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THE VISUAL IMAGINARY OF THE POSTHUMAN: AN ANTHROPOLOGICAL READING BETWEEN CINEMA AND CONTEMPORARY ART

ABSTRACT

The first step was to define the posthuman. This study is particularly focused on some art works and movies to try to recognize what are their implications on the weaving of the collective imagination, referring to the visual dimension of a coming future. The report continues with the analyses of the film *Gattaca* (1997), directed by New Zealander Andrew M. Niccol, and of artworks by Cypher (2009), which contain an explicit reference to Niccol's film and *GFP Bunny/Alba* (2000), both created by the artist Eduardo Kac. The works of these two authors and the relations between them become the main referential axis for examination of the construction of an imaginary of transformations in the parental relationship and, more generally, in social relationships associated with artificial genetic revolution.

keywords

visual anthropology;
posthuman; science fiction
film; anthropology of art

In this study, I propose to examine the creation of the “near future” imaginary using artworks and cinema. Particularly, I will analyze Andrew Niccol’s movie “Gattaca” and Eduardo Kac’s artworks called “Genesis” and “Cypher”.

Before initiating actual analysis of the visual materials and of their importance in the construction of the imaginary of the near future, I will briefly explain the perspective from which I will analyze them. The two vanishing points of this perspective are, on the one hand, the posthuman paradigm and, on the other, the “cultural imaginary” applied to film production and contemporary art. I will quickly explain the two terms, “imaginary” and “posthuman”, and some of the other definitions to which I will eventually refer.

Although the term and the concept of imaginary is deeply rooted in psychoanalytic theory, I will refer to the term considering its use in cultural studies and particularly in the work of Graham Dawson and the “cultural imaginary” in his text “Soldier heroes: British adventure, empire and the imagining of masculinities”. As it is possible to see in “*those vast networks of interlinking discursive themes, images, motifs and narrative forms that are publicly available within a culture at any one time, and articulate its psychic and social dimensions*” (DAWSON, 1994, p. 48).

This definition is repeated several times by subsequent authors and especially by Susanne Hamscha in “The fiction of America” (HAMASCHA, 2013).

Of course, it would be impossible not to mention Stuart Hall’s work “Representation: Cultural Representation and Signifying Practices” (SAGE, 1997), which owes much to the theories of Jean Baudrillard, Judith Butler, and Jacques Derrida.

POSTHUMAN

Although the term posthuman was first used in the contemporary art scene and literature a couple of decades ago, its semantic definition is still so vast that makes it easily misunderstood.

Although it will be impossible, in the time which we have today, to cover all the complex layers associated with this expression, I will try to give a brief explanation of the term (with the aid of a relevant bibliography) so as to analyze Niccol’s film and Kac’s artworks - even if they are not posthuman in the strictest sense, being examples of bio-art.

The term “posthuman” is also used to define an artistic movement. The Australian Stelarc and the French Orlan tend to call people’s attention

(including anthropologists) and are well-integrated into the group of posthuman artists. Probably because of the “corporal” dimensions of their works, as well as of the exoskeleton technologies that they use, these artists are declared to be automatic members of the fictional Cyborg.

The creation of the expression “posthuman” can be traced back to the American gallery owner Jeffrey Deitch, who used it as the title of a series of exhibitions he had curated in 1992. In his essay for the posthuman exhibition catalog, Deitch refers to an article that appeared in the front page of the *New York Times*, on February 6 of 1992, to show how cosmetic surgery and mood control medicine have become front-page stories because of the growing interest of an ever growing public in the current technical capacity of mankind to remodel itself. With a few strokes of a pen, Deitch creates a picture of a new dimension of the self and the possible remodeling of the self, a world away from Freudian hypotheses, and unforeseen by Darwin’s theory of evolution.

Curiously, in the first lines of his essay, when defining “post human”, Deitch refers to a veritable evolutionary leap: “*This new techno-evolutionary phase will bring us beyond eugenics*” (Deitch 1992). In other words, he contemplates a kind of evolutionary leap of the *Homo sapiens* from the hybridization of body and machine (here I understand “machine” as a product of technology; so, in this sense, even a drug can be considered a machine).

This is how Deitch described his notion of posthuman in an interview with Giancarlo Politi published by Flash Art:

“I have the sense that we are beginning to experience an extraordinary revolution in the way human beings understand themselves. The convergence of rapid advances in biotechnology and computer science with society’s questioning of traditional social and sexual roles may be leading to nothing less than a redefinition of human life.

It sounds a little too much like bad science fiction, but in fact powerful genetic engineering technologies that will allow people to choose their children’s or their own genetic recombination are likely to be available during our own lifetimes. Computer science is perhaps a decade or more away from producing computers that will have more intellectual capacity and maybe even more creative intelligence than any human.

In the essay I wrote about the end of natural evolution and the beginning of artificial evolution. These

developments will have an enormous impact on economics, politics, and on virtually every aspect of life. As we turn toward the 21st century we are likely to be experiencing a wave of new technologies and accompanying social changes that will possibly be even more important than the changes that were part of the development of the industrial revolution and of modernism. The point of 'posthuman' is to begin looking at how these new technologies and new social attitudes will intersect with art.

It fascinates me to think about how many creative and even artistic decisions will have to be made in the application of the new bio and computer technologies. I am not particularly involved with the latest developments in genetics and computer science, getting most of my information from journalists rather than from primary sources. I was therefore quite amazed when the artist Paul McCarthy and his wife gave me an article by the leading geneticist Leroy Hood entitled 'Notes on Future Humans' in which he actually uses the term 'posthuman'. Coming from the direction of art criticism, I was actually much closer to current theory in advanced genetics than I had ever realized" (Politi, Kontova 1992).

When trying to understand the semantic genealogy of the term, I find the article by Leroy Hood (Hood 1992) particularly interesting, considering the author is now one of the leading exponents of genetic (and digital) revolution and its associated technology.

It was in the early 1980s that the American biologist Leroy Hood perfected an automatic DNA sequencer, a device designed to map the sequences of the nitrogenous bases of a DNA strand quickly and automatically.

Hood's automatic sequencer dramatically reduced the amount of time needed to analyze the nucleotide sequence of a DNA strand, making it possible to conduct it in a single night the equivalent of a week or more of manual sequencing work. The several models of the device, which were subsequently manufactured and marketed, were able to read 12,000 base pairs per day, and were more accurate than any form of manual sequencing. For the purposes of this study and without going into too much detail on the way an automatic DNA sequencer works, it is possible to say that a fundamental part of this instrument is constituted by a complex computer system that analyzes output and processes it very quickly.

From a philological reconstruction of the term "posthuman", I have reconstructed its essential elements and, more precisely, identified the link

between the two revolutions that occurred in the second half of the 20th century (the cybernetic revolution and the genetic revolution), and how this makes it possible to talk about an evolutionary leap. That said, it is worth looking a little closer at this basic concept and at the work of the authors who use it to discuss the social implications of posthuman theories.

Among the authors whose work are associated with this text, there is Katherine Hayles, author of “How we became posthuman” (Hayles 1999).

Hayles divides the formation of posthuman thought into three phases:

The first phase concerns the period between 1945 and 1960 and begins with the series of Macy Conferences that led to the birth of cybernetics. Norbert Wiener, Claude Shannon, John von Neumann, and Gregory Bateson played a fundamental role in this period. I would like to emphasize how, and this is my own personal addition, as an area of anthropological thought, it is included in the origins of cybernetics, despite criticism regarding the overall results.

Wiener and Shannon theorized that information was meaningless, implying that information is decontextualized (the complete contrary of embodiment). Not everyone agreed with this view. Donald MacKay, for example, defended that information should be understood as something specific and situated. This means that universalization and quantification become almost impossible. And yet the position of Wiener and Shannon, who believed that information is purely abstract, prevailed.

In the second phase, between 1960 and 1985, the main interpreters were Varela and Maturana. Information is once again something connected to a body, to the observer. Here I would like to briefly recall how, ever since the early 1920's and Heisenberg's Uncertainty Principle, the observer had been forcefully inserted into the scientific world.

Finally, the third and present phase (Hayles was writing in 1999) is characterized by various developments in the field of artificial life forms. Hayles also introduces criticism of the postmodern vision that dismantles the Body. She is not surprised that theorists who write about the Body (such as Foucault) prefer to write about the universality of the Body. Hayles proposes an interesting distinction between “body” and “embodiment”, in which the first is an idealized abstract form, a universal conversational construct.

Perhaps the limitation of Hayles' text is the failure at analyzing the scientific revolution of genetics and genetic manipulation technologies, which today, but also in the 1990's, have overcome the barrier separating the produced information and the biological world.

After finding its bond with the observer and being dissociated from the Body, information becomes a system of hybridization between the metabolic world and that of the electrons. Artificial information is inserted into biological matter, becoming a constituting part of it and acting at the level of the subject in its social relations – as seen in the film “Gattaca” or the artworks by Kac.

Thus, for over a decade, representations of a hypothetical society have filtered their way into the popular imaginary, a hypothetical society where the division between which is considered cultural and which is considered natural has disappeared.

Now we are going to take a closer look at these works.


In 1997, ten years after the creation of the automatic sequencer and eight years before the genome project reached its conclusion, the director Andrew Niccol, from New Zealand, produced his first film: “Gattaca, the door of the universe”.

Unlike many other science fiction films, Gattaca was not a movie adaptation of a book. Instead, the director developed both the idea and the screenplay of the movie. Despite being widely categorized as “cyberpunk”, more attentive observers have inserted this work in the biopunk subgenre.

Niccol’s film was originally called “The eighth day”, referring to the day following the divine creation, but when Jaco Van Dormael presented a work with the exact same name at the 1996’s Cannes film festival, Niccol changed it to “Gattaca”. The choice of the new title was not casual. It contains a cryptic reference to the DNA and, as it is possible to see later, it will be used again by a bioartist. The letters that constitute the name “Gattaca” are, in fact, the four letters used to define the four nitrogenous bases in DNA sequences: A for adenine, C for cytosine, G for guanine, T for thymine.

“Gattaca” is set in a not so distant future, when the application of genetic engineering to human beings is common and DNA plays a key role in determining social class. Before the embryo is implanted in the uterus, its genetic assets are engineered by selecting the best of the parents’ genetic makeup. Those who are born naturally, the movie’s so-called “invalids”, are destined to perform the most menial jobs and subordinate roles. The genetically modified or “valid” members of the population occupy the dominant positions, while those who were born naturally are marginalized and have no access to the most prestigious professions.

The protagonist Vincent Freeman (Ethan Hawke) is a natural born, i.e., his conception did not come from genetic engineering. After his birth, an initial



analysis of his DNA not only shows that he is short sighted, but also that he has a high probability of developing a heart disease – a condition that considerably reduces his chances of living beyond the thirties. Consequently, Vincent’s parents decide to conceive their second child, Vincent’s younger brother Anthony, with the aid of genetic programming. Thus, a competition between Vincent and Anthony, the naturally-born and the programmed, the “invalid” and the “valid”, begins and continues throughout the film. The race between the two brothers sums up many of the themes in “Gattaca”: the birth of a new kind of genetic/transgenic family, its contradictions, and its hybrid and competitive state. The existence of these very close and yet very different worlds within the same family is the precursor of even more complex genetic interactions in the world.

Vincent’s desire to become an astronaut is incompatible with his “invalid” status, as well as any hope he has of achieving a high position in a society based of genetic segregation. In the world of “Gattaca”, it is impossible to escape from a subordinate status: as a no-valid, Vincent is destined to perform only the most menial jobs. Determined to follow his childhood dream of becoming an astronaut, Vincent moves to Gattaca, the city of astronauts and space missions, where he gets a job as a cleaner. To overcome the social barriers created by genetic segregation, he had to use a strategy, a disguise – Vincent becomes a “genetic pirate” and takes the identity of another person: Jerome Morrow.

The genetically programmed Morrow is an athlete and a swimming champion, who has been stuck in a wheelchair since an accident. His genetic makeup had been programmed to make him a champion swimmer, but circumstances destroyed his chances of achieving his objectives. Later the film reveals that what had appeared to be an accident had been a failed suicide attempt because of the athlete’s frustration for never winning a race and always having to accept second place.

Like in every good pop movie, the plot evolves into an intricate web of “noir” and romance with vintage photography. The noir element is represented by the murder of one of the flight directors just before Vincent’s first space mission. The romance element is introduced with the love story between the no-valid/genetic pirate Vincent and the valid Irene Cassini.

Using DNA analysis and information from a data base containing the genetic sequences of the entire population, an eye lash found in the scene of the crime is identified as belonging to Vincent.

As an “invalid”, Vincent should not have been in that part of Gattaca, so the police start to search for him without knowing his physical appearance. To “become” Jerome, Vincent underwent an operation to lengthen his leg

bones and change his height. In addition, it is evident that a paradox similar to that described in Edgar Allan Poe's "The *purloined* letter" is at play.

In fact, nobody suspects Vincent/Jerome, who continues to roam the streets of Gattaca protected by his valid identity. A series of dramatic twists in the plot follows, including the love story between Vincent and his valid colleague Irene Cassini, and the discovery that the investigator is none other than Anthony, Vincent's programmed brother who he thought to be dead. In this whirlwind of events, Vincent's identity as an "invalid" is uncovered by Irene Cassini, who continues to love him, and the investigator/brother Anthony who is once more defeated in a "re-make" of the swimming race.

When it looks like Vincent is doomed, the police discovers that the flight director was murdered by the valid responsible for the space program, who had been concerned that the budget for space launches would be cut and his program eliminated, and the case is closed.

Thus, Vincent/Jerome manages to travel to Titano with the help of a doctor from Gattaca, who confirms Vincent's valid identity because his son was a fan of him. While Vincent heads to Saturn, the real Jerome commits suicide, leaving enough blood and urine with which Vincent would be able to prove his valid identity for the rest of his life.

THE BODY

Despite dealing with the social and ethical issues surrounding the relation between genetics and society, the body is the implicit object of the film.

"Gattaca" is a representation of a possible future social dystopia based on genetic discrimination. Grafted to this principal axis we find the themes of sibling rivalry, love between different social classes (the invalid Vincent and the valid Irene Cassini), and the opposing forces of chance and programming.

It is chance that establishes the genetic "imperfections" from natural conception and it is chance that disrupts the genetic programming of the athlete's body.

Apparently, the film can be read along this narrative until the explanation of the protagonist's individualistic vision that states his natural subjectivity by his own will. However, a number of Vincent's "valid" accomplices leave the social dimension wide open to overcome genetic class barriers.

The society described in “Gattaca” recalls Aldous Huxley’s dystopian vision in “The brave new world” (1932). This said, in Huxley’s book, on the one hand, genetic programming is compulsory, being imposed by an all-controlling and authoritarian super State. In “Gattaca”, on the other hand, what we see can be defined as liberal eugenics: it is not the State, but the parents that autonomously decide their preferences concerning their child.

Besides the storyline of the film, which describes the social dimension, the images also describe another subject, a complementary and even more evident subject than that woven in the narrative: the centrality of the body as a place of transformation and contrast, as the concrete ground of genetics - of programming and chance at the same time. The body is like the crossroads of political and social relationships, in which both incarnation and contradiction occur. The location at which the no longer biopolitics of Foucault becomes a concrete place of manifestation and realization.

SYNECDOCHE

The first sequence of the film shows the details of residual parts of the body. Before the beginning of the narrative, as backdrop to the opening titles, the director inserts a sequence that powerfully draws the attention to the body and its residual components. Jackie Stacey gives an interesting interpretation of this initial sequence in his article (STACEY, 2005):

“In the opening sequence of *Gattaca*, an enigmatic scene of minimalist formal beauty gradually becomes a display of the shedding of abject bodily detritus for the purpose of an elaborate disguise. In the first few shots of the film, the excessive visual magnification of nail clippings, strands of hair, and flakes of skin effects a visual deception upon the audience: the nails look like large crescent-shaped pieces of frosted glass, the hair like lengths of rubber piping, the shower of skin like a beautiful snowfall. Initially unidentifiable, these gigantic bodily fragments fall in slow motion, hitting the ground with a thudding vibration as they eventually settle on a luminous blue surface that fills the screen” (STACEY, 2005, p. 1851).

It is possible to say that the director uses the rhetorical figure of Synecdoche (a part for all). Nails, skin and hair become representatives of the entire body; they embody the total identity of the individual, without having to show the totality of the body.

Using this rhetoric strategy that identifies the body using one of its segments, “Gattaca” describes the way in which genetic technologies have changed the concept of identity.

Identity is no longer provided by an image or a photograph (a passport photograph, for example), but by something that is hidden (as already happens in airports where the image of the iris is used to check identity). Even though this is not a complete novelty (fingerprinting was invented in the 19th century), in “Gattaca” it occurs at an even more infinitesimal level. We descend deep into the cells, into that irreducible biological dimension of the body, which nevertheless seems to almost escape from us.

The Panopticon, absolute optical surveillance, makes way for a sort of molecular surveillance performed by computers and genetics, which redefines the observation of the body – taking it to the world of the infinitesimal and subtracting the validity of certification.

Surveillance is conducted using new parameters of identification, which no longer depend on sight, but on biological investigation with technological instruments.

Analysis of blood and urine for DNA sequencing, an eyelash as an identity card, and other fragments work almost as incorporeal emanations of the body that seem to contain the entire identity of the subject.

In this, we can find some sort of implicit criticism of Foucault’s theories on biopower, such as found in the contemporary text by Donna Haraway (HARAWAY, 1997)

According to Haraway (1997), the technological world to which Foucault refers to no longer exists. Modernity has evolved to posthuman and the domination technologies have computer and genetic systems rather than optical systems.

An image: the body, which has been increasingly sharing relationships with the machine, finds its identity through these relationships with the machine itself. This aspect conjectured by “Gattaca” is a microscopic body far beyond the optically visible. In fact, if the length of the human DNA is little more than a millimeter, its width measures from 2.2 to 2.4 nm.

By referring to the body’s invisibility and its “biological” level, “Gattaca” reveals the dual aspect of technology, both as a tool for genetic manipulation and as a system of identification, by presenting it under the appearance of “nude life” (to use an expression by Giorgio Agamben, 2005), but being, in reality, a life dressed in technical appliances. The body as an expression of a biological layer becomes the stage of a techno-cultural world that acts in the deep recesses of the biological, so as to transform and give it a bioartificial or biocyborg form.

VISIBLE/INVISIBLE

In this dialogue between the visible and invisible, “Gattaca” is partially coherent with the iconic Western tradition. The body has been represented as the vehicle used to reveal the invisible; Gothic painting and sacred art generally tried to make the divine visible through the image of the body. The statute of the image in western culture was not created by a philosopher or an artistic movement. It was fixed in the year 787 by the Fathers reunited in the Second Council of Nicea, the seventh ecumenical council of the Catholic Church.

The council established the victory of the iconophiles over the iconoclasts. That ancient debate about the image and the drawn and accepted conclusions (amidst dramatic contrasts of Christianity) have shaped Western culture. (Russo L. 1997). In the initial sequence of “Gattaca”, but also in the rest of the film, the visible parts of the body are a visible reference to the invisible DNA.

HYBRIDIZATION BEYOND THE BODY

Thus, in “Gattaca”, on the one hand, the body is defined by its relationship with technology and, on the other hand, by the need to establish relationships with other bodies, such as the one between valids and invalids, genetically modified bodies and natural bodies. While this relationship is dominated by power, this dominion has its porosity. Allied valids Victor/Jerome represent this porosity, which is expressed in various ways: the act of falling in love, competition/alliance, and respect.

The film mainly describes porosity from the act of falling in love, which despite the aseptic and technological environment, manages to find how to escape from the totalitarian social hierarchy.

Falling in love, and love’s ability to subvert the established order, becomes the reference for one of the constituent parts of the movie’s plot. The love story between Vincent and Irene exposes the fragility of the encoded boundaries with the explosion of what we can describe as the subversive capacity of eroticism (BATAILLE, 1962).

In “Gattaca”, the choice of partner seems to depend on the evaluation of genetic factors rather than the “correspondence of amorous feelings”, described by Foscolo in his “Sepolcri” as amorous feelings that go beyond the rational and that are the indomitable human prerogative in the end.

To be more clear, I would like to make a quick reference to other science fiction films inspired by robotics, such as Alex Proyas’ “I Robot” (2004)

and Chris Columbus' "Bicentennial Man" (1999) with Robin Williams, in which the Cyborg is threatened by human ability to feel.

The element of competition/alliance is represented by the relationship between the two brothers and, more specifically, by the swimming race (swimming is a recurring theme and, in fact, Vincent adopts the identity of a swimming champion).

Vincent reminds his brother of how he was able to beat him at the moment that he no longer thought of the necessity to save energy for the return journey (the race consisted in swimming as far out in the sea as one dared, and who came back first would be the loser). Thus, Vincent wins because he challenges death by adopting a less rational and, therefore, entirely human point of view. Having feelings for others is what differentiates the human who was naturally created from the one who was artificially produced according to engineering that represents the apparent success of pure rationality.

Nonetheless, the establishment of dialogue between human and genetically transformed bodies points to hybridization as a way to overcome dualism and affirm the posthuman.

In other words, this alliance (and hybridization itself) represent the overcoming of the nature/culture opposition, expressed by the overcoming of the opposition between invalid/nature and valid/artificial-culture.

This way, the transformation in machine illustrates and updates the power relations of a subject that is no longer locked in the dialectical context.

The fusion of the human and technological acquires a new transverse compound, as stated by Braidotti (BRAIDOTTI, 2013, 100). Scenes from "Gattaca" about the DNA test and scene about the love between Vincent and Irene in the swimming competition in the beach house.

THE SCENARIO

At this stage, I would like to consider a few points on the setting where these events occur. The director sets his fictional near future in a recent past, thus creating a kind of short circuit in the substantial future of the narrative. Actually, this short circuit illustrates how what has been discussed currently has already occurred or how the technological potential has achieved its end in scientific laboratories at least.

This could place "Gattaca" in the Steampun genre. Despite having many things in common with this genre, Gattaca exceeds it with its very peculiar setting.

There is a number of key elements that go beyond the photography (for which the director uses a varied repertoire of warm red and yellow tones), such as Gattaca's space center setting and the cars used in the film.

Gattaca's space center is set in the architect Frank Lloyd Wright's Marin County Civic Center, that was built in the early 1960's. The reference to Wright, well known for his romantic vision of American pioneering and his idea of architecture in harmony with the natural world, is not casual at all.

The relation between near future and recent past continues with the choice of cars used in the film –all electric versions of vehicles produced in the 1960's. Thus, the director creates an image of a future set in the 60's: a time when the seeds of posthuman technology were sown and cybernetics and genetics were born.

Finally, a last observation concerns the use of Esperanto in the official announcements displayed in Gattaca's space center.

The use of Esperanto - a language that never came into being, suspended between past and future - serves as a counterpoint to the use of the letters DNA to create the title, or better, to transform the symbolism of DNA into some sort of embryonic language.

Here I use the word "language" in its strict sense, not as a metaphoric expression, but as the relationship between a signifier and an arbitrarily defined meaning.

One could say that the genetic penetrates the sphere of language or, more precisely, that it disrupts the opposition between nature and culture, breaking down the deepest boundaries of this opposition.

The irreducible biological cell and cultural language are confused in the inscription which is, somehow, already present in the title, which uses the abbreviations of the nitrogenous basis of DNA to create a word.

There is a Brazilian artist currently based in Chicago who approaches this relationship between language and DNA at the heart of a series of works and in what he defines as "transgenic art".

In "Cypher", one of his latest works, he makes an explicit reference to "Gattaca". In this work, the artist codifies by means of the "artist's gene", the following message: "A tagged cat will attack Gattaca".

The expression "artist's gene" was created by Kac himself and refers, quite literally, to a laboratory created gene whose amino acids sequence has been defined by the artist according to his own specific linguistic logic.

In “Cypher”, Eduardo Kac prepared a veritable transgenic book: a box that opens like a book and contains a kit for activation of a transgenic bacterial colony from which the artist’s gene is synthesized to encode a short poem.

Codification is invariably performed using the initials of the four nitrogenous bases adenine (A), cytosine (C), guanine (G), thymine (T) (directly and without recourse to the Morse code, as in his previous work “Genesis”, which I will discuss in a moment). The four letters are used to compose a sentence. However, given that they are not enough to provide the other six letters needed, he adopted the following scheme: the repetition of the four letters/bases for two or three times to correspond to a new letter. This is the scheme of the code:

E = TTT,

D = AA,

K = CC,

W = GG,

I = AAA,

L = TT

Thus the poem is: “A tagged cat will attack Gattaca”

The result of this process is that the poem and code complement each other in such a way that the code becomes an integral part of the poem. Both are included in the booklet in the kit, thus enabling the viewer to discover this when following the protocol that gives life to the poem. The title manifests an anagrammatic relation between sign and referent that is by itself also part of the work (from the artist’s site).

“Cypher” is an artwork that presents itself as an invitation to engage in procedures concerning art and poetry, biological life and technology, reading/seeing, and kinesthetic participation. The relation between the sculptural object and the book is enhanced by the title of the work being engraved in the spine of the slipcase and on the “cover”, i.e, the front of the kit. The work may be placed on a bookshelf and clearly identified. When opened, the viewer discovers a complete transgenic kit. The “reading” of the poem is achieved by transforming *E. coli* with the provided synthetic DNA. The act of reading is processual. By following the specified procedure, the participant creates a new kind of life, one that is literal and poetic all at once.

I am not going to extend myself any further on the conduction and significance of this work, and the various internal references, such as those to “Gattaca”, because I would like to present another work by E. Kac, from 1999.

“Genesis” was the first of Kac’s transgenic artworks and was presented for the first time during September 4-19, 1999, at Ars Elettronica held at the OK Center for Contemporary Art, Linz, Austria.

The work comprises of several sequences. In the first, Kac creates (in a genetic biology laboratory) what he calls an “artist’s gene”, which, in the next phase, will be inserted into an *E. coli* bacterium. The “artist’s gene” is a purposefully sequenced DNA strand. In the case of “Genesis”, the strand was sequenced to encode, by means of a system of symbols, a passage from Genesis of the Bible.

The passage inscribed by Kac in the artist’s gene states: “*Let man have dominion over the fish of the sea, and over the fowl of the air, and over every living thing that moves upon the earth*”. (Bible Genesis 1:28; rewritten by Kac E)

Once created, the gene is introduced into plasmids and then inserted into the *E. coli* cells. The plasmids are circular strands of DNA in cell cytoplasm and are differentiated from the chromosomal DNA, insofar as they reproduce themselves independently. In addition, the plasmids have the ability to migrate between cells.

“Genesis is a transgenic artwork that explores the intricate relationship between biology, belief systems, information technology, dialogical interaction, ethics, and the Internet. The key element of the work is an ‘artist’s gene’, a synthetic gene that was created by translating a sentence from the biblical book of Genesis into Morse Code, and converting the Morse Code into DNA base pairs according to a conversion principle specially developed for this work. Morse code was chosen because, as the first example of the use of radiotelegraphy, it represents the dawn of the information age – the genesis of global communication” (Perra 2000, 76-81.).

Therefore, Kac has translated the passage in “Genesis” to Morse code in such a way that only four symbols are used to encode his message. The Morse code uses five symbols: dot (•), dash (–), short gap (between each letter), medium gap (between words), and long gap (between sentences). In this case, given that he was dealing with a single sentence, Kac only used four of the five symbols.

Having obtained the text in Morse code, he associated each of the four nitrogenous bases needed to codify a strand of DNA: adenine (A), guanine

(G), thymine (T), and cytosine (C) with a Morse symbol: the dot to C, the dash to T, the gap between words to A, and the space between letters to G. Using the letters that symbolize the various chemical sequences, he associated the Morse code with a DNA structure. After the ordered sequence of nitrogenous bases was obtained, this was produced biochemically to generate a DNA molecule. This molecule was then inserted in the plasmids which were, in turn, inserted into the *E. coli cells*.

figure 1

Eduardo Kac, "Encryption Stones", Laser-etched granite (diptych), 20" X 30" (50 X 75 cm) each, 2001. The triadic configuration of the "Encryption Stones" critically reveals the intersemiotic operations that lie at the heart of our current understanding of life processes. Collection Richard Langdale (Columbus, OH).




The next step was marking the cells with a technique based on the GFR gene according to two variants, ECFP and EYFP. Essentially, the cells in which the plasmids were inserted with the author's gene were marked in blue when exposed to UV radiation, while the cells without the author's gene were marked in yellow when exposed to UV. This made it possible to track the mutations and migrations between cells that exchange plasmids.

Three types of situations were generated:

- 1- The blue bacteria (ECFP) exchange their plasmids with the yellow ones bacteria (EYFP), producing green bacteria (EGFP).
- 2- No exchange, thus the bacteria maintains its original color.
- 3- The bacteria lose all their plasmids and become of a pale ocher color.

Once the cell culture was ready, Kac developed a displaying and interacting system with the set of evolving bacteria. The Petri dish in which the culture had been placed was observed by a camera, whose signal



was screened both in the showroom and in the internet. In addition, by using an electronic connection, any virtual visitor could directly interact with the bacteria. By turning on a UV light one could both see the different colors and mutation strategies within the colony and accelerate the exchange of plasmids.

The exhibition ended with the extraction of the strand of DNA that codified the biblical passage and the verification of eventual mutations following nitrogenous bases. The mutations were always decrypted according to the Morse code.

Here is one of the resulting variations: *“Let man have dominion over the fish of the sea and over the fowl of the air and over every living thing that moves on the earth”*.

Finally, I would like to conclude with the presentation of another work by Kac: Alba, the GFP Bunny.

Of all transgenic artworks, Alba, the transgenic bunny, was the one that aroused the most controversy, even before being “displayed”. It was censored the day after its presentation and before coming out of the laboratory of genetic engineering where the process was conducted. In fact, the work failed at reaching its creator or the general public.

Alba, whose name as an artwork is “GFP Bunny”, was an albino rabbit that looked very similar to any other albino rabbit: white with red eyes. What made this genetically modified creature different was the way it became phosphorescent green when exposed to a source of UV radiation.

Everything else about the animal was the same as the natural species and the fluorescent effect did not alter its vital functions in any way.

To obtain Alba’s fluorescence, the gene that regulates the production of the protein associated with fluorescence in *Aequorea victoria* (jellyfish) was added to the animal’s original genes.

For Eduardo Kac, his complex GFP Bunny art project was supposed to serve as a starting point for a much wider reflection on the widespread presence of transgenic life forms in complex societies.

Thus, Eduardo Kac expected that the social inclusion of his work would encourage discussions on genetic engineering and social criticism of genetic techniques, leading to mass awareness of these particular technologies and, above all, their widespread use in research laboratories.

“The GFP Bunny project, says Kac, includes not only the process of bringing Alba into the world and integrating her into society, but also deliberately provoking the fears, imaginations and hopes we have attached to genetics and new life forms. One small hop for Alba; one large hop for mankind” (Allmendinger 2001).

The project had three phases. The first phase was dedicated to the creation of a transgenic rabbit in a genetic research laboratory; the second involved the presentation of the transgenic animal to the public; and the third would show Alba being introduced into the domestic life of Kac’s family as a transgenic pet.

In this way, the artist wanted to create a complex social event in which the creative phase would be followed by a moment of dialogue in which the general public together with artists, writers, philosophers, and scientists would reflect on the cultural implications of the “chimerical” animal (here I use the word chimerical in the mythological rather than the biological sense).

In fact, as the artist himself states, his transgenic art does not end with the simple creation of a genetic artwork, it aims at evolving into a transgenic social subject.

The central part of the Brazilian artist’s work was supposed to be the social relations developed in regard to this new domestic animal.

Alba would participate in all social relationships involving a domestic animal, with the mere addition of a transgenic nature. We might add “cultural animal” to this phrase to provoke a confrontation between animal and culture (I will address this issue later).

According to the artist’s idea, the transgenic rabbit should represent an important milestone in the relationship between man and domestic animals. In fact, Kac based his artistic thought on the association which gives unity to species in a co-evolution relationship, to the extent that today’s *homo sapiens* is capable, at least partially, of redesigning the biological status of other species and, evidently, his own – if not at an ethical, at least at a technical level.

In his artwork, Kac was concerned with the reconstruction of part of the relationship between the species that for thousands of years linked the *Sapiens* to the *Oryctolagus cuniculus*, using iconographic references that include Roman coins and images used in the Aztec calendar. In other words, we can say that, for Kac, the Alba/GRF Rabbit should have been a further step in a series of reports concerning the association between rabbit and man, reducing this relationship in the contemporary technological landscape.

With this work, the artist wants to provide the coordinates for a reflection on the transformations that the relationship man/other species is undergoing thanks to the adoption of techniques of genetic engineering, transformations that should acquire a social dimension, of social criticism regarding the technological modification of genomes.

The first phase of the work was carried out in the laboratories of the Institut National de la Recherche Agronomique, in collaboration with the researcher Louis-Marie Houdebine, but descriptions of this phase are contradictory.

While for Kac there was agreement regarding the entire operation, both laboratory and researcher deny this, claiming that Kac merely studied one of their many transgenic animals, and never asked them to create a GFP rabbit specifically for him. According to the laboratory and the researcher, Kac simply took one of the many GFP rabbits habitually bred for laboratory purposes and used it for his own project.

Louis-Marie Houdebine gives the following version of events:

“The GFP rabbits were prepared, as we always said, years ago, before E Kac came to visit us. My colleague JP Renard asked me to generate these rabbits because he needed cells with markers to clone rabbits. We chose to construct a gene capable of expressing the GFP gene in all cell types. This was expected to create a very versatile tool” (Boulanger et al. 2002, 88). And in: “Essentially all the cells of the rabbits are green under UV light. The newborn rabbits appear uniformly green as long as they have no hairs. In adults, only the part of the body devoid of hairs look green and of course, eyes are green instead of red (under UV light).¹” The second and third phase of Kac’s artistic project were never completed, at least not in the initially intended way because of the censorship that prohibited Alba’s departure from the INRA laboratory.

The presentation should have occurred in the Avignon Numerique in June of 2000, but it was suspended because the Institut National de la Recherche Agronomique (France’s public center of research where the transgenic variation of Alba/GFP Bunny had been produced) did not want to be at the center of a scandal involving the creation of transgenic animals for “artistic pleasure” or pure curiosity. Above all, the Institut National de la Recherche Agronomique did not want to be questioned on the appropriate use of public funds.

In effect, Alba/GFP Bunny is not only experiment that has created a fluorescent transgenic mammal. In fact there is a well-consolidated

¹ <https://goo.gl/iZfRB4>. Accessed in 12.8.2017.

production of transgenic GFP mammals, including mice and pigs, conceived for scientific experiments; the Alba/GFPBunny project turned into a scandal because of its artistic or even playful purpose and because of Kac's intention of including the animal in his domestic routine in the third phase of the project.

Kac summarizes his point of view when he asserts:

“As I see it, there is no reason to believe that the interactive art of the future will look like anything we knew in the 20th century. GFP Bunny (Alba) shows an alternative oath and makes clear that a profound concept of interaction is anchored on the notion of personal responsibility (as both care and possibility to response). GFP Bunny gives a continuation to my focus, within art, on what Martin Burber called “dialogical relationship” and Mikhail Bakhtin called “dialogic sphere of existence”, what Emile Benveniste called “intersubjectivity”, and what Humbert Maturana called “consensual domain”: shared spheres of perception, cognition and agency in which two or more sentient beings (human or otherwise) can negotiate their experience dialogically. The work is also informed by Emmanuel Lévinas' philosophy of alterity, which states that our proximity to the other demands a response, and that the interpersonal contact with others is the unique relationship of ethical responsibility. I create my works to accept and incorporate the reactions and decisions made by the participants (including bacteria and other forms of life)” (Bolognini 2006).

I would like to conclude by drawing attention to the fact that, in 2010, Craig Venter (Gibson 2010) announced that he had created the DNA of a cell thanks to the elaboration of a chromosomal sequence exclusively calculated by using computers. Indeed, without the computer, calculating all of the nucleotide bases present in the strand would have been impossible. As impossible as it would be for me to explain in this text the process of producing the million base pairs plus needed to create this genome!

An article published in *Science* Gibson explains how the *M. mycoides* bacteria genome was produced with the addition of DNA sequences to “watermark” the genome and distinguish it from a natural one (ibid, 52-56). The scientists then transplanted the *M. mycoides* genome in another type of bacteria, the *Mycoplasma capricolum*.

In addition, given that present-day computers are only able to produce small strings (and, in this case, a sequence of over one million base pairs

was needed), special assembly techniques using enzymes from DNA strings were employed. At this stage, I would like to state the aspect that interests me the most: “*This is literally a turning point in the relationship between man and nature,*’ said molecular biologist Richard Ebright at Rutgers University, who wasn’t involved in the project. ‘*For the first time, someone has generated an entire artificial cell with predetermined properties*’” (Hotz 2010).

We might ask ourselves what the cells containing the author’s gene and the scientist’s DNA have in common, which would be easy to answer with an oxymoron, and say that both are cultural cells. But this would surely hide the overcoming of the nature-culture opposition which, by simplifying the world, has allowed us to draw a clear line between *Homo sapiens* and his environment.

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