New York Medical College who uses glowing proteins to track how animal limbs develop. "There are some pretty awfully deformed animals in transgenic research, and scientists have sometimes done these things with no good theory behind it.""* [6]

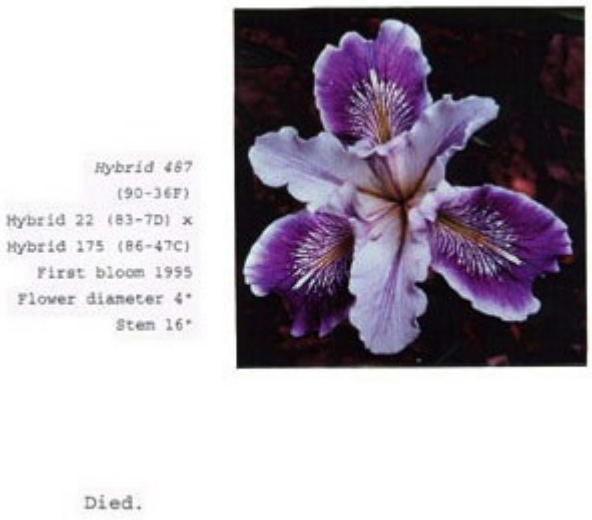
Another response was from *"Woodland Hastings, a Harvard biologist who helped discover the jellyfish's glowing gene, added: "There's nothing dangerous about it, as far as we know. But the project is rather frivolous. There are many more important things you can do with these genes.""* [7]

Part three of the GFP Bunny project was replaced by a number of works protesting the INRA's obstruction. Kac marked Alba's absence with an Alba Flag, which flies in front of his home. Kac's attempt to re-contextualize a genetically engineered animal failed, but the project did succeed in bringing some awareness about the gap between the world of scientific research and everyday domestic life. In bringing the existence of bio-art into the public awareness as evidenced by the numerous news items, this work was also successful in stimulating a discourse on this new art form.[7]

A corner of the Museum of Modern Art during exhibition of Delphiniums by Edward Steichen (1879-1973). The invitation to that show noted that "these delphiniums are a new American strain which, after twenty-six years of cross-breeding and selection by Mr. Edward Steichen, are being shown to the public for the first time."
www.hsny.org/html/library_archive_Steichen.htm

In 1936 Edward Steichen's *Delphiniums* were the first genetically altered organisms to be presented in a museum context. The Museum of Modern Art in New York hosted an exhibition of the artist's flowers. Steichen had altered the genetic makeup of his delphiniums during 26 years of selective breeding. By placing this in an art context, it could be said that this was the first bio-art project. [8] The slowness of the technique of breeding might explain why there was a gap of fifty years before another artist, George Gessert exhibited his *Iris Project* at New Langton Arts in San Francisco in 1988.

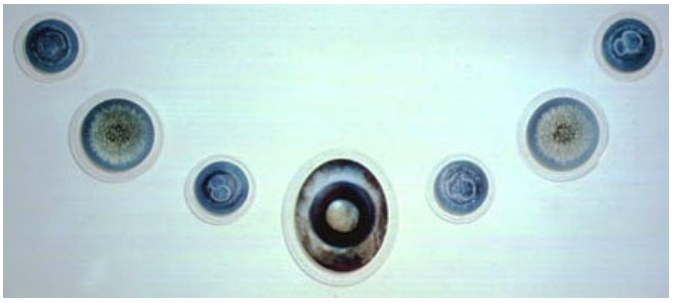
"Since the late 1970s I have been breeding plants, concentrating on the native irises of California and Oregon. I have also bred other ornamentals, including daylilies, streptocarpuses, nasturtiums, and several kinds of poppies."
"When I first exhibited plant hybrids as art



Natural Selection, *1994-present,*
by U.S. artist George Gessert (1944-).
Dye sublimation prints with text selected leaves,
7 3/4 x 5 1/4 in. each leaf (detail)

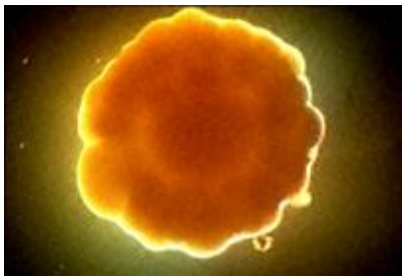
I expected to have to defend my work against criticism that plants were not art, but no one, then or now, has raised that question, at least not in conversation with me or in print. There have been plenty of other questions and criticisms, but not about plants as art.
This is rather surprising, considering that until relatively recently nonhuman organisms were not exhibited in galleries. Even as late as the 1980s, shows that included works with live plants were extremely rare."
"My installations sometimes invite audiences to participate in making aesthetic decisions that affect the lives and deaths of plants, and these decisions remind some people of eugenics.
Occasionally people get hostile, even though I have never used plants as symbols of human beings. I hybridize for the pleasure of working with plants and because hybrids are various, astonishing, and wonderful in themselves."

"However, the traumas of the Holocaust and of the eugenics movement are still with us, and I try to remember those wounds when I bring genetic issues into galleries, which after all are spaces that encourage wide-ranging free association, including associations that have nothing directly to do with the work on display." [9]



Nebula, 1996 by Helen Chadwick (1953-1996)

However, artists have tended to focus on the visual possibilities offered by bio-technology, rather than actually altering living organisms.The work titled "Unnatural Selection", by British artist Helen Chadwick, was the result of a residency to research embryology at the In Vitro Fertilization Unit at Kings College Hospital in London. Human embryos were photographed and displayed like delicate jewels.



"*Andre Serrano at Paula Cooper 3/1/97* " from the "Art Cultures" project by Susan Jennings
www.susanjennings.com

U.S. artist, Susan Jennings went a step further in culturing the work in her photographs of bacteria.
During her visits to art galleries, often during the openings, she exposed a petri dish to the air in the space. Susan Jennings said:
"Galleries attempt neutrality with their white walls, but every visitor and every event which takes place in the space leaves its impression. Many thoughts, questions, reactions, criticisms, anxieties, and jealousies are experienced in these spaces...
The air holds the microscopic mark of each event occurring in the space. We breath these in and leave them behind ourselves. In the process we exchange matter with the visitors to the space. Quite literally, I cultured art (spaces) and documented what grew." [10]

The two artworks above illustrate a limit of the categorization “bio art”. Susan Jennings cultured living forms for an aesthetic purpose and so for many would be considered bio-art, whereas Chadwick's work would not be considered bio-art, even though its content directly addresses the subject-matter of genetic-engineering.
Chadwick's sensual visualizations of the manipulation of human life gives shape and form to a complex procedure and, like the “GFT Bunny”, in turn provide opportunity for discourse on this.
Susan Jennings' work also engages the viewer, at the literal level by raising awareness of ever-present bacteria, even in a seemingly sterile place, but also to the paradox of 'culture' as something cultured as opposed to the forces of nature. In fact her work begs the question, where does the influence of culture stop?
Bio-art works have had some influence even on the physicality of art galleries. George Gessert wrote:
“The first time that I exhibited hybrid irises in San Francisco the curators had to install windows in the gallery, because the space had too little natural light for the plants. Gallery workers, who had worked for years under artificial illumination, thanked me. Unfortunately new problems arose. After I had transported pots of irises to the gallery, a heat wave struck, and temperatures climbed into the nineties. Before the opening, the plants bloomed out. I had promised flowers, but presented instead a not very interesting mass of seed pods and grassy leaves. Someday, perhaps, there will be new kinds of art spaces to accommodate nonhuman life, spaces that combine features of galleries, gardens, menageries, and wilderness. In the meantime artists have worked out problems of exhibiting organisms in the biologically hostile environments of traditional galleries and museums, and as a result, it is no longer surprising to see nonhuman creatures on display.
The question is, what kind of awareness does this serve? Does it aestheticize the biological revolution? Will it speed the commodification of life? Can living things in galleries help remind people that all forms of life have intrinsic value? Can we play some role other than tyrant in the community of life? Can we develop an art of evolution?” [9]

Gessert raises an important question here. What can bio-art become as it matures as a medium? When photography was an infant technology, photographs told us that the camera was an eye, that its image was real, not drawn or painted. Photography's first theme was photography itself. Later photography came to be used as a medium for aesthetic purposes, and the camera showed us other ways of seeing. Similarly, the first movies focused on motion itself, with slap-stick scenes, racing trains and galloping horses. Films later matured into using the medium for expressing a filmic aesthetic experience that went further than experimenting with the technique of presenting motion.

“Disembodied Cuisine” by Oron Catts , Ionat Zurr and others of the TC&A (Tissue Culture & Art) Project in L’art Biotech’ in Nantes, France, March 2003. The living frogs are on the left and the lab where the frog legs steaks were grown is on the right.

http://www.tca.uwa.edu.au/disembodied/dis.html

Recent bio-art projects seem to focus on the technology of manipulating living tissue, such as the “Disembodied Cuisine” by Finish born Oron Catts, British born Ionat Zurr and others of the The Tissue Culture & Art Project [11]. Here they grew muscle cells taken from frogs' legs, over biopolymer, into tiny steaks which were then cooked and eaten as a performance. The frogs which supplied the tissues continued to live and were displayed in the gallery alongside the growing “steaks”.

This work raises issues about what is life, or semi-life, or embodiment, in that the tissue was grown and presented outside the host body, yet it still focuses on the technologies of the lab and manipulation.

"OneTree" by Natalie Jeremijenko (1966-)
1000 cloned Paradox Vlach infertile walnut tree saplings exhibited at Yerba Buena Center for the Arts, San Francisco, in 1999 and then planted around the San Francisco Bay area in 2001. See: www.onetrees.org

An example of bio-art which reaches physically into the community is Australian artist Natalie Jeremijenko's "One Trees", in which one thousand tree clones of a single tree were micro-propagated. In the spring of 2003 the clones were planted in public sites throughout the San Francisco Bay Area.[13]

"Because the trees are genetically identical, in the subsequent years they will render the social and environmental differences to which they are exposed. The tree(s) slow and consistent growth will record the experiences and contingencies that each public site provides. They will become a networked instrument that maps the micro climates of the Bay Area... through their biological material." [14]

Stef Kofman wrote that *"Jeremijenko's work is an example of a very beautiful and subtle commentary on genetic engendering, but it fails to generate enough public attention.",* while adding *"that by pushing his experimental works to uncomfortable extremes, Eduardo Kac generates enough media attention to alert large groups of people to the possibilities of genetic engineering technology and its potential horrifying uses. Genetic Art that is more subtle and less controversial than the works of Eduardo Kac often fails to deliver its message to the world. His art is successful precisely because of the scandal it generates."* [5]

Detail of a field of red poppies at Documenta XII by Croatian artist, Sanja Iveković, 2007. Photo: Julia Zimmermann

However we don't just have bio-art about bio-art or about biotechnology. Art that is mediated through the biological is increasingly influential in the art world, such as the field of poppies planted in front of the Fridericianum Museum at last summer's Documenta.
In 1936, it was innovative for Steichen to position his bred flowers as an artwork and since then the use of 'biological' is a body of well-known works such Beuys' 1982, "*7,000 Oaks",* Orlans' operations or Sterlac's implants.

Bio-art that uses genetic-engineering is new and still largely not accessible to artists because of expertise, technical and funding limitations [15]. Such works tend to focus on the theme of the bio-technological, such as in the "GFP Bunny" and the "Disembodied Cuisine" but it is also true that the media attention thus far, has focused on the issues of manipulation and ethics. Nevertheless genetically engineered artworks can also stimulate a broader sense of engagement within society, with the natural world or the world of science.

Footnotes + References

1. Green fluorescent protein (GFP) was first isolated from Aequorea victoria and used as a new reporter system (see: Chalfie, M., Tu, Y., Euskirchen, G., Ward, W., Prasher, D. (1994) in 1994 and has been developed since. EGFP yields greater fluorescence in mammalian cells than the original jellyfish gene. See Eduardo Kac's references on this development at: www.ekac.org/gfpbunny.html. or http://en.wikipedia.org/wiki/Green_fluorescent_protein

2. The rabbit only glows when illuminated with blue light (maximum excitation at 488 nm). Being an albino rabbit she has no pigment in her skin and fur and has pink eyes.

3. http://www.ekac.org/gfpbunny.html

4. Kac's term for *"a new art form based on the use of genetic engineering techniques to transfer synthetic genes to an organism or to transfer natural genetic material from one species into another, to create unique living beings."* from his essay "Transgenic Art" originally published in **Leonardo Electronic Almanac**, Vol. 6, N. 11, December 1998, and available at: http://www.ekac.org/transgenic.html

5. Quoted from Stef Kofman's blog, GREEN LIGHT FOR TRANSGENIC ART, THE THEORIES AND WORKS OF EDUARDO KAC at: http://stefkofman.blogspot.com/

6. "Cross hare: hop and glow. Mutant bunny at heart of controversy over DNA tampering" by Gareth Cook, Globe Staff, Globe Correspondent, September 17, 2000, www.ekac.org/bostong.html

7. "Artist 'invents' glowing mutant bunny" originally published in **Ananova.com**, 19 September 2000 http://www.ananova.com/news/story/sm_63911.html. Available at: http://www.ekac.org/ananova.html See the bottom of: http://stefkofman.blogspot.com for links to 18 news items or articles about the GFT Bunny project.

8.Adapted from stefkofman.blogspot.com/ and www.hsny.org/html/library_archive_Steichen.htm

9. www.viewingspace.com/genetics_culture/pages_genetics_culture/gc_w02/gc_w02_gessert.htm

10. Adapted from a statement for the exhibition: "Paradise Now: Picturing the Genetic Revolution" curated by Marvin Heiferman and Carole Kismaric, Sept-Dec 2002, Carnegie Mellon University, Pittsburgh, PA, U.S.A., http://www.genomicart.org/offerings.htm

11. http://www.tca.uwa.edu.au. "Tissue Culture & Art" initiated in 1996, is a research and development project into the use of tissue technologies as a medium for artistic expression based at SymbioticA, the Art & Science Collaborative Research Laboratory, School of Anatomy and Human Biology, University of Western Australia, Perth.

12.Towards a New Class of Being: The Extended Body by Oron Catts and Ionat Zurr http://www.tca.uwa.edu.au/atGlance/pubMainFrames.html.

13. article: "Natalie Jeremijenko's trees aren't simply decorative -- they can be read like a social register", Zahid Sardar, Chronicle Design Editor, SFChronicle, October 23, 2004 www.sfgate.com/cgi-bin/article.cgi?file=/c/a/2004/10/23/HOGCQ9DH301.DTL&type=printable

14. http://www.nyu.edu/projects/xdesign/onetrees/description/index.html

15. Institutes such as the Wellcome Trust, (http://www.wellcome.ac.uk/Funding/Public-engagement/Grants/Arts-Awards/index.htm) or The Art and Science Collaborative Research Laboratory, SymbioticA (http://www.symbiotica.uwa.edu.au) do help give artists access.