TRANSGENIC ART AND SCIENCE IN EDUARDO KAC'S WORK: ETHICAL ISSUES ACKNOWLEDGED

by

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DECLARATION

I, Megan Erasmus (Student Number 47254068), declare that this dissertation, **TRANSGENIC ART AND SCIENCE IN EDUARDO KAC'S WORK: ETHICAL ISSUES ACKNOWLEDGED** is my own unaided work, except to the extent explicitly acknowledged. All the sources that I have used or quoted have been indicated and acknowledged by means of complete references.

This dissertation is being submitted for the Master in Visual Arts, Faculty of Human Sciences, University of South Africa. It has not been submitted before for any degree or examination by any other University.

Signed at _____ on this _____day of _____ 2015

Signature_____

DEDICATION

To Karen, who taught me that the world is rich with treasures, interesting souls, humorous secrets and glittering discoveries.

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ABSTRACT

Title:

Transgenic Art and Science in Eduardo Kac's work: Ethical issues acknowledged

Summary:

The rise of the biotechnical and genomic revolution has motivated contemporary artists to explore the use of scientific methods as a medium for art-making. The application of these ground-breaking methods within the realm of contemporary art allows for the distortion that exists between life sciences and the imagination to become a reality. This practice is known as transgenic art. With biotechnology as the new playing-field for art comes a myriad of dangerous implications, ethical issues, questions of authorship and responsibilities. The transgenic artworks of Eduardo Kac entitled *GFP Bunny* (2000) and *Genesis* (1999) form the basis of the research. The main question posed in this research explores the purpose of transgenic art and the unavoidable impact thereof on society. Social awareness of ethical issues surrounding this type of art-making is addressed. The poignancy of the study lies in debates deliberately introduced by the artist, but also unintended controversial issues that surface from the creation of living artworks.

List of key terms:

Transgenic Art; Kac (Eduardo); Bioart; Bioethics; *GFP bunny*; *Genesis*; Genetic engineering; Biotechnology

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CHAPTER 1: INTRODUCTION

1.1 BACKGROUND INFORMATION

> … But whatever this pressure toward aesthetic decency, the temptation of transgression will remain, and biotech art will retain some of its adventurous and dangerous power (Michaud 2007:394).

The gravitational relationship between the disciplines of art and science has been an attractive area of research for many years. Although there are many differences between the methodologies of science and art, both fields share the similar characteristic of robust imagination. It is usually thought that science methodologies focus on results only, but some scientists think the role of the creative process has been underestimated and that the creative methodologies bring about the desired effects. According to Thomas Kuhn[1] (1970:35), the importance of the anticipated results is "…always small compared with the range that imagination can conceive". The creative process allows both the scientist and the artist to explore possibilities and, more importantly, to explore impossibilities.

Contemporary artists are responding to the most recent discoveries in biotechnology[2] by integrating the controversies evoked by this evolving technology into their artistic methods. The implications of scientific application in contemporary art and the subsequent ethical discussions that unfold is the focus of this study. This study analyses two artworks of Eduardo Kac, specifically chosen because the boundaries between art, science and ethics grow dim. This form of art is known as transgenic art.

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[1] Thomas Kuhn (1922–1996) was an American physicist, historian, and philosopher of science.

[2] There are variations that include or exclude the use of the hyphen in the spelling of the term 'biotechnology' (bio-technology). Most recent research shows the use of the term without the hyphen, so for the purpose of this study I will omit the hyphen and refer to the term as biotechnology, unless quoted otherwise by other sources. The same rule will apply to the terms 'bioethics', 'bioart', 'bioartist', 'bioengineering', 'biotechniques' and 'biomarker'.

The starting point of the background information for this study is the historical attraction of arts to the science of human anatomy. Intellectuals such as Leonardo da Vinci, Andreas Vesalius and later, Rembrandt van Rijn, made the science of human anatomy a part of their life's work. Da Vinci researched and portrayed anatomical precision in his drawings and paintings. Leonard Shlain[3] (2014:4), in his ground-breaking work about the evolution of the human brain, *Leonardo's Brain*, proposes that Da Vinci was the *sui generis* individual effortlessly working across the boundaries of art and science.

Rembrandt, in *The Anatomy Lesson of Dr Nicolaes Tulp* (1632)[4], portrayed keen interest in the dissection of the cadaver but relative discomfort as expressed on the faces of the observers. In the background of the painting, the Anatomy Treatise, a set of rules made up by Vesalius in 1543 are visible. Even as early as 1632, the fields of science, art and ethics have been encompassed in one single painting (Egorova, Kouznetsov, Linnik & Loewinson-Lessing 2003:10). The first edition of Mary Shelley's novel *Frankenstein* was published as early as 1818, already introducing the dangers of the ruthless pursuit of knowledge, an important platform on the topics of science and ethics.

The splitting of the atom by Ernest Rutherford in 1908 influenced abstractionist artists such as Piet Mondrian and Wassily Kandinsky in their search for the truth,[5] or rather, the not immediately apparent. Their paintings tried to become fragmented sculpture pieces, as if they were visionary or perhaps prophetic inklings of the impact of the atom bomb. In 1936, the announcement for one of the least understood exhibitions entitled *Edward Steichen's Delphiniums* was released by the Museum of Modern Art (MoMA) in New York.

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[3] Leonard Shlain (1937–2009) was an author, inventor and surgeon.

[4] Rembrandt, *The Anatomy Lesson of Dr. Nicolaes Tulp* (1632). Oil on canvas. 216.5 cm × 169.5 cm. Mauritshuis, The Netherlands. [Online]. Available: http://www.rembrandthuis.nl/en/rembrandt/belangrijkste-werken/de-anatomische-les-van-dr-nicolaes-tulp

[5] The search for the ultimate truth corresponds to the tenets of Modernism.

Artist Edward Steichen exhibited "…remarkable new varieties of delphinium developed through twenty-six years of cross breeding and selection," the purpose being to achieve "…ultimate aesthetic possibilities of the delphinium" (Gedrim 2007:347).

In the 1950s, scientists were changing the concept of the body from "…a morphological structure to a molecular organization, from organism to text, from flesh and blood to information" (Anker & Nelkin 2002:968). In the past three decades, the technology to assemble DNA was mastered. The body became a decipherable text for scientists and artists alike as Joe Davis[6] (2007:249) explains:

> The first work of art made with synthetic DNA and genetically modified bacteria was created in 1986. It is by no means an oversimplification to say that we have, in at least a few first, cautious steps, learned how to bring ideas to life.

In most recent years, the influence of biotechnology on contemporary art has increased visibly. Artists have developed a special interest for the physical application of new technologies in science for their artistic practices. According to the artist discussed in this dissertation, Eduardo Kac[7] (2007b:18), transgenic art can be defined as a process that employs the following approaches:

> (1) the coaching of biomaterials into specific inert shapes or behaviours; (2) the unusual or subversive use of biotech tools and processes; (3) the invention or transformation of living organisms with or without social or environmental integration.

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[6] Joe Davis (born 1951) is a research affiliate in the Department of Biology at MIT and in the George Church Laboratory at Harvard Medical School. Many refer to him as the father of bio-art.

[7] Eduardo Kac (born 1962) is a contemporary American artist and professor of Art and Technology Studies at the School of the Art Institute of Chicago. "Eduardo Kac is internationally recognized for his telepresence and bio art. A pioneer of telecommunications art in the pre-Web '80s, Eduardo Kac (pronounced "Katz") emerged in the early '90s with his radical works combining telerobotics and living organisms. His visionary integration of robotics, biology and networking explores the fluidity of subject positions in the post-digital world. His work deals with issues that range from the mythopoetics of online experience (Uirapuru) to the cultural impact of biotechnology (Genesis); from the changing condition of memory in the digital age (Time Capsule) to distributed collective agency (Teleporting an Unknown State); from the problematic notion of the "exotic" (Rara Avis) to the creation of life and evolution (GFP Bunny)" (Kac [Sa]d).

The processes referred to involve (1) the creation of semi-living artworks; (2) commentary on the ethical issues involved with creating life; and (3) the creation of synthetic life or the manipulation of natural living beings. The application of these processes in transgenic art today shifts the notion of representation of life in art to the presentation of life through art.

Although the application of scientific methods and artistic representation overlap in transgenic art, there are different approaches, methods and limitations on how to explore, envision, create and execute when it comes to scientific experiments and transgenic artworks. Firstly, the discipline of art includes a full range of emotional, intellectual, ethical, social and political experiences while the discipline of science is less focused on the above issues in order to ensure an unbiased and objective outcome of the experiments conducted.

In connection to these differences between the fields of science and art, Suzanne Anker and Dorothy Nelkin[8] (2002: 970) question the unbiased and objective aim of the discipline of science, especially when it comes to the experimentation with genes and the embodiment of the self within the realm of science:

> Are people simply the measure of their genes or are they the product of their history, personal experience, social relationships and cultural values? Is the self merely a sum of its biological parts or is it a more dynamic and interactive system that is shaped by culture and is mutable over time?[9]

This is where the collaboration between art and science can assist in the discussion on ethics; where scientific limitations conceal the social and emotional debates.

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[8] Suzanne Anker (born 1946) is a visual artist and theorist working at the intersection of art and biology. Anker has co-authored many publications with the late sociologist from New York University, Dorothy Nelkin (1933-2003). Nelkin was an expert in the field of science and society.

[9] There is a wide range of views presented on the matter of nature versus nurture. For example, David Eagleman in his work *Incognito: The Secret Lives of The Brain* (2011) believes that biology determines behaviour. Michael Foley in *The age of absurdity: Why modern life makes it hard to be happy* presents the concept of responsibility for one's actions. He attacks what he calls the "Holy Trinity of Determinism—genetics … evolutionary psychology … and neuroscience" (2010:79) as the main culprits of relaxed attitudes towards unacceptable human behaviour. Antonio Damasio, on the other hand tries to reconcile this dilemma in *Self comes to mind* (2010) by claiming that the Self is an ongoing process that takes into account all these issues mentioned above.

Secondly, most scientific discoveries are connected to the idea of progress, where an artwork (regardless of the concept) can endure the passage of time and transcend the cultural trends and fashions. Thirdly, science requires a group of people who work together, whereas artists are not necessarily dependant on team work to create an artwork[10]. According to Francois Jacob[11] (2001:113), "…science tries to construct a coherent representation of the world as close as possible to what we call reality. This is a collective undertaking in time and space". Art, however, according to Jacob (2001:113),

> aims to produce representations of the world, each of which expresses the personal vision of a reality as it is perceived or imagined or dreamed. Most of the time, it is an individual undertaking.

Furthermore, science is a progress of ideas on facts and its methodology is therefore accumulative[12]. Art methodologies are disruptive in the sense that each new field may be born out of critique or rebellion towards the past or existing trends. It does not necessarily build on existing 'laws of art'. This allows the individual to execute his or her own ideas independently from any previous restraints or concepts. It also allows the artist to engage with any current trend, historical interest or discourse.

Patricia Leavy[13] (2009:255) explains that art is a particularly effective way to raise public awareness of societal issues because "[t]he arts can grab hold of people's attention in powerful ways, making lasting impressions". She has identified two main reasons for the arts having such a strong impact on society (2009:255):

> Firstly, the appeal of arts extends beyond academia so that the issues addressed in

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[10] The idea of autonomy when creating a work of art is discussed in Chapter Four: *Genesis*.

[11] Jacob (1920–2013) was a French biologist who shared the 1965 Nobel Prize in Medicine with Jacques Monod and André Lwoff.

[12] This is not to say that science is a unanimous, monolithic and undisrupted practice. The famous example is the 1949 Nobel Prize for exceptional achievements in the field of medicine awarded to António Egas Moniz. The prize was for "the discovery of the therapeutic value of leucotomy in certain psychoses" and so endorsed the practice of lobotomy (*The Nobel Prize in Physiology or Medicine 1949*, 2015).

[13] Patricia Leavy (born 1975) is a best-selling author, women's studies expert, and an internationally recognized leader in arts-based and qualitative research.

> specialised academic journals, presented at conferences to limited audiences, if undertaken by artists, can be popularised within broader media…. Secondly, the arts have the capacity to evoke emotions, promote reflection, and transform the way that people think … increasing a critical consciousness, promoting reflection, building empathetic connections, forming coalitions, challenging stereotypes, and fostering social action.

This study, although focusing on the latest trends in biotechnology such as genetic engineering, synthetic gene creation and bioethics, is placed in the discipline of art as an opportunity to investigate the strategies some artists use to raise public awareness toward the ever-increasing complexities of experiments played out in the field of genetics.

As art movements are influenced by technologies emerging from science and vice versa, the field of ethics becomes the underlying discourse which presents itself when it comes to the creation and manipulation of life. Before the biotechnological Frankenstein comes in to play, current ethical systems, as well as the need for legislation for the future, should be investigated.

1.2 TOPIC INTRODUCTION

The study explores two selected artworks by Eduardo Kac entitled *Genesis* (1999) (fig 17) and *Green Fluorescent Protein Bunny* (2000) (fig 5) which will henceforth be referred to as *GFP Bunny* (2000) (fig 5). The artworks are used as a vehicle to unpack the ethical issues represented by the artworks. Furthermore, ethics is explored through the debates around the medium of transgenic artworks. The role of Kac as transgenic artist, combined with the role of the scientist who applies both scientific and art methodologies, is a point of reference for the controversial nature of the artworks explored in this study. More specifically, this study focuses on the creation and manipulation of ethical systems involved when living systems are situated in the field of transgenic art.

Breakthroughs in biotechnology have increased and "…have swept us along faster than we can follow—and certainly faster than allows for adequate consideration of ethical consequences" (Baillie 2003:43). The manipulation of genetics in living beings and animals is at the core of the artworks *GFP Bunny* (2000) (fig 5) and

Genesis (1999) (fig 17). I unpack the application of this new technology, focusing specifically on the ethical considerations within the realm of art and from the viewpoint of art as social commentary.

1.3 RESEARCH QUESTION

The main question addressed in this dissertation is: What is the purpose of transgenic art? Different avenues to pursue this question present itself throughout this study: is it good enough to answer simply because we can? Are we just demonstrating scientific and technological possibilities? Is Marshall McLuhan's answer that the 'medium is the message' adequate when artists 'play' with life?

Questions about ethical and social concerns of transgenic art are relevant to the discussion of Eduardo Kac's work. This study deals with the question of how ethical debates are introduced through transgenic art and how the transgenic artworks of Eduardo Kac have become the conduits for and contributions to ethical debates.

This also raises the question whether transgenic artists purposefully comment on the social awareness of current applications of genetic engineering or whether it is just a fascination with new possibilities offered by the sciences?

This study also investigates the question: what is the social impact of transgenic art? Is the application of scientific methods, specifically genetic engineering, justifiable and ethical in the case of the transgenic artworks presented?

And it finally asks: must art be ethical?

1.4 AIMS AND OBJECTIVES

This study is based on the premise that artists, through their artworks, can instigate debates. With this in mind, the dissertation aims to acknowledge ethical issues raised by the transgenic artworks of Eduardo Kac and focuses on the social awareness of current applications of genetic engineering in the realm of arts.

This study also aims to:

- explore the transformation in art from presentation of ethical issues into becoming the actual debate in the form of transgenic artworks;
- question the purpose of transgenic art as a vehicle to create social consciousness about the current applications of genetic engineering;
- determine the social impact of the transgenic artworks of Eduardo Kac and his unconventional methods of art-making;
- explore the unconventional use of scientific methods such as genetic manipulation and synthetic gene creation in Eduardo Kac's artworks, and whether their unpredictable outcomes are significant in terms of the purpose of the artworks, irrespective of the ethical implications associated;
- question why transgenic artists play with life.
- form part of the practical component of the degree requirements. A research-led exhibition of artworks is presented. I present artworks created through digital media such as photographic manipulation and stopframe animations in dialogue. The purpose behind this decision shows my intended stance against the suffering of animals used in biotechnology (in science and art) due to a lack of proper ethical procedures. I therefore used non-living material and methods to represent the suffering of the living for the creative component.

1.5 RATIONALE FOR THE STUDY

The two chosen artworks for this study, *GFP Bunny* (2000) (fig 5) and *Genesis* (1999) (fig 17), are presented in this order even though the artwork *GFP Bunny* (2000) (fig 5) was created after the artwork *Genesis* (1999) (fig 17). This order is specifically chosen for the flow and structure of the discussion with regards to the premise of the study. The chronological order of the creation of the artworks is therefore not of value to this study, but rather what the artworks represent as they fit into the main discussion of the study. The study has considered connections, similarities and the tension that is derived from the integration of the three main disciplines of art, science and ethics presented in the artworks.

From the sources consulted in the literature review, it became apparent that there is a need to explore public awareness and to introduce the voices of society as part of the discussions on bioethics within the fields of genetic engineering and transgenic art practices. This is supported by the premise of the study, namely, to introduce ethical issues raised by the transgenic artwork of Eduardo Kac and to focus on social awareness of current applications of genetic engineering in the realm of arts.

Although research has been done within the three main fields independently, this study is placed at the core of transgenic art and the subsequent discussion on bioethics that flows from the practice of this art form. The following sections provide an overview of the delineation and limitations of the study and the research methodology used.

1.6 OVERVIEW OF THE DELINEATION AND LIMITATIONS OF THE STUDY

The purpose of this section is to shed light on the limitations of the research methodology and the angle from which the analyses of the artworks in the body chapters is approached.

Even though the transgenic artworks are created through mixed methodologies, the analyses of the artworks follow a qualitative methodology. Scientific techniques are not my field of expertise, so sources from various experts and the artist's own statement have been consulted for the description of scientific processes in the artworks to ensure that the knowledge behind the scientific methods applied and the subsequent intentions of the artist are not lost in translation. The objectives of the study, however, focus on the philosophy and intentions behind scientific applications within the realm of art.

1.7 RESEARCH METHODOLOGY AND DESIGN

This study follows a qualitative exploratory research design. A qualitative research approach is chosen to provide an in-depth understanding of the literature surrounding the artworks discussed. According to James Key (1997), a disadvantage of qualitative research is:

> the very subjectivity of the inquiry leads to difficulties in establishing the reliability and validity of the approaches and information … its scope is limited due to the in-depth, comprehensive data gathering approaches required.

Aware of these disadvantages, I have undertaken a critical approach to the literature review in an attempt to preserve the relevance of the objectives of the study. This investigation also includes reviewing research outside of the field of contemporary art, namely ethics and biotechnology.

The case study chapters address the two selected artworks that guide the research, but other artworks (transgenic and contemporary) are included to support the objectives. The case study includes descriptions of the two selected artworks followed by in-depth analyses of the debates surrounding the artworks. Iconography and iconology by Erwin Panofsky are consulted according to the three systematised levels for further investigation of the artworks. According to Ross Woodrow (1999), iconography is described as: "…the study of traditional images or symbols and iconology with a similar definition as the study of icons or artistic symbolism". Woodrow (1999) explains the three levels, starting with the first level: "…simple identification through familiarity". The second level deals with the field of iconography: "…the linking of artistic motifs with themes, concepts or conventional meaning". The third level is the iconological interpretation, which is the:

> deepest level, the intrinsic meaning or content of the work … ascertaining those underlying principles which reveal the basic attitude of a nation, a period, a class, a religious or philosophical persuasion (Woodrow 1999).

I choose to rely on Panofsky's method because he offers a holistic approach to art interpretation.

Secondly, as Kim Veltman (1980) reminds us, Panofsky,

> was constantly asking how the history of artistic styles related to changing world views, ever seeking to establish underlying bonds linking philosophy, art, science, mathematics, indeed all realms of human experience.

Therefore, Panofsky's relevance to this study lies in the relationship between transgenic art and the application of biotechnology which aims to challenge current views in art-making and links it to ethical issues. This study refers to the collective

awakening of society of the current effects and possible implications of biotechnology.

Although there are many artists that deal with transgenic art and the issues regarding genetic engineering, this study was limited to the two artworks by Kac, mentioned above, because they deal with the topics of the consequences of the marriage of art and science, the involvement of the public and the subsequent impact acknowledged through the ethical debates presented.

1.8 OUTLINE OF THE CHAPTERS

This study comprises of an introductory chapter, literature review, two case study chapters and a concluding chapter.

Chapter 1: The aim is to introduce the study, to outline its scope and to identify the research questions, premise and objectives. It includes the rationale of the study, its delineation and limitations and the research methodology. It culminates with the outline of the chapters.

Chapter 2: The literature review includes the scope of the literature discussed in the body chapters of the dissertation. It introduces seminal theorists, the camps of thinking, the theoretical trends, and the sources consulted for this study. The main areas of investigation include transgenic art and bioethics. Similarities, differences and the overlapping of the fields are discussed. The chapter also includes the outline of key terms, key concepts, and a discussion of the most influential theorists.

Chapter 3, entitled *GFP Bunny*, introduces the manner in which scientific methods are applied to art. More specifically, it deals with how the application of science through genetic manipulation alters a living being for both artistic and scientific purposes. The historical background provides why the use of an albino rabbit in the artwork *GFP Bunny* (2000) (fig 5) is significant to the artist and the analysis. It also shows the progression of human interference in the life of animals, from selective breeding to genetic manipulation and eventually transgenic art. The intended and unintended phases of the creation of *GFP Bunny* (2000) (fig 5) resulted in the sequential events which altered the natural life of the rabbit involved. The intended

phases include the artist's announcement of the project to the public, followed by the birth of the artwork and the public dialogue provoked by the project. The unintended phase of the artwork, the planned social integration, had to be altered to fit in with scientific laboratory rules and ultimately led to the captivity and the death of the artwork. Part of the ethical debate of the chapter is the proof that the predicted outcome of interfering with natural life is not a certainty, even when applying trusted scientific methods.

The second part of the chapter is the analysis of the artwork which introduces specific topics surrounding ethical debates. These debates include public knowledge and awareness of the genetic revolution, the social effects of transgenic artworks like *GFP Bunny* (2000) (fig 5), bioethical legislation, justification of meddling with natural life and the responsibilities of the transgenic artist.

Whereas Chapter 3 focuses on introducing concepts of transgenic art, genetic engineering and bioethics to civil society, Chapter 4, entitled *Genesis,* explores the active participation of society in shaping the culture of genetic engineering. The description of the artwork *Genesis* (1999) (fig 17) focuses on the processes behind the creation of synthetic life. These processes include the fabrication of the Genesis gene (fig 18), the transformation thereof into Morse code (fig 19) and then into DNA coding (fig 27). Another element included in the process is the effect of UV light on the DNA structure and the subsequent mutation of the Genesis gene into the Artist's gene. The display of the mutated gene in a petri dish, an unnatural environment, reflects on the concept of interfering with natural life.

The analysis of the artwork *Genesis* (1999) (fig 17) is anchored in the exploration of ethical and belief systems associated with nature and the creation of life. The analysis includes a historical background on classical theism and traditional belief systems. Natural life versus synthetic life is defined and interpreted as components of the artwork *Genesis* (1999) (fig 17). Because translation plays a pivotal part in the creative process of the artwork, it is addressed and explored in conjunction with belief systems. As part of the artwork, the internet is the interactive space where human interference and the subsequent alteration of the Genesis gene transpire

before the physical alteration to the gene itself takes place. The significant use of the internet in the artwork becomes a tool for the artist to involve the public as creators of synthetic life. Therefore, the internet as a metaphorical platform for ethical debate is unpacked. The chapter concludes with a discussion of the purpose of the artwork.

Finally in Chapter 5, the conclusion of the study, I discuss the premise and objectives of the study in relation to the research question and sub-questions. My findings are anchored in the discussions which take place in the body of the dissertation. From the discussions and information gathered, I suggest how the transgenic art of Eduardo Kac are purposeful, but also alarming. The essence of the study forms the springboard from which the practical component of the study originates.

CHAPTER 2: LITERATURE REVIEW

2.1 INTRODUCTION

The literature review is described by Johann Mouton (2001:179) as "…studies that provide an overview of scholarship in a certain discipline through an analysis of trends and debates". This study depends on the analysis of related literature in order to support its views and aims. According to Mouton (2001:180), the strength of a literature review lies in the following:

> a comprehensive and well-integrated literature review is essential to any study. It provides you with a good understanding of the issues and debates in the area that you are working in, current theoretical thinking and definitions, as well as previous studies and their results.

The literature review also has limitations. Mouton (2001:180) explains that "…a literature design can, at best, only summarise and organise the existing scholarship. Even a critical review of the literature cannot produce new, or validate existing, empirical insights". Errors can occur due to "…selectivity in the sources; unfair treatment of authors; misunderstanding the source; selective interpretation to suit one's own viewpoint; poor organisation and integration of review" (Mouton 2001:180). Erik Hofstee (2006:91) explains the importance of understanding what a good theory base is and how the selection of sources influences how a study is integrated and relevant to existing scholarship. The scholarship reviewed to explore the research question of this study has been specifically chosen to address the debate on the delicate topic of ethics surrounding genetic engineering when applied for the purpose of creating works of art. I aim to come to terms with transgenic methodologies of art, genetic technologies and relevant biological concepts involved in a comprehensive study of academic journals in the fields of art, science and ethics.

In order to understand the platform that the case study chapter are based on, the examination of what it means to behave ethically, hence to establish justice,

happiness[14] and a good life in broad terms, prompted me to consult historical perceptions around ethics in order to establish which application of ethics, more specifically bioethics, would be best suited as a foundation point for the research of transgenic art and its implications for society. Categorising different schools of thought and highlighting those that are applicable in arguing the research question is the point of departure for the section on bioethics. Key concepts like the sacredness of life and the classification of 'being human' are elucidated by exploring a wide range of the genres of ethics in philosophy.

2.2 THE SCOPE OF THE LITERATURE

Certain challenges, implications and limitations came to light through the investigation of the creative process behind transgenic art-making. One specific challenge is the fact that there is a vast amount of research on bioethics for the scientist, but limited research on the regulation and legislation for the transgenic artist. Another challenge in investigating discussions on bioethics in genetically engineered artworks lies in the fact that the field of biotechnology constantly changes. This directly influences transgenic art practices as well as ethical discussions surrounding them. It was therefore necessary to constantly review the sources consulted to safeguard the currency of the study. These challenges show the very necessity for information, debate and discussion regarding ethical systems and legislation in the field of transgenic art.

To access the voice of the public, internet blogs and social media platforms have been researched and included in the discussion of the social impact of the artwork *GFP Bunny* (2000) (fig 5). This was necessary to evaluate the public's emotional reaction to the outcome of the artwork on issues of morality and ethics.

[14] I am aware that the definition of 'happiness' is very elusive and the word is often considered to be old-fashioned as Foley demonstrates in *The age of absurdity: Why modern life makes it hard to be happy* (2010). Foley (2010:13) draws a final conclusion that the "…greatest gift of happiness may not be the feeling itself as much as the thrill of possibility. Suddenly the world is re-enchanted and the self born anew. Everything is richer, stranger and more interesting. The eye sees more clearly, the mind thinks more keenly, the heart feels more strongly – and all three unite in enthusiasm, delight and zest".

I acknowledge that some of the sources consulted in Chapter 3, for instance internet blogs and social media platforms, are not peer reviewed or from academic journals, but are considered relevant for this study. These sources give valuable and first hand insight into the opinions of and emotions experienced by the public. The use of social media sources is metaphorical in the sense that it introduces new technologies in the field of genetic engineering and transgenic art, commenting on the possible implications of including technology that has not been expertly reviewed and delineated.

I am aware that not all contemporary artists working with life sciences as their inspiration are transgenic artists. There are artists who illustrate the same ethical debates introduced by this study, but through traditional mediums of art-making. Current artists working with traditional mediums of art and science include Patricia Piccinini, Tony Cragg and Robert Brown (to name a few). These artists rather comment on genetic engineering than actually applying it in their art. This study, however, focuses on the actual application of scientific practices as a medium, shifting from traditional modes of representation (even though they deal with contemporary issues) to artworks that actually become the point of debate which they represent. This prompted me to carefully consider the similarities between traditional representations and transgenic art presentations, but especially the manner in which transgenic art practices aim to differentiate itself from traditional mediums.

Scientific methods used as a medium for art, take on many different approaches. Some of the artists[15] working with this integrated relationship are categorised as bioartists, some as biotech artists, biohackers, or artist-scientists. Bioartists would generally work with biological matter such as skin, while biotech art implies the merging of genetics, art and information technology (Pandilovski 2004). The art of biohacking refers to ‘do-it-yourself biology’, for example, body enhancements and

[15] For example, Stelarc works with body enhancement, Joe Davis focuses on microbiology, George Gessert is known for his artistic practices in plant biology and Oron Catts and Ionat Zurr are forerunners in the use of live tissue culture in art.

amateur gene experimentation (Michels 2014).

This study deals with bioart, more specifically with the scientific application of genetic engineering in order to produce an artwork. This implies meddling or interfering with natural life, its biological processes and its visual traits, through the collaboration of artists and scientists, possibly in a laboratory. In *GFP Bunny* (2000) (fig 5), Kac interferes with the natural appearance of the rabbit and in *Genesis* (1999) (fig 17), he creates a synthetic gene. As a bioartist, Kac simultaneously represents an artistic manipulator of genetic material, a scientific creator of synthetic genes and a messenger for bioethical discussion.

2.3 THE STRUCTURE OF THE LITERATURE REVIEW

The literature review firstly addresses transgenic art by outlining the main academic debates. It identifies the main proponents of these debates and presents the issues or questions pertinent to the field of transgenic art. It provides a short historical overview of transgenic art with delineations of representations of transgenic art and also artworks which are presentations of genetic engineering. This section also provides an exploration of the concepts of biotechnology and genetic engineering, including the impact of current applications on society. It sheds light on the difference between the age old practice of selective breeding and more current applications of interfering with genes. Both these practises debate the dominion of man over nature, a concept which is integral to the analyses of the artworks. The discussion deepens when human-guided evolution is not only considered for the impact it has on nonhuman[16] species, but also for the placement of the self within this evolution.

From the questioning or placement of the self and the role of the individual as viewer, artist, scientist or creator, the structure leads into the concept of awakening social consciousness. It focuses on the need for a collective understanding of the

[16] With reference to footnote 1, there are variations that include or exclude the use of the hyphen in the spelling of the term ‘nonhuman’ (non-human). For the purpose of this study I will omit the hyphen and refer to the term as nonhuman, unless quoted otherwise by other sources.

realities of biotechnology through transgenic art, especially when it comes to the manipulation of genes. From this discussion, the study looks at the societal impact of these controversial methods in the creation of transgenic artworks, questioning the purpose and justification behind the desire to play with life.

The justification to play with life leads to the second area of investigation in the literature review chapter, namely, bioethics. This section provides a historical background on the concept of bioethics. More specifically, it indicates how key philosophical voices influenced and shaped ethical codes and how I considered this to apply to biotechnology and transgenic art today.

This section explores how bioethics is considered within belief systems. Different perspectives on the role of the creator, whether it is the artist or a higher power, contribute to the bringing about of the necessity for a collective discussion about the manipulation of life. New advances in the fields impact all forms of life and are not limited to or bound by culture, religion, race or gender.

Because legislation is closely related to ethics in terms of restriction or the need to set protective boundaries for the sake of society, current views on law-making are included. What is clear is that, should governments choose not to legalise certain biotechnology procedures, the risk of illegal practices will always be there. In support of the argument for proper legislation, the shortfalls and dangers of bioethics are addressed.

In conclusion, this chapter provides a summary how the study approaches discussions brought forward in the following case study chapters and how this study is relevant within the field of transgenic art.

2.4 TRANSGENIC ART

In the article Transgenic Art, Eduardo Kac (1998) outlines the concept of transgenic art as "…a new art form based on the use of genetic engineering techniques to transfer synthetic genes" or genes from another species into an organism or from one species into another in order to create new living beings. Biotechnologies have started to influence artists to include and use new genetic technology in the creation

of artworks. Artworks which present this phenomenon are called transgenic art. Both works, *Genesis* (1999) (fig 17) and *GFP Bunny* (2000) (fig 5), are classified as transgenic artworks because of the application of scientific methods in the creation phases as mentioned previously. The artworks acknowledge bioethical issues, not only through the controversial nature of their creation, but also through their respective subject matters.

The fact that artists have entered the scientific realm deems it necessary to understand the process of creation from a scientific point of view. In order to better understand the term transgenic art, the concept of genetic engineering is unpacked.

Genetic engineering implies modifications to an organism's natural genome by the use of biotechnology to remove or add to heritable material. This alters the genetic make-up of organisms. It is defined by Biology-online (2008, sv 'genetic engineering') as follows:

> The term genetic engineering implies … various experimental techniques that manipulate the genes of an organism. It uses recombinant DNA, molecular cloning and transformation. At present, it is applied in improving crop technology, manufacturing synthetic human insulin (using modified bacteria), production of erythropoietin (using Chinese hamster ovary cells), and production of new types of experimental mice for research (such as cancer mouse). It also has the potential of being used in humans by changing their appearance, intelligence, character and adaptability.

The terms biotechnology, bioengineering and genetic engineering often overlap. According to Yves Michaud[17], author of the article Art and Biotechnology (2007:388), the term "…is as widespread as it is little defined" because it covers a very wide range of procedures "…from traditional and ancient to the most recent applications of biochemistry and genetics". The ancient techniques of biotechnology refer to methods for food making such as the fermentation processes in the making of cheese and alcoholic beverages, ground cultivation, the domestication of selected animals, animal cross breeds and vegetable hybrids (Michaud 2007:388). Current

[17] Yves Michaud (born 1944) is a French philosopher who has published widely. He is also the co-establisher of the *Université de tous les savoirs* (University of all knowledge), a French government initiative to disseminate information on new scientific advances.

applications of these techniques are specifically relevant in today's agronomics where food manipulation is paramount for the survival of growing populations.

In order to shed light on the shift from human manipulation of natural systems to interfering with nature's code (genetics), it is important to distinguish between genetic engineering and genetic breeding. Kac offers a clear distinction between the two concepts. Breeders manipulate the process of gene selection indirectly as opposed to genetic engineering which manipulates genetic material directly (1998). Louis Bec[18] (2007:84) is of opinion that the development of genetic engineering dates back to "…the age-old practice of breeding and domestication". Bec (2007:84) explains that the practice of breeding and domestication "…is based on intentional modification of certain animal species, already ushered in the initial stages of human-guided evolution".

Richard Doyle[19] (2007:74) has a similar theory: "[s]urely biotechnology is nothing if not the intensified application of human consciousness to evolution and its ecosystems". The concept of human-guided evolution does not only apply to the dominion over nonhuman species such as animals and plants but also leads to intervention of the human body. Kac discusses why it is unlikely that humankind will not make changes in the human genome to an extent where it can alter life as we know it. "To be human will mean that the human genome is not a limitation, but our starting point" (Kac 1998). This statement implies that Kac is in favour of humankind's ability to interfere with its own genome and sees it as a natural progression of evolution. It also implies that the playing field for the transgenic artist

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[18] Louis Bec (born 1936) is a biologist and zoosystematician who extends the scientific field to his artistic practice. "For several decades, Bec's artistic work has revolved around the interlocking of art and science. He became known through his efforts related to extending biological evolution and simulating new life forms, emphasizing in particular how these could bring forth evolution. His search for new zoomorphic types and forms of communication between artificial and natural species led to his founding a fictitious institute named *Scientifique de Recherche Paranaturaliste*, with Louis Bec as its presiding director. Bec was first introduced to artistic research on artificial life through his collaborating with the philosopher Vilém Flusser, who wrote about Bec's *Vampyroteuthis infernalis* in his book of the same name" (Media Art Net [Sa]).

[19] Richard Doyle is a Professor of rhetoric and science studies at Pennsylvania State University.

is unlimited.

Robert Zwijnberg[20] (2004:10) concentrates on the fact that the development in life sciences increasingly leaves a mark on "…our ideas about who and what we are, and what we want to remain and become". This statement supports Kac's bold statement that genetic engineering is not only the beginning of change in art-making, but also the alteration of life as we know it.

Zwijnberg mentions that the development of biotechniques (whether in the field of transgenic art or science) have other factors to consider, such as financial and economic consequences[21]. Secondly, by just copying what scientists create in laboratories, does not necessarily classify it as art. Thirdly, the question of responsibility towards the created is also raised by Zwijnberg (2004:10), who says that artists:

> need to adopt some form of critical distance, which might be impossible if they have to follow the same rules as scientists and if they cannot do anything that life scientists may not do.

This poses a paradox to which Zwijnberg provides an answer through the work of Adam Zaretsky entitled *Two-headed Zebrafish* (2012).[22] In a MIT laboratory, the artist cut off the head of a zebrafish embryo and tried to attach it to another embryo. Normal lab ethical procedures were applied. This work thus probes the boundaries of laboratory ethics. Almost from the inside, the artist answers the question how art produced in the lab can have transformative force within the system of rules and

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[20] Robert Zwijnberg (born 1954) is a Professor in Art History who focuses on the development of science and technology at Universiteit Leiden.

[21] Oron Catts and Ionat Zurr furthers this discussion in the article The ethical claims of Bio Art: Killing the other or self-cannibalism? (2003) by stating that "[t]his is also a result of the fact that the institutional ethical framework set up to deal with issues raised by these new forms of manipulation is very much an expression of the prevailing political and economical ideology" (2003:7). They refer specifically to a clause in section 15.8 of the National Statement on Ethical Conduct in Research Involving humans (1999) in Australia that deals with "waiving the need for consent from the tissue donor when there is a possibility of commercial exploitation of derivatives of the sample" (Catts & Zurr 2003:8).

[22] Adam Zaretsky, *Two-Headed Zebrafish* (2012). Bioart. [Online]. Available: https://waag.org/sites/waag/files/public/Publicaties/bioart_special.pdf

procedures of the lab. The answer, according to Zwijnberg (2004:11) is: "…through performativity" by deconstructing communication through action.

Zwijnberg (2012:9) states that:

> an important aspect of the specificity of the practice of art engaging with the life sciences is the relationship between ethics and aesthetics. This of course applies in particular to bioart. The very fact that these works of art are produced in part in a biology laboratory must, necessarily, give rise to ethical considerations, irrespective of the main focus of the work.

The practice of transgenic art questions the freedom of expression without violating rules. The problem, however, arises when this statement is applied to living matter and its well-being. Zwijnberg (2004:11) still feels that, for bioart to retain its transforming force, and thus open public debate, it must not be "…weakened in advance by fear of breaking rules". It is worth mentioning that he does not necessarily only refer to breaking new rules, but also to repeating historical misfortunes. Manipulating living beings for aesthetic value is not a new phenomenon, as shown by Steve Tomasula[23] in *Genetic art and aesthetics of biology*. Tomasula shows how human beings have pushed the boundaries for aesthetic value, for example the eugenic programmes of Nazi Germany, the forced sterilization of 'undesirables' and banned immigrations by the United States of America (2002:140). The ethical complexities associated with current biotechnologies today, together with the historical ramifications of applying aesthetic judgment to humans, could be why transgenic artists like Kac are so intrigued with this unconventional form of social comment and why this discipline is gaining strong momentum.

The question: why bioart? was discussed in an interview with a panel of experts in the field of bioart in Amsterdam. The panel included Huub de Groot, head of the Department of Solid State, NMR Leiden Universiteit; Colja Laane, Professor of Biochemistry at Wageningen University and Marleen Stikker, president of the Waag

[23] Steve Tomasula is an acclaimed author, focusing on topics of new-media and the biotech revolution.

Society in Amsterdam. Stikker believes that because technology determines our society, the artist has to stay part of the design team for humankind's future. Bioart, she believes, will prevent tunnel vision for both artists and scientists (Bioart under a microscope 2004:12). De Groot says that transgenic art confronts current norms, but not in the way that propaganda does, while Laane is of opinion that it should evoke emotions and move people (Bioart under a microscope 2004:12).

The panel also deliberated whether artists and scientists play an essential role in scientific innovation and valorisation. Laane explains that transgenic art has not been around long enough to answer this question so it is not yet possible to say whether there are major breakthroughs in science because of transgenic art (Bioart under a microscope 2004:12). De Groot, on the other hand, feels that artists inspire scientists by achieving the impossible through creativity. Stikker points out that art can be a tool to understand scientific language and that artists "…can create the interaction with the public on these topics" (Bioart under a microscope 2004:13).

2.4.1 The history of transgenic art

The term 'genetic engineering' was introduced by Jack Williamson in a science fiction novel, published in 1951 with the title *Dragon's Island* (Booker 2014:334). One year later, Alfred Hershey and Martha Chase confirmed the role that DNA played in hereditary material (Lee 2013:65). In 1968, James Watson and Francis Crick proved the double helix structure of the DNA molecule (Clark & Pazdernik 2013:70). In 1972, Paul Berg combined DNA from a monkey virus with a lambda virus to create the first recombinant DNA molecules (Rao 2014:152). Ground-breaking research was conducted in 1973 when Herbert Boyer and Stanley Cohen created the first transgenic organism by inserting antibiotic resistant genes into an E-coli bacterium plasmid (Kumar & Sahal 2014:8).

When Rudolph Jaenisch and Beatrice Mintz introduced foreign DNA into the embryo of a mouse, the world's first transgenic animal was created (Rao 2014:150). This made the scientific community aware of potential risks in the fields of ethics, morality, possible issues in funding and economic gain while the art community began to produce new and sometimes living art.

One of the most important developments in the field of genetic engineering announced by world-renowned scientist Craig Venter (in Pollack 2010:28) was that:

> the team had manufactured the complete genome of a bacterium from chemicals and transplanted it into another closely related type of bacterium, where it took over control of the organism.

Because synthetically created life overtook a natural living organism, the notion of 'playing God' with technology was introduced. The report in December 2010 by the US Presidential Commission for the Study of Bioethical Issues included a discussion on bioethics, the current legislation and views of the US government on genetic engineering. It stated that Craig Venter's team had not 'played God' since it had duplicated a known genome and transplanted it into an already living cell (Pollack 2010:28).

There is clearly a debate around whether certain types of genetic experiments can be seen as the creation of synthetic life or as the alteration or duplication of information about existing life. The question is whether research in the field of genetic engineering should be supported and handled as a progression of existing information or whether it is a ground-breaking revolution in the field of genetics that could deeply affect life as we know it. The need for clear distinctions between different types of experimental fields in genetic engineering that are funded for different reasons is crucial to enable the adaptation of the current legislation for the human race's own progression and protection.

Bioart, an offshoot of genetic engineering, originated around the end of the 20th century with artists like Joe Davis, George Gessert, Monica Orlan and Eduardo Kac. The phrase was coined by Kac in 1997 when he created his artwork *Time Capsule* (1997). Since the beginning of the 21st century, with the developments in biotechniques, transgenic art has been more widely practiced.

2.4.1.1 The application of biotechniques in the process of art-making

The exploration and experimentation with biotechnologies started to influence some artists to experiment with and use this new technology for the creation of their artworks. In the early 1990s, a major breakthrough in the field of tissue engineering

led to the realisation that cells can be grown to form functional tissue that could be implanted into a body (for instance, for organ replacement). Once it was proven that the engineered tissue can function and sustain itself to remain alive outside of the body, the term 'Semi-Living' (which refers to the creation of life), was born (Catts & Zurr 2002:66). This technology resulted in new opportunities for artists, allowing them to create living works of art that can function outside of the laboratory. Metaphorically, as living tissue can sustain itself outside of the body, scientific experiments can become artworks that can sustain themselves outside of the laboratory and even exist in an exhibition space. Kac (1998) shows, for example, how the development in medical technology has allowed humankind to expand and transform its actual natural body: "[t]he skin is no longer the immutable barrier that contains and defines the body in space. Instead it becomes the site of continuous transmutation". Ryan O' Donnel explores the artist's pursuit when it comes to the desire of the obsolete body, a concept that has been examined for thousands of years. However, when the manipulation of the physical corporeal form is within our reach, O' Donnel's (2011) following statement is in alignment with Kac's quest for experimentation through scientific application:

> The notion of an obsolete body has led artists to question, and effectively problematize the corporeal form. Our push for a utopian body has led to the desire for augmentation and experimentation. The body is not necessarily obsolete, it is just a matter of its limits being pushed, tested, and redefined.

Throughout the history of art, representations of the ideal human figure changed as artistic expression evolved and adapted to societal, cultural and identity transformations. However, it has always been just that: representational. The application of actual desired traits as one of the possibilities brought on by the biotechnological revolution lead me to the exploration of the next intriguing point of discussion: the transition from the representational function of art to the corporeal presentation called transgenic art.

2.4.1.2 The transition between illustrative art and transgenic art

Artists have depicted emerging events in science for many years as discussed in Chapter 1. Ingeborg Reichle[24] (2003:6) distinguishes between artists engaging with science on a representational level (for example, as models of molecular biology) and transgenic artists engaged with "…creating novel organisms".

Some artists, even though they are not practicing transgenic artists, also engage with bioethical issues deriving from the subject matter of the transformation of the actual natural body. Artist Pro Hart uses DNA to protect his own art from forgery, making his invisible DNA signature a guarantee of authenticity of his art. Philip Galanter's series of breeding paintings is made up of digital prints entitled *100 Random Chromosomes* (1996) (fig 1). It depicts the idea of virtual breeding:

> This was a first attempt to use genetic algorithms to create "paintings" in the form of high resolution digital prints. Each panel corresponds to a single chromosome, and each chromosome is a collection of genes that determine the color, brush type, width, length, density, order, and shape of the marks. In some pathological cases the final brush virtually covers the entire canvas in effect creating a monochrome (Galanter sa).

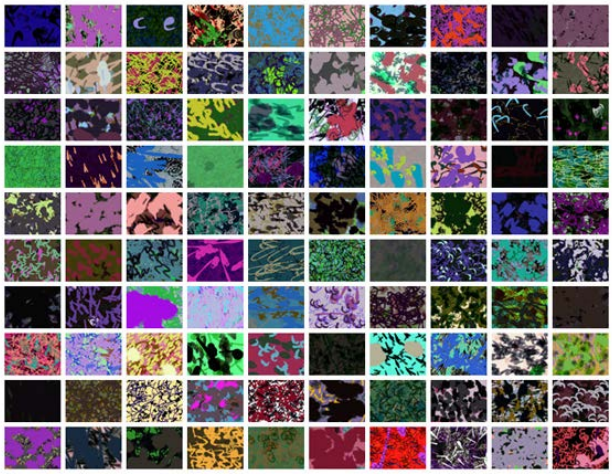

Figure 1: Philip Galanter, *100 Random Chromosomes* (1996).

[24] Ingeborg Reichle (born 1970) is a cultural theorist writing on contemporary art and new technologies with a focus on biotechnology and artificial life. She is a Lecturer of Contemporary Art at the Hermann von Helmholtz -Zentrum für Kulturtechnik, Humboldt-University Berlin.

Abigail Fallis was approached by a supermarket chain to raise awareness about the importance of scientific research on muscular dystrophy. Her sculpture is entitled *DNA DL90* (2003) (fig 2). Fallis used shopping trolleys in the form of DNA's double-helix structure, a fundamental part to understanding muscular dystrophy.

Figure 2: Abigail Fallis, *DNA DL90* (2003).

Artists known as medical illustrators, use dissections to illustrate the human body. The exhibition, *Bodyworlds* (2013) by Gunther von Hagen (Sci-Bono Centre, 20 March-30 June) displayed real cadavers to show "…the human body's complexity, resilience and vulnerability via anatomical studies of the body in distress, disease and optimal health" (*Bodyworlds* 2013). The bodies were represented in real-life scenarios, as if they were engaging in certain acts while 'still alive'. Similar to transgenic artworks, the exhibition dealt with real biological matter and presented real-life scenarios. However, whereas an artwork of representations like *Bodyworlds* uses cadavers, transgenic artworks generally deal with living biological matter. Although ethical procedures should be considered in both cases due to their nature of dealing with life and death, transgenic artworks have an additional implied element of consideration for the living and its survival.

Artist Hubert Duprat was intrigued by the natural process of the caddisfly larvae and how they build their cocoons. He intervened in this natural process by removing the

natural elements like leaves and twigs that they use to build their aquatic cocoons in the river, and instead provided them with precious material such as gold, jewels and pearls. The result was that the caddisfly larvae created Duprat's works of art (see figure 3).

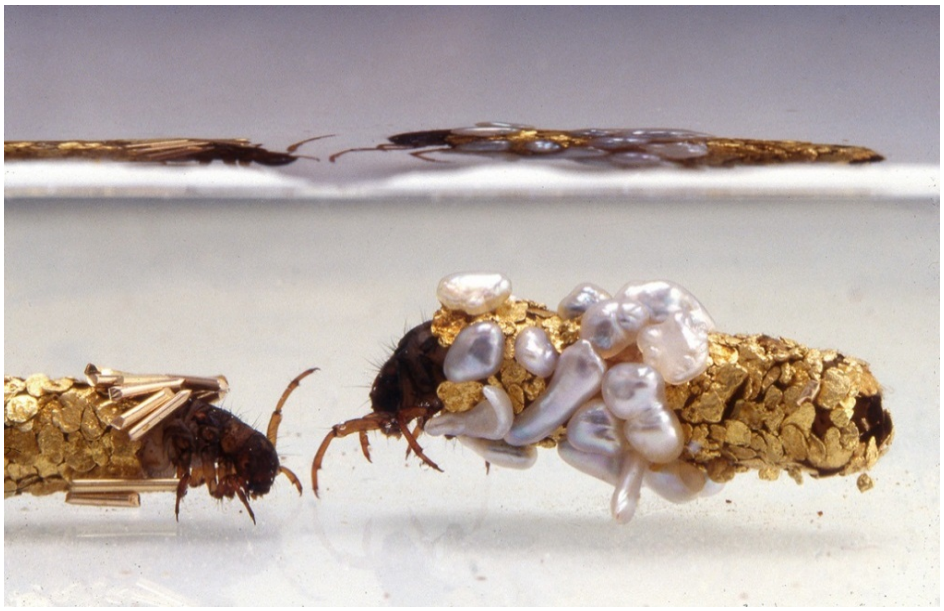

Figure 3: Hubert Duprat, *Trichoptera larva with case*, (1980-2000).

Even though Duprat altered the appearance of the natural process by replacing the natural elements with gold, other precious stones and jewels, he did not interfere with the process of creation, leaving the caddisfly larvae to proceed with their method as it would in nature (see figure 4). Duprat's role as an artist is therefore not of creator or manipulator of new life, but rather a facilitator of new ideas in an established natural ecosystem.

Figure 4: Hubert Duprat, *Trichoptera (caddis larva) building case (studio view)*, (1980-2000).

Artists such as Galanter, Fallis, Von Hagen and Duprat create visual storytelling with genetic algorithms, biological processes and other sciences which they use to explain complicated research processes to their viewers. This illustrates the role of the artist as informer of the public, whether through illustration, installation or by facilitating scientific processes. The biotechniques used to create the transgenic artworks of Kac become the tools that make the artworks 'become alive'. In doing so, the artist becomes a scientist and the scientist becomes an artist.

Paul Virilio is a French cultural theorist who writes extensively on inter-related cultural subjects. His views on biotechnology, genetic modification, mutations and cloning are extreme. Virilio finds the overlap between modern science and modern art distressing because he believes that modern art (more specifically contemporary art) is no longer the only field where traditional and sacred taboos are violated. He sees scientific research as official art, sponsored by the state (Virilio 2000). He comments on the dichotomy of pitiful and pitiless art of the twentieth and twenty-first centuries. The pitiless century, according to Virilio, refers to the twentieth century. The term was coined by French philosopher Albert Camus. It was the century that included both the world wars, the atom bomb, the tragedy of the Titanic and the commencement of genetic engineering (Virilio 2000).

Virilio is of opinion that instead of producing a 'merciless' art which presents wretchedness, self-destruction, disfigurement, extinction and abhorrence, contemporary artists should reclaim the evacuated space of the art of representation, the space for symbolic yet sympathetic images of violence. In other words, rather than using violent shock-tactics[25] in art, Virilio suggests that artists make a representation in the form of image, a more sympathetic approach to sensitive subject matters.

The art of presentation, as opposed to the art of representation, seeks to present reality as instantaneously present, without delay or option to interpret. The question raised is: are we aware of the quiet yet visible, even blinding threat of art that is becoming counter-nature? The relevance of this question to this study is reflected in the use of extreme science such as cloning and the quest for the chimera, the hybridisation of man and animal. This desire and wonder for augmentation and experimentation of this kind is explored by editors Noreen Giffney and Myra Hird[26] in Queering the non/human. They explore the term 'human', but more specifically the apparent inverse of the term, namely 'nonhuman'. Jeffrey Cohen[27] (2003: xxiv) further explains that the queering of the human versus nonhuman, at its core, is a process of wonder. Giffney and Hird's exploration of that which is deemed 'unnatural' to some and issues of identification is relevant when we consider the artwork *GFP Bunny* (2000) (fig 5). Virilio (2000:51) claims that extreme arts, such as transgenic practices "…aim at nothing less than to embark biology on the road to

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[25] As an example; the work of Guillermo Vargas, *Exposición No 1,* (2007) in which he allegedly starved a dog in the Códice Gallery in Nicaragua as a performance piece, was supposed to address the issue of cruelty to animals and placidness of society in its reaction to unethical behaviour towards animals (Aloi 2012:126-129).

[26] Noreen Giffney has published widely and currently works at the University College Dublin. Myra Hird is Professor in the School of Environmental Studies and the Director of the genera Research Group (gRG). Hird's research interests include science studies, environmental studies, and knowledge mobilization. Giffney is an expert in the field of psychoanalytic psychotherapy.

[27] Jeffrey Cohen (born 1974) is a Professor of English and the Director of the Medieval and Early Modern Studies Institute (MEMSI) at the George Washington University in Washington. His research examines phenomena that are paradoxically alien and yet intimate to the human (Jeffrey Jerome Cohen 2015).

a kind of expressionism". He feels that contemporary art has convinced society that there should be no limits to expression, allowing a limitless space for development in the fields of both art and biotechnology.

Another article that deals with the use of biotechnology in contemporary art is: Elsewhere in contemporary art: topologies of artists' works, writings, and archives (2006) by Simone Osthoff[28]. This article explores Eduardo Kac's and other transgenic artists' intentions to "…cultivate a network of collaborators" which "…might have been prompted by the need to create a critical space for their work to develop" (Osthoff 2006). Whilst Virilio is, in principle, against the creation of the sensitive space where transgenic art occurs, Osthoff is of opinion that the establishment of this space (where transgenic art occurs) is inevitable, because of the fact that transgenic art pushes boundaries. One fundamental characteristic of the discourse of art is that it will always develop, adapt, explore and expand to new spaces.

Davis, in his article Cases for Genetic Art, concludes his debate on genetic art with the same view as Osthoff. According to Davis (2007:266), referring to the field of transgenic art, "…it is unlikely that scepticism or indifference of the scientific community will serve to prevent these developments". Davis explores how transgenic artists are confronted with art that overlaps with nature. These artists have moved away from the representation of life and society to directly manipulating life itself. Davis (2007:266) believes that the impact of this movement on society will hopefully be contained by the fact that "…genetic artists may ultimately behave with more environmental sensitivity than science itself has demonstrated to date". This statement can only be reviewed over time as the field of transgenic art grows and unfolds new possibilities and responsibilities for the transgenic artist.

[28] Simone Osthoff is a Professor of Art and Critical Studies in the School of Visual Arts at the Pennsylvania State University.

2.4.2 Key concepts

The two artworks in this discussion contribute to the research questions in an integrated attempt to achieve the objectives of this study. Firstly, transgenic art and its concomitant ethical debates are explored. Subsequently, by placing living art in the public sphere, social consciousness of the genetic revolution is discussed. The impacts of these controversial artworks on society are followed by the question of why artists have the need to play with life.

2.4.2.1 The artistic transformation: ethical debates come to life

The first research sub-question of this study asks how ethical debates are introduced through transgenic art and how the two transgenic artworks of Eduardo Kac become the conduits for ethical debates.

Firstly, the description of the artwork *GFP Bunny* (2000) (fig 5) is outlined according to the phases through which the artwork was created; from the announcement of the intention to create the artwork until the unintended death of the artwork. These phases allow the viewer to be part of and or aware of the creation process of a transgenic artwork and serve as an introduction to the ethical issues presented. These phases include public knowledge and awareness of the genetic revolution, the social effects of transgenic artworks like *GFP Bunny* (fig 5), bioethical legislation, the justification of meddling with natural life and the responsibility of the transgenic artist towards society. The artwork's classification as 'being alive' not only serves to introduce these issues, but explores the transformation from the representation of these ethical issues to becoming the actual ethical issues themselves.

Secondly, the artwork *Genesis* (1999) (fig 17) shows how the participation of society in its creation allow the viewers to not only be aware of issues like 'playing God' and concepts about the protection versus life-altering interference with nature, but to actually become active accomplices. The ethical debates actually come to life through the choice to participate in the interactive installation.

2.4.2.2 Awakening social consciousness of the genetic revolution

By placing art that was created through scientific methods within the public sphere, the method of creation might raise the question: is it even art? The following research question addresses this issue: do makers of transgenic art purposefully comment on social awareness of current applications of genetic engineering or is it just a fascination with new possibilities offered by sciences? I look at how art and science, as a combined practice, are perceived or judged by society.

In order to explore the purpose behind the introduction of transgenic artworks to the public and whether it is perceived as art, aesthetics as an underlying theory is discussed. Aesthetics, in its general sense, deals with the nature of art and beauty. In scientific terms, the philosophy of aesthetics can be linked to the senses or, as defined by Immanuel Kant, "…the science which treats … the conditions of sensuous perception" (*Online Etymology Dictionary* 2014, sv 'aesthetics'). This discussion focuses on experimental aesthetics, the ethics of aesthetics and aesthetic judgement.

Both *GFP Bunny* (2000) (fig 5) and *Genesis* (1999) (fig 17) have physically attractive traits that draw the eye. Both artworks have an element of illumination through UV lighting. According to Kac (2007b:204), the purpose behind the transgenic artworks in question lies not only in their attractive visual elements, but rather in their creation methods and the technologies used, as he explains:

> In my work I appropriate and subvert contemporary technologies—not to make detached comments on social change, but to *enact* critical views, to make present in the physical world invented new entities (artworks that include transgenic organisms) which seek to open a new space for both emotional and intellectual aesthetic experience.

Barbara Sibbald, from the Canadian Medical Association, considers issues deriving from THE RACAR (Revue d'art Canadienne/Canadian Art Review) of 2008 which includes eight scholarly papers and seven contemporary Canadian artists' projects on the visual representation of medical issues. Sibbald is considered relevant to this study for her summative views on artistic representations of medical aesthetics. Even though this study does not focus on medical issues, Sibbald comments on the

visual traits in general science. The article, Art is Science made clear, indicates how an interdisciplinary approach can assist society to understand scientific experiments and the subsequent ethical issues that occur in the visual arts.

The Life and Death of Images by Diarmuid Costello and Dominic Willsdon[29] deals with the value of aesthetics. Costello and Willsdon (2008:8) reflect on the identification of aestheticism in Modernism, but it is the focus on the "…late or post-modernism, and our current modernity, as … a way of orienting ourselves towards questions concerning the ethics of artworks" that is relevant for this study. Costello and Willsdon's views on the relationship between ethics and aesthetics give insight on ways to approach the current topic of transgenic art. Included in the source, is a chapter entitled *Art and Alienation* by Noël Carroll[30] (2008). Carrol (2008:90) shares how "Pre-modern art, in short, functioned as one of the-if not the most-powerful disseminators of the ethos of a people and it was widely recognised to possess this capacity". Carroll then focuses on how, for many today, this link between art and ethics seems uncharacteristic (2008:91).

Carol Gigliotti[31]'s article, Leonardo's choice: The ethics of artists working with genetics, is consulted for her views on art and science. What is important for bioart and bioethics is Gigliotti's debate on whether art can be seen as "…a last bastion for radical thinking" (2005:24). She discusses the artwork *The Eighth Day*[32] by Eduardo Kac in conjunction with Machado who argues that critics of biotechnologies are

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[29] Diarmuid Costello is Associate Professor of Philosophy, University of Warwick. Dominic Willsdon joined SFMOMA in 2006 as the Leanne and George Roberts Curator of Education and Public Programs. He directs the department of Education and Public Programs.

[30] Noël Carroll (born 1947) is an American philosopher and is considered to be one of the leading figures in contemporary philosophy of art.

[31] Carol Gigliotti is a writer, educator, and artist, She was an Associate Professor in Interactive Media and Critical and Cultural Studies at Emily Carr University of Art + Design in Vancouver, B.C., Canada where she taught Environmental Ethics, Critical Animal Studies and Interactive Media courses. She now teaches as online faculty for both ISMA (Interactive Social Media Arts) and Critical and Cultural Studies. (Emily Carr University of Art and Design 2015).

[32] Eduardo Kac, *The Eighth day* (2001). Transgenic artwork. (Source: http://www.ekac.org/8thday.html).

conservationists who base their opinions on dogma and religion. She believes that Kac's work, *The Eighth Day* (2001), makes a plea for the technology of science, and art alike, to be confronted as the complexity that it is, and not to reject its advancement merely because of concepts like good or bad, right and wrong (Gigliotti 2005). Two points are made by the author, firstly, that art should be consistently experimental and non-conformist and, secondly, that the ethics around transgenic art should be embedded in its complexity (Gigliotti 2005). Gigliotti (2005) also refers to Catts and Zurr[33], transgenic artists involved in tissue culture art projects:

> we argue that the underlying problem concerned with the manipulation of life is rooted in the perceptions of humans as a separated and privileged life form …This anthropocentrism is distorting society's ability to cope with the expanding scientific knowledge of life.

An article by Matthew Causey[34], The Ethics and Anxiety of being with Monsters and Machines: Thinking Through the Transgenic Art of Eduardo Kac (2002), is reviewed for its direct connection with the subject matter of this study. The article explores transgenic beings as "…fuel for the art engine" (2004). Causey does not offer a critique but applauds the controversial debates put forward by the art of Eduardo Kac.

Jacob is included in this study for his perception on the aesthetic similarities and differences between art and science. One significant difference between art and science, as identified by Jacob (2001:113), is that:

> a truly 'finished' work of art will never be outdone: it will never age, whereas in science we all know that our work will be overtaken sooner or later[35]. This is

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[33] Oron Catts (born 1967) is the director of SymbioticA, the Centre of Excellence in Biological Arts, within the School of Anatomy and Human Biology, The University of Western Australia and Ionat Zurr (born 1970) is an artist, curator, researcher and academic coordinator of SymbioticA.

[34] Matthew Causey is a senior lecturer in the School of Drama, Film and Music at Trinity College Dublin.

[35] See the example of the invention of the lobotomy which was awarded the Nobel Prize. Furthermore, Paul Feyerabend in the source *Knowledge, Science and Relativism* (1999) describes how 'old' theories have even been accepted, challenged, overtaken and reapproved, for example

> because every scientific work begets new questions: because that is its very purpose.

If the same principal of 'overtaking' is applied to transgenic art, will art become a forerunner of technology, or will the freedom of creative expression of the artist result in dangerous practises? Art remains a field where pushing boundaries is encouraged and ethical boundaries may become dismissible. How these boundaries should be determined is discussed in section 2.5 on bioethics where the study considers the answer to lie in self-censorship which comes about through ethical guidance and enlightenment.

2.4.2.3 The impact on society of controversial methods of art-making

Controversial art-making methods have raised ethical, ecological and economic objections leading to litigation, protest, restrictive regulation and disputes.

Like art, society has also changed profoundly with the developments in media communications and biotechnology. Social media has created a communication space that has given society information and a tool for action. Jordi Vallverdú[36] (2006:13) is of opinion that "…hypermedia have changed our democracies and demand a new comprehension of social management models". Kac's work, *Genesis* (1999) (fig 17), strives for societal involvement that can lead to new comprehension and insights. He deliberately involved society for the impact or influence it could have on his artworks. In gauging the emotional response of society to his artworks, he would have a criteria to measure the impact of transgenic art on society.

This study considers the media and social media platforms as a voice in determining the impact of controversial methods of art-making. In order to explore multi-faceted discussions, internet blogs have been researched for this section as a tool to yield

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"[a]fter the idea of Aristotle and Ptolemy [Ptolemaios], the idea of the motion of the earth was considered antiquated once and for all … but Copernicus, Kepler and Galileo revived it and led it to victory" (1999:144). He shows how "[d]evelopments like these are not surprising when one considers that no idea is ever investigated in all of its ramifications, and that no point of view ever receives all the chances that it deserves" (1999:144).

[36] Jordi Vallverdú is an Associate Professor and teaches Philosophy and History of Science and Computing at Universitat Autònoma de Barcelona in Spain.

valuable and first hand insights into the opinions and emotions of the public. As mentioned in the scope of the literature, I acknowledge that these sources are not academic in nature but I consider them relevant because they reflect the voice of contemporary society.

Section 3.3.3 on the social effects of the artwork *GFP Bunny* (2000) (fig 5) unpacks the comments of several bloggers who have a clear stance on how they feel, in particular, about Kac as a person, artist and self-acclaimed creator of life. From these voices, it becomes clear that there are three noticeable camps. Firstly, there is a collective concern towards *GFP Bunny* (2000) (fig 5). The purpose behind the artwork is questioned and some bloggers became extremely outraged by the intentions of the artist towards the rabbit. This shows how the public can place an artist in a negative light, irrespective of the artist's good intentions. The second camp supports Kac's transgenic artworks and the use of unconventional methods. This camp believes that it opened a new field of the aesthetics of science and strongly supported Kac's campaign to have the rabbit released after her birth which also shows concern for the rabbit's wellbeing. The third camp reflects a neutral stance. They are not offended or opposed to Kac's controversial medium of art-making, but question the necessity behind it. The real identities of the bloggers are not used in this study, because of the bloggers' choice to remain anonymous should they wish to do so. I have therefore used the onscreen names provided by the bloggers. Specific voices have been chosen to reflect the three camps in chapter three, such as Daryl Hoyt, George Washington and Being Irfan.

The significance of the public's stance regarding the artworks *Genesis* (1999) (fig 17) and *GFP Bunny* (2000) (fig 5) is reflected in Doyle's viewpoint on the place of society within transgenic art. The article, The Transgenic Involution, compares *GFP Bunny* (2000) (fig 5) to an evolved hybrid of cannabis called "White Widow". More specifically, Doyle (2007:74) links the two artworks by their "…need for a human host, who both extends and hacks strangely into our agency as humans". This means that transgenic artworks need societal impact as much as society might need transgenic art, because societal involvement can ultimately lead to democratic decision making when bioethics and legislation are considered and art can be a

vehicle to enlighten society on realities of biotechnology. Polyxeni Potter[37] expresses the same thought by observing the interdisciplinary approach in the life and work of Leondardo da Vinci. In a more general sense, this interdisciplinary approach of science and art can contribute to societal awareness when the following dilemmas of our era are considered:

> unknown pathogens, many of them vectorborne, emerging biological threats, ecologic disasters, antimicrobial drug resistance can also benefit from meticulous observation, accurate recording, added perspective, and the interdisciplinary approach to knowledge. Just as with Leonardo, the art is in the science (Potter 2006:1309).

2.4.2.4 The artistic desire and purpose of playing with life

Kac (in Kalenberg 2008:94) explains the transgenic artist's ceaseless quest to be a *demiurge* as:

> to summarize, language, the semiological continuum between sign systems, communication, subjectivity, the organic continuum between every kind of life and the dialogue [which] are the paradigm of relationships that have shaped my interests from the very beginning.

Ángel Kalenberg (2008:94), Uruguayan art scholar and critic, is of opinion that Kac's claims for his work, the 'dialogue paradigm', shows that Kac regards his dialogue with society as an integral part of the artworks: "Kac's oeuvre reveals an insatiable impulse to innovate, which propels him in surprising directions, ones that are perhaps alien to what is commonly understood as art".

Kalenberg states that Kac is of opinion that, as a transgenic artist in the domain of digital and biological art, his work enables him to assert and shape its space outside of the arts. In the artwork, *Genesis* (1999) (fig 17), when the web viewers turn the light on and off to influence the E.coli's unpredictable mutation (a detailed description follows in Chapter 4: Genesis, section 4.2.2.7 and 4.2.2.8), the artist:

> parodies genetics' tendency toward technoscientific manipulation and exemplifies the potential of emergence as a bridge between technological techne and poetic techne (Ilfeld 2012:62).

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[37] Polyxeni Potter is a former Fulbright scholar, and works at the Centers for Disease Control and Prevention at Georgia State University.

Martin Heidegger, a German philosopher of the 20th century, pointed out that the root 'techne', within technology, originally implied a mode of revealing that which is hidden (Ilfeld 2012:61). Kac's work builds the bridge between biotechnology and poetic/artistic 'techne'. Transgenic artists allow for the cultivation of the unexpected and the indeterminate and, in that way, ensure that the concept of playing with life becomes a tangible reality. Ilfeld (2012:62) explains that "…while it takes time for ideas to seep into the social consciousness, artists are often capable of rapidly integrating ideas and conceptualizing new ones". This indicates that the transgenic artist has a fearless, ground-breaking purpose and should be a continuous source of concepts and ideas in his/her field, as all other artists should be in theirs.

Carol Becker[38] (2000:47) explains that the transgenic artist has "the role of educator, researcher, scientist, social critic, inventor, and co-creator of life". In her discussion of *GFP Bunny* (2000) (fig 5), Becker (2000:47) states that: Kac's

> struggle as an artist is no longer to interrogate his own 'hybridity' to register his own 'agency', but rather to actually be part of creating a visual and genetically new, transgenic creature, and then focus on her integration into society, her agency, individuality, and potential designation as 'other'.

Becker (2000:47) notes that the humans will determine their own destiny regarding how 'human' they will become and that they may even develop into choreographers of other existing- and yet-to-be-imagined species. Notwithstanding the human's general need to have dominion, Kac proposes that we should "create forums where conversations about consensual domain between ourselves and other creatures can take place" (Becker 2000:47). Lori Andrews[39] (2007:142), author of *Art as a public policy medium*, shows how the practice of transgenic art can guide us when it comes to creating discussion forums, especially where policy and regulation is concerned:

> By pointing out the gaps in regulation, the risks of these technologies, the inequities in

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[38] Carol Becker is Dean of Faculty and Professor of the Arts at Columbia University School of the Arts.

[39] Lori Andrews (born 1952) is a Professor of law, director of the Institute for Science, Law and Technology, and associate vice president at Chicago-Kent College of Law, Illinois Institute of Technology.

> access, and the way in which application of certain technologies may harm important social and cultural values, artists can encourage the social discussion that is necessary to adopt social public policies for biotechnologies.

When one considers what the role of the transgenic artist should be (as proposed by Becker, Andrews and Kac), the question on setting protective boundaries when exploring unchartered territories in the fields of biotechnology and transgenic art comes to light. This leads to the following section on bioethics.

2.5 BIOETHICS

Bioethics refers to a division of ethics dealing with the controversies surrounding biotechnologies such as genetic engineering, human cloning and stem cell research. The term 'bioethics' was defined by the Centre for Genetics and Society in the late 1960s as "a field concerned with the ethical and philosophical implications of certain biological and medical procedures, treatment and technologies" (*About bioethics & human biotechnology*: [sa]). Human biotechnology became a legal concern when the first bioethics institutes were established in the 1970s. Interest skyrocketed in 1990 when the US Human Genome Project earmarked 3 to 5% of its $3 billion federal budget to the Ethical, Legal and Social Implications (ELSI) research program (*About bioethics & human biotechnology*: [sa]).

2.5.1 Research on the history of bioethics

To the ancient philosopher Protagoras, nothing in itself is right or wrong, only because a person or society judges it to be (Man is the measure of all things 2011:43). On the other hand, according to Socrates, it is the role of individuals who make up society to examine life and to avoid ignorance and immorality.

Jacques Derrida promotes deconstruction which is the breaking down of existing knowledge about a phenomenon so as to get to the truth about it. Some philosophers have suggested that Derrida's deconstruction is essentially an ethical practice because, by deconstructing them, difficult ethical issues that may have remained hidden are opened up for discussion (Anderson 2013).

Plato's concept of an ideal state can shed light on the biotechnological phenomenon. Plato's ideal state has three classes: artisans, guardians and rulers and he explained that, in his opinion, "[t]he meddling with one another of the three classes that there are and exchange of work between them, is the greatest harm for the polis, and would be most correctly called the greatest evildoing" (Plato 2009). It can be debated that the artisans of science or art cannot also be the regulators or 'polis' of their work. Plato promotes the role of education in monitoring and guiding the process of natural development. He is of the opinion that an ideal state should protect a healthy life for its citizens and that combatting illness of any sort adds value to the greater society. In context his philosophy is very relevant. However, there is a difference between combatting illness and self-enhancement. When we consider the manipulation of genes in order to demolish inequality (by genetically manipulating and enhancing intelligence in all humans, for example), it would destroy personal identities and possibly promote unhealthy conformism.

A contemporary philosopher who can be linked with Plato in this regard is Mary Midgley. She is of opinion that the impact that natural science (more specifically evolutionary biology) has on our understanding of human nature is undermining our society. She wants to address this by showing that, although we have evolved as creatures who have cultures which make us unique in the animal kingdom, we must still recognise our reptilian animal nature (McEachran 2009).

Aristotle's belief that every phenomenon has four causes, the material cause, the formal cause, the efficient cause and the final cause, is applicable in bioethics. It is the final cause which embodied the function or purpose of an entity that Aristotle related to ethics. He states that this function of an entity is not separate from science, "…but rather a logical extension of biology" (Truth resides in the world around us 2011:61). Aristotle further says that "…to know the purpose of a thing is also to know what a good or a bad version of a thing is" (Truth resides in the world around us 2011:61).

A school of thought that branched from Aristotle's philosophy is Stoicism, which declares that humans are powerless against natural laws and advises humans to

accept both the benefits and also the cruelty and injustice of natural life. He does, however, agree that humans have a rational soul with which to exercise free will.

When this school of thought, Stoicism, is considered from an ethical point of view in transgenic art, it firstly questions whether we apply what comes to us naturally (to constantly search and apply technologies that can improve our existence), or whether we look at what is considered as natural when creating synthetic life in art. Secondly, it questions humankind's right to exercise free will, linking back to the domain of humans over nature as depicted in Genesis 1:26-31. Does this type of thinking give human beings the right to exercise their free will over other living creatures who cannot necessarily voice their opinions?

The philosophy of St Augustine of Hippo can also be applied to contemporary belief systems as addressed in Kac's artwork *Genesis* (1999) (fig 17). Augustine believes that evil is not a presence, but a lack of something (God is not the parent of evils 2011:72). He also explains, like Aristotle, that the rational soul of the human being is the deciding factor between ethical and unethical conduct. The process of freedom of choice is what determines the outcome of a matter (God is not the parent of evils 2011:72)

From the philosophy of the Renaissance and the Age of Reason, the political philosopher Niccolo Machiavelli who has a realistic approach to life, was researched. His reason is that the end justifies the means. In his well-known work, *The Prince*, Machiavelli advises the ruler to avoid certain means (procedures) that might lay him/her open to future dangers. This strongly links with realities of genetic engineering (Machiavelli 2006).

Jean-Jacques Rousseau, from the Age of Revolution, wrote an essay for a competition by the Academy of Dijon, answering the following question: Has the restoration of the sciences and the arts contributed to refining moral practises? He won the competition with his discourse that explained the idea that "…arts and sciences corrupt and erode morals" (Palmer 2002:57). The argument is that, instead of uplifting, both art and science decrease virtue and happiness for humankind.

Rousseau's view on fair legislation is relevant when bioethics and the law are considered. He claims that society "…loses touch with humanity's natural virtues, including empathy, and so imposes laws that are not just but selfish" (Man was born free yet everywhere he is in chains 2011:158). This statement is a double edged sword when legislation around bioethics is considered. Kac's inclusion of the public in the discussion regarding ethics and legislation, especially with the artwork *GFP Bunny* (2000) (fig 5), is considered by some as a selfish act, especially since it is done by a human being at the expense of an animal who has no voice to contest controversial practices applied to her natural body. At the same time, both of Kac's artworks discussed relate to Rousseau's plea for legislative power to the people, for the benefit of the people. Edmund Burke's theory supports this notion, stating that the unreliability of individual judgement creates the need for tradition. This echoes David Hume who claims that "…custom is the great guide to human life" (Federici 2012). The question, with regards to this study, is not only whether or not there is a need for ethical systems and legislation in genetic engineering, but rather how far are we willing to go to develop these systems in transgenic art. Will we benefit humankind by sacrificing these possible semi-living who-what synthetic beings? Henry Thoreau promotes the individual's right to protest against unjust laws, because he saw legislation as necessarily one-sided for political reasons. This theory is still applicable today with regard to legislation.

Immanuel Kant admired the progress that science had made in his time that empiricists attributed to careful observation methods. Kant, on the other hand, states that both empirical reason and experience are necessary for us to understand the world. Arthur Schopenhauer (2014) builds on Kant's philosophy when he said that "…every man takes the limits of his own field of vision for the limits of the world". This statement may be useful when considering the changes brought about by genetic engineering and transgenic art.

Friederich Nietzsche embraces the idea of limitations in individual belief systems that can make us turn away from life itself as moral restrictions around the new biotechnologies. Nietzsche's philosophy as applied to Kac's artwork *Genesis* (1999) (fig 17), underwrites Nietzsche's basic message which was related to overturning

old values. According to Nietzsche, certain concepts like humankind, morality and God have become inextricably entangled (Man is something to be surpassed 2011:218). Nietzsche prompts us to re-evaluate our existing belief systems and call into question our perception of ethics and the meaning and purpose of life. As a scientist, Nietzsche wants us to believe that the world of the intellect is the world where everything of value resides. It may be of value for the biologist working with genetic engineering, or for the artist who applies these techniques, to argue, like Nietzsche, that the Platonic and subsequent Christian heritages encourage us to deny the immediate world we live in and only focus on an imagined world. Nietzsche (in Man is something to be surpassed 2011:221) is positive towards "…a life-affirming way of being. It is one that can become the bearer of meaning not in the world beyond, but here; Superman is 'the meaning of the Earth'".

Michel Foucault, a contemporary French philosopher, does not believe that humankind is a natural and eternal idea. He believes that man may be close to coming to an end; that advances in computing, human-machines and cloned individuals might eradicate the natural human being completely (Wolfe 2007:95).

The Australian contemporary philosopher, Peter Singer, is relevant to bioethics and transgenic art in his active campaign for animal rights. He takes a utilitarian approach which states that we need to judge the moral value of an act by the consequence of that act. Utilitarianism started with John Stuart Mill, who, notwithstanding his belief in the right to freedom and own good of the individual, also establishes the 'harm principle'. This refers to the fact that actions that can harm any living being, do not warrant own good, neither physical or moral (Over his own body and mind, the individual is sovereign 2011:192).

Michael Shermer, author of *The science of good and evil* (2014), has a different perspective. He believes that ethical decisions are not always purely based on moral or immoral behaviour. Shermer (2004:214) uses the following example:

> [T]he trade in animals, as it was in slavery in nineteenth-century America, is so extensive that if animal rights were suddenly instituted just for all mammals, the economy would suddenly grind to a disastrous halt.

I am aware that not all ethical decisions flow from moral or immoral behaviour because it is acknowledged that there are other hidden consequences when ethical behaviour or protective legislation is determined.

2.5.2 Key concepts

The following key concepts have been identified as part of a process to find possible solutions and ultimately address the research questions. In defining these concepts, I address existing belief systems and how they affect society, current legislation around ethics and transgenic practices and highlight the shortfalls and dangers applicable to these issues.

2.5.2.1 Bioethics, society and belief and ethical systems

Bioethics should represent diverse ethical philosophies and legislation around bioethics must consider juxtaposed worldviews. The Centre for Genetics and Society recently voiced its concern that although bioethicists appropriately consider informed consent and patient safety, their concern for the broader society and the political implications of human biotechnology is questionable. It is felt that many bioethicists "…promote their own world views, which often emphasize libertarian values over commitments to the public interest" (About Bioethics & Human Biotechnology [sa]).

Literature where art, science and bioethics overlap is consulted. One such source is *Human Dignity in the Biotech Century* (2004) by Charles W Colson and Nigel M De S Cameron. A chapter written by Nathan Adams, chief litigation counsel and Christian legal society, is used for its insight into natural law and bioethics. Natural law, inspired by Judeo-Christian theology, implies that human beings have rights by virtue of their humanity, which are independent and sometimes different from the rights given to them by government. Adams' essay explores the rights of the human in biotechnological research. Adams (2004:164) states that the protection of the living human depends on the worldview and philosophy of law that the government adopts because "[w]orldviews provide the foundation for jurisprudence, which determines the legal strategy for regulating biotechnology". He describes a worldview as a scheme by which society consciously or unconsciously places all

that helps people interpret and judge reality. The Christian worldview supports the notion that a personal God created the world from nothing, and that the world is maintained by Him. It believes that human beings are coded with moral laws that are as fixed as physical laws and they should be divine right bearers.

The secular worldview of Richard Dawkins[40] (2000), on the other hand, denies the existence of a deity and discusses the survival of the fittest that derive from biologic selfishness (humans versus nature) as the guardian of our existence:

> The human brain, probably uniquely in the whole of evolutionary history, can see across the valley and can plot a course away from extinction and towards distant uplands. Long-term planning - and hence the very possibility of stewardship - is something utterly new on the planet, even alien. It exists only in human brains. The future is a new invention in evolution. It is precious. And fragile. We must use all our scientific artifice to protect it. It may sound paradoxical, but if we want to sustain the planet into the future, the first thing we must do is stop taking advice from nature. Nature is a short-term Darwinian profiteer.

Whereas Thomas Aquinas sees the imprint of the divine on humankind as the reason for our natural discernment of good and evil, Legal Positivism believes that law is an act of the public domain that will be amended whenever needed by lawmakers. It need not reflect morality. This pragmatic approach supports the utilitarian view discussed previously in section 2.5.1. This philosophy seems to favour biotechnologists who want to proceed with new technology as well as transgenic artists because "…method is immaterial to the utilitarian if the consequence of an action satisfies this maxim" (Adams 2004:167). Hedonism, also in contrast to the Christian worldview, is summarised by Dawkins (1976:167) as the following: "[w]e are survival machines—robot vehicles blindly programmed to preserve the selfish molecules known as genes". The vision of the super human race prevails for this worldview, and might support the view of some scientists. Adams makes it clear that, although Christians support the advancement of medical treatment, he is convinced that the divine right of the human must ensure that he or she is not harmed, let alone cloned, to save another human life.

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[40] Richard Dawkins (born 1941) is one of the world's leading scientific intellectuals, specialising in evolutionary biology.

There is an underlying theme of religion or belief systems in Kac's artwork, particularly in *Genesis* (1999) (fig 17) which includes views of the Judeo- and Neo-Christian faith although the subject matter of the artwork is applicable to all of humankind. This particular camp includes the discussion on biotechnology as it is applied to the human body. The reason for the inclusion of this belief system is because the approach toward bioethics, belief systems and legislation is argued from the controversial issue of the creation of life and ultimately the application of biotechnology on human beings and the systems wherein we function. These systems not only include the application of biotechnology to our own bodies, but also to other living creatures (as in the case of *GFP Bunny* 2000).

Metaphors of religion, specifically the Christian faith, and underlying implications are represented in the artwork *Genesis* (1999) (fig 17). Harold Baillie explores the notion of the sacred made holy by its connection with deity (2003:44). Baillie is of the opinion that, before policies regarding the ethics of biotechnology could be established, the definition of what constitutes a human being should be determined. Baillie approaches this question from a religious angle where God is the sole creator of all living things and therefore he relates the artwork *Genesis* (1999) (fig 17) to the theme of religion and the use of metaphors from the Christian faith.

Another important voice in the debate on science and belief systems is that of Linda MacDonald Glenn[41]. The article, Biotechnology at the Margins of Personhood: An evolving Legal Paradigm (2002), explores religious views on biotechnology, such as the Judeo-Christian view, Neo-Christian view and other major religious views. According to Glenn, within the Judeo-Christian belief system, the person is unique, because he/she alone is made in the image of God as depicted in Genesis 1:26-31. According to this view, the person is the object of God's love and other creatures were given to him/her for his/her benefit. This belief is the foundation for the sanctity of life doctrine (Glenn 2002). Followers of the Judeo-Christian faith

[41] Linda MacDonald Glenn is an American bioethicist, healthcare educator, lecturer, consultant, and attorney-at-law.

interpret the word ‘dominion’ as a stewardship. It infers that humans will be held accountable and therefore must treat other people and animals with respect (Glenn 2002). Glenn states that the basis of respect for all living things is derived from various religious traditions including Buddhism and Hinduism. The Hindu doctrine of *ahimsa* is “…a vow of non-injury to any living thing—especially to animals” (Glenn 2002).

Nancy Pearcey is a fellow of the Discovery Institutes Centre for Science and Culture and the Centre of the Intelligent Design Movement. Pearcey (2010:100) is of relevance to this study because she draws parallels between the fate of art and the fate of religion in the modern world:

> Beginning in the Enlightenment, both were stripped of their traditional status as avenues to truth. Both were put on the defensive and reduced to private, subjective experience. Both were kicked out of the ‘fact’ realm and relegated to the ‘value’ realm.

Pearcey’s arguments in the source, *Saving Leonardo* (2010), are supported primarily by historical material. She claims that worldviews can be detected in the history of the arts. According to Pearcey (2010:76), “…the truth is that artists interact deeply with the thought of their day, translating worldviews into stories and images”. This connects with the worldview of the classical Greeks, in particular, Pythagoras who taught that spiritual enlightenment could be achieved through studying music and mathematics. The human body was described in mathematical proportions which already hint towards the notion of human classification.

In *Hole in Our Soul: The Loss of Beauty and Meaning in American Popular Music* (1994), cultural critic Martha Bayles[42] (1994:33) says that during the Modern Age, art “began having radical doubts about its relationship with the truth”. Changing artistic styles, in particular the use of science as medium for the creation of artworks, relates to the changing of ideas, views and values. According to Pearcey (2010:92),

[42] Martha Bayles (born 1948) is an author focussing on areas within the arts, media, cultural policy, and U.S. public diplomacy.

> a columnist for the scientific journal Nature recently announced that genetics and neuroscience are verging on drawing the ultimate materialist picture of human nature—a picture … in which humans are all machine and [have] no ghost.

John Bryant and John Searle[43] further this discussion in their source *Life in our hands: a Christian perspective on genetics and cloning* (2004) by discussing what it means to be human from a biological and a biblical perspective.

Gregory Kaebnick[44] (2000:1), in his article, On the Sanctity of Nature, says that "…concerns about the sacred—common in everyday moral thinking—have crept into bioethics in various forms". Kaebnick is of opinion that judgement about what is seen as sacred can be part of careful and reasoned deliberation. Kaebnick feels that to imply that to genetically engineer is to play God, can be seen as conservative in scientific circles and therefore only casts a sidelight on the issue of bioethics. How we define what is bioethical has everything to do with what we regard as sacred and therefore untouchable by human intervention. On the subject of bioethics, Kaebnick (2000:1) explains that, if the ethical objection to transgenic art and genetic engineering is simply to avoid interference with nature, we are already in a dilemma because all human activity can be seen as an interference with nature.

Dominique Lestel[45] in his article, Liberating life from itself: Bioethics and aesthetics of animality, says that trying to preserve that which is natural to us, for example leaving animals in peace, is not an alternative anymore. With reference to Kac's

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[43] John Bryant (born 1925) is a Professor of Cell and Molecular Biology and Head of Biosciences at the University of Exeter. John is a Past-President of the Society for Experimental Biology, a former Chair of Christians in Science and is currently Professor Emeritus of Biosciences at Exeter. (Prof John Bryant 2015). John Searle (born 1932) is an American philosopher and currently the Slusser Professor of Philosophy at the University of California, Berkeley. He is widely noted for his contributions to the philosophy of language, philosophy of mind and social philosophy.

[44] Gregory E. Kaebnick is a research scholar and editor of the Hastings Center Report. He is interested in questions about the values at stake in developing and using biotechnologies, and particularly in questions about the value given to nature and human nature. This work has evolved out of earlier work on the nature and status of moral values and the structure of moral deliberation (Gregory E. Kaebnick, Ph.D 2015).

[45] Dominique Lestel (born 1961) is a philosopher and a Professor in the Department of Cognitive Sciences at the École Normale Supérieure in Paris (Kac 2007).

artwork *Genesis* (1999) (fig 17), Lestel shows another angle how human's dominion over nature can be interpreted, that by embracing and applying new biotechnologies it can also lead to the protection, survival and even the enhancement of nature. On the other hand, the article, Technogenesis: Aesthetic Dimensions of art and biotechnology, explores the negative impact of human involvement on nature as expressed through the artwork *Genesis* (1999) (fig 17). More specifically, the irreversible stages that takes place during the installation (which is explained in-depth in Chapter four: Genesis, section 4.2), comments on the lack of protection in nature, causing irreversible genetic mutations which can possibly "…crippl[e] the values that order life and give it meaning" (Anker et al 2008:306).

The artwork *GFP Bunny* (2000) (fig 5) is an example of what could happen when there is a lack of protection. The processes involved with the rabbit's creation and quality of life is explained in detail in Chapter Three: *GFP Bunny*, section 3.2.7, but in summary it shows us how human interference on nature, especially on the level of genetic manipulation, can have a direct influence not only on the quality of life, but it can have a direct influence on the death of such mutations. From a different perspective, Kristen Philipkoski[46] (2002) explains the nature of the relationship between Kac and the rabbit's creators, shedding light on the impact caused by human conflict. The disagreements and misunderstandings between the artist and the scientists of the laboratory had an indirect impact on the rabbit, but still contributed to the unnatural quality of life and perhaps ultimately the death of the artwork. Kaebnick (2000:1) points out that there must be a clear distinction between those interferences that are worrisome and those that are for the greater good of all living beings.

Even when one considers uniquely religious ethics as one-sided, there is still the will of nature and that which can be observed in nature that prevents abominations occurring. Baillie (2003:45) comments that Kaebnick means that the concept of

[46] Kristen Philipkoski is an author at Wired News, dealing with contemporary issues of the day. Her social voice is valued in this regard.

sacred should not be linked to "…the historical 'baggage' of God and creation". This concept reflects Kant and his followers. Kaebnick suggests, but does not directly state, that sacredness is linked with environmental ethics. Kaebnick (in Baillie 2003:45), feels that "…the idea of the sacred is the idea that we bear a moral relationship to other things", Kaebnick further suggests that we can ascribe sacredness to the natural order of birth and death. However, this natural order Kaebnick refers to should certainly be re-examined if human cloning and genetic manipulation is brought into the equation, seeing that both practices are 'unnatural' processes, in the context of Kaebnick's natural order.

Traditional culturists want the aggressive development of scientific advances and their applications to be slowed down at least long enough to properly consider the implications. Philosopher Ronald Dworkin, who has a significant influence on Kaebnick's views, comments on the debates regarding euthanasia and abortion. He is of opinion that we cannot resolve these ethical issues of life (both natural and bioengineered) if we do not focus on the sacred (Kaebnick 2000:18). The main problem according to Dworkin, is that there are so many opinions on what is classified as 'sacred', each having the possibility to influence the direction of genetic engineering and transgenic art. This debate therefore constrains the process of classifying what is truly ethical to all human beings. The possibility of classifying bioethics in terms of what is ethical to each individual human being, including the influences of different cultures and religions, seems questionable.

From a biological perspective, humans are mammals, sharing a lot of the same DNA and characteristics with many other mammals. From a biblical perspective, Bryant and Searle focus on the scripture Genesis 1:26-31 that Kac focuses on in his artwork *Genesis* (1999) (fig 17), although Bryant and Searle focus on the part of the scripture that precedes the part on which Kac focuses (Genesis 1:26-27). The scripture explains how God created man in His image and his likeness, as opposed to the biological view that we share our likeness with mammals (Bryant & Searle 2004:30). The comparison between the biological and biblical perspectives contributes to the controversy of Kac's transgenic artwork *Genesis* (1999) (fig 17). The biblical perspectives of the creation of humankind and the responsibility of

humankind over nature as instructed by God are (simultaneously) presented by creating synthetic life through the scientific and biological techniques described in Chapter 4: Genesis section 4.2.

Thomas Shannon[47], author of *Made in whose image?* focuses on many different religious and ethical views in terms of genetic engineering. Most importantly, Shannon (1997:7) focuses on the issue of human responsibility as explored through different religious views toward the human world and the plant and animal world.

The source entitled *The ethical Brain* (2005) by Michael Gazzaniga emphasises the point that bioethicists are philosophers and not scientists. As a member of the President's Council, USA, of bioethics involved in research, Gazzaniga, a neuroscientist, came to the conclusion that the fear of science can stifle progress. The author addresses the fact that the widespread use of the internet and access to knowledge can contribute to disagreements in many traditional and often ubiquitous belief systems (Gazzaniga 2005:163).

Gazzaniga (2005:165) points out that the best minds of the human race, philosophers and theorists, have established our moral and belief systems:

> For those who realize and believe this, the task and the challenge of modern humans is to try to discern whether our highly evolved human nature and culture can benefit from an underlying universal ethics, a moral response to life's challenges that has been a feature of our species from the beginning.

With Kac's artwork, *GFP Bunny* (2000) (fig 5), the public is involved and unknowingly establishes the 'universal ethics' that Gazzaniga mentions by its outrage about the fluorescent bunny. He conveys the message that, even though the scientific method is thought to be the enemy of morality, scientific findings always provide substantial evidence of their validity.

[47] Thomas Shannon is Professor of Religion and Social Ethics in the Department of Humanities and Arts at Worcester Polytechnic Institute (Thomas Shannon 2015).

2.5.2.2 Bioethics and the law

The research for this part of the study limited itself to current legislation because legislation is so closely related to ethics. The catastrophe around the fluorescent rabbit and its future was a direct result of legislation not being in place around this issue and was thus deemed necessary to include.

Carolyn Williams (2014:12) from the Yale-New Haven Teachers' Institute states that:

> [t]he struggle to balance the protection of individual rights, social interests and technology against founding principles and values declared in the Constitution may take on a whole new meaning in the face of this new biomedical technology.

She debates on the right to reproduce through cloning, in the light of the fourth amendment of the US Constitution. She discusses the right to privacy and the Human Genome Project. She addresses, for instance, the issue that genetic manipulation can be used as a political or social weapon, and shows the importance of legislation in this regard. She also deals with amendments in the US Constitution written to ensure the public's fundamental rights when genetic engineering and cloning are practiced. Williams warns that if government chooses not to legalise certain biotechnology procedures, the risk of illegal practices are high and dangerous.

Andrew Perzigian's studies from the Animal Legal and Historical Centre at Michigan State University focus on transgenic animals and the law, as set out in the USA and Europe. Perzigian gives insight into the types of animals that are legal to experiment on, as well as patenting rights. The relevance of Perzigian's views in Chapter 3 adds to the discussion of the ownership over the green fluorescent rabbit, which ultimately determined her fate.

A study by Rahul Dhanda and Chris Macdonald entitled, Ethics in biotechnology: An executive guide (2004:3), argues that if government lags behind in legislative matters where bioethics is concerned, "…it is likely that corporations will have to form their own responsible policies to oversee the introduction and continued evaluation of their technologies". They point out that companies that work with

biotechnologies have, as their stock-in-trade, the very building blocks of life—DNA, RNA, proteins and stem cells, among others, and that there is a monetary value to this trade (2003:4).

It is considered that bioethics should be placed into perspective in terms of the classification of human genes. The current legislation on bioethics and the field of genetic engineering is a process because of the uncertainty as to what is achievable in the field of genetic engineering and the undetermined classification of what it means to be human. From the research undertaken, it is evident that there is a need for biotechnological practices to be regulated by a universal system of bioethics, due to the sensitivity of the matter and the impact that it could have (or already has) on societies around the globe. A universal system of bioethics also applies to biotechnological practices in art, seeing that living matter as a medium is the core in both the biotechnological revolution and the transgenic art movement. More importantly, practices in both fields affect the public, whether on a physical or emotional level.

James Lissemore[48] (2005:599) argues that "…generous public funding and public support will only continue so long as the public perceives that genetics is being used responsibly for the public good". Cary Wolfe[49] in *Bioethics and the Posthumanist Imperative* (2007) analyses bioethics as represented by policies in healthcare and medicine. Regarding these policies, Wolfe (2007: 95) incorporates Michael Foucault's views:

> Contemporary bioethics is best understood not as ethics at all, but rather as the apotheosis of what Michael Foucault has analysed as the rise of 'bio-power' during the modern period, within which the areas of 'health' and what will come to be called 'biomedical' take on new, politically central roles directly linked to the reproduction of both the state and capitalist relations.

In other words, Foucault's view is that bioethics is mainly determined by those in

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[48] James Lissemore is a Professor in Molecular genetics and Genetics at the Department of Biology at the John Carroll University in Ohio.

[49] Cary Wolfe (born 1959) is Bruce and Elizabeth Dunlevie Professor of English at Rice University in Texas (Kac 2007).

political power who are influenced by capitalist deals. He suggests that bioethics is therefore not intended to protect society, but is used by those who have the power to fund genetic research projects.

2.5.2.3 The shortfalls and dangers of the current view of bioethics

Sources that stand apart from religion or belief systems are included in the research to ensure that the integrity of the study has been considered from various angles.

Carolyn Williams, author of the article, Human Cloning, Genetic Engineering and Privacy (2014), comments on two identified camps: those who are pro- and those who are against genetic engineering. Both camps have valid concerns. According to Williams (2014), "[s]ome concerns go toward the ideas of immorality for creating in laboratories that which God intended in nature" while others feel that there is much to be gained by continuing the research and testing its possibilities. The beneficiaries are a concern for Williams because a possible inequality in society, as far as intelligence and positive character traits on the grounds of monetary means is concerned, might eliminate human individuality and diversity. The series *Futurescape* (2014) produced by James Woods gives an overview of ethical issues that can be expected in the future when biotechnology is applied to humans, transforming the body from its natural form to an adapted, perhaps more physically reliable version. The scenarios given throughout the series show that there is a fear surrounding the idea of human cloning: that they will create individuals without souls. Williams (2014:9) also predicts that, by 2020, 95% of human body parts will be replaceable with laboratory grown organs. Williams' article suggests that those involved with genetic engineering (whether for scientific or artistic purposes) should be able to continue research in these new fields freely and legally.

Catts, in the article, Why artists play with life (2004:6), uses the term 'uneasiness' that seems to stem from overlapping art and human life. It is made clear that society is ill prepared to deal with life's major transformations, such as stem-cell research,

genetic engineering and the concept of 'post-humanism'.[50] One of the most contentious issues, according to Catts (2004:6), is the fact that the artist is questioning the scientist's "…specific domination over processes and rituals". Furthermore, "[t]hings become even more contentious when both the subject and the object of the artistic manipulation is life" (Catts 2004:6). Catts mentions interventions with natural life from the molecular level all the way through to the whole ecological system. The problem is that artists can be transgressive, often trespassing into areas that can be dangerous and problematic. On the other hand, artists do have a different type of relationship with society. It is their role to question, provoke and reveal. According to Catts (2004:6), the purpose of the bioartist is to offer "…contestable future scenarios" of science. This statement, however, is worth questioning when transgenic art is considered in the context of the biotechnological development in Africa. According to H3Africa (2013a), a group focussing on human heredity and health in Africa,

> most African countries are being left behind in this genomic revolution and if this is not urgently addressed, genomics will contribute to the widening of global and ethnic inequalities in health and economic well-being.

My concern,[51] however, is for the created beings/artworks. To create, play with or manipulate life without proper awareness or legislation can result in dangerous consequences for the synthetic life forms, bioartists, the environment and society. On the other hand, the problem as outlined by H3Africa (2013b), is perhaps exactly where African transgenic artists can contribute to principles that,

> aim to strike an appropriate balance in ensuring that adequate safeguards are in place to protect participants, while maximizing the ability of investigators to advance research in line with this goal.

Among the principles currently being dealt with are: informed consent, custody of material, genomic sovereignty, community involvement and public understanding.

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[50] The term 'post-humanism' refers to "an interdisciplinary approach to understanding and evaluating the opportunities for enhancing the human condition and the human organism opened up by the advancement of technology" (http://www.nickbostrom.com/ethics/genetic.pdf).

[51] This concern is fully addressed in the conclusion chapter where I refer to my own practical work for this study.

Glenn (2013) recognises the challenges of these new medical practises for the 21st century, and makes a statement that is, for the purpose of this study, relevant for the practice of transgenic artists:

> Until we as a society or, perhaps, as a global entity can agree on what beings, human or otherwise, are worthy of moral and legal status and respect, we can expect intense cross-disciplinary debate and discussions as new intelligent life is created through science and medicine.

2.6 CONCLUSION: THE RELEVANCE OF THIS STUDY WITHIN THE FIELD OF TRANSGENIC ART AND BIOETHICS

The literature reviewed in the fields of transgenic art and bioethics had a purpose in mind which was to get a historical perspective on two concepts: to show the complications that may derive from using transgenic art as a medium and the shortfall of legislation which should be in place to minimise harmful practices. This study is best understood when these two concepts of transgenic art and bioethics are integrated because the one (transgenic art) becomes the vehicle for the development of the other (bioethics) and vice versa.

This study, within the discussion on bioethics and transgenic art strives to be objective while revealing possible untruths within the fields of transgenic art and subsequently bioethics, but also acknowledges that the transgenic art movement presents a new platform for conversation. More specifically, this study aims to show how the transgenic art of Eduardo Kac unfolds these platforms. The influence that this study has on the practical component of the study is discussed in-depth in the conclusion chapter. This study is positioned to provide insight that there is a need for social enlightenment on the realities of using living matter as a medium for art, especially in South Africa where the practice of transgenic art is still a relatively new concept. Even though the artworks discussed are not local, the ideas for social involvement presented are very relevant in a South African context where transgenic art as a medium and its subsequent ethical implications are a growing field.

CHAPTER 3: GFP BUNNY

3.1 INTRODUCTION

This chapter presents a critical analysis of the transgenic artwork *GFP Bunny* (2000) (fig 5) created by Eduardo Kac, with the assistance of zoosystemician Louis Bec and scientists Louis-Marie Houdebine and Patrick Prunet in a laboratory in Jouy-en-Josas, France. The artwork deals primarily with the concept of tampering with animal genes. Even though the use of Green Florescent Protein is not a new phenomenon in science, the *GFP Bunny* (2000) (fig 5) was the first transgenic rabbit presented as an art form. The *GFP Bunny* (2000) (fig 5) project consisted of planned and unplanned phases which led to intended and unintended consequences. This chapter unpacks each phase to explore the intricate and sensitive subject matter generated by the artwork. More specifically, this chapter will explore the *GFP Bunny* (2000) (fig 5) as a highly controversial artwork that fuels many public debates on the relationship between ethics, science and art.

The *GFP Bunny* (2000) (fig 5) project is discussed as a vehicle that introduces the public to the complex concepts that are applied in the field of biotechnology, for example, genetic manipulation. The first section of this chapter describes *GFP Bunny* (2000) (fig 5) and summarises the planned and unplanned phases of the project and its suggested purpose, from the birth to the death of the artwork. A short background on the history of human interference with nature (specifically, the rabbit) is included to clarify the difference between breeding projects, scientific experiments and ultimately the application of genetic engineering to create new living artworks. The discussion on scientific methods and/or artistic media used to create the transgenic artwork includes the artist's statement which shows his artistic intention. The artwork, *GFP Bunny* (2000) (fig 5), is where transgenic art makes a paradigm shift from the representation of biological concepts to the realisation of actual application.

The continuation of this discussion leads to the second angle of the bioethical discussion in this chapter. The following debates are chosen as main concern for this study:

Firstly, the social effects of the transgenic artwork *GFP Bunny* (2000) (fig 5) are discussed. Secondly, I explore current bioethical legislation to determine whether regulations are in place to protect both natural and synthetically created life in the fields of science and art alike. The application of science as a medium for art and its ethical justification is probed together with the responsibility of the transgenic artist. Finally, because of its poignant impact, the purpose of the transgenic artwork is presented.

Through the analysis of *GFP Bunny* (2000) (fig 5), it becomes evident that there are many underlying issues to this artwork apart from what is presented on the surface by the artwork and intended by the artist as revealed publically. This is to be expected from a controversial artwork such as *GFP Bunny* (2000) (fig 5). Throughout the chapter, experts from the fields of science, art (both contemporary art and transgenic art), philosophy, politics, ethics and bioethics contribute to the multi-faceted discussion on the justification of the artist's intended or unintended objectives through the practice of transgenic art.

This study also explores how the general public perceives the intentions of the transgenic artist. The public voice is an integral part of the purpose for creating transgenic artworks such as *GFP Bunny* (2000) (fig 5). The public's involvement forms part of the integral three-way relationship between the artist, the transgenic being and society. Furthermore, the public's perception contributes to the ethical discussion on whether this specific method of creating art is effective and therefore justifiable. This chapter includes informal discussions from social media such as blogs to explore the public voice on a platform where emotional reactions can be expressed freely.

The creation of an artwork of this nature places it in two different fields simultaneously, science and art. Traditional art media allows the viewer to engage with an artwork through some or all of our senses. In the case of *GFP Bunny* (2000) (fig 5), the artwork is literally alive, which adds another dimension of engagement between the viewer and the artwork. The application of transgenic art enables the exploration of invisible systems within a living body. It "…explores the invisible to

raise our awareness of what firmly remains beyond our visual reach but which, nonetheless, affects us" (Kac 1998:4). When a viewer engages with an artwork or another living being, it can be said that assumptions, influenced by constructs in our minds and memories, arise from such an interaction.

GFP Bunny (2000) (fig 5) is not only viewed as an artwork but also as a living organism which may initiate concern towards the artwork or the living organism, depending on how it is perceived by the viewer. The classification of *GFP Bunny* (2000) (fig 5) as an artwork or as a unique animal is therefore undetermined because it contains fundamental characteristics of both. The uncertain classification or placement of this creation within the construction of our minds affects the way we perceive and react towards it. The traditional ways we classify life, culture, living beings and art objects become problematic in view of *GFP Bunny* (2000) (fig 5). The work also raises ethical concerns as a living organism has been placed in the realm of contemporary art to act as an artwork.

To use science as a medium for art, more specifically, genetic manipulation and the concept of nature tampering, are the main areas of concern. The involvement of the public in setting ethical boundaries for the transgenic art movement questions whether we can realistically protect and responsibly move forward into the biotechnological age.

Just as science has been the object of research, it can also become its method. In the case of *GFP Bunny* (2000) (fig 5), both the disciplines of art and science are shaped by the interaction between the two. The scientific process of creation, the iconographic analysis and subsequent public involvement in the artwork *GFP Bunny* (2000) (fig 5) are discussed throughout this section to explore the collaboration between the fields of art, ethics and genetic engineering. The purpose of this analysis is to illustrate the manipulation of invisible systems within a body and the ethical implications of tampering with the genes of living beings. More specifically, this chapter focuses on the role and involvement of the artist in tampering with nature. By using genetic engineering as a medium for art and subsequently placing scientific experiments into the realm of art, it introduces alternative ways to look at

the ethical systems and legislations that are currently applied (or not applied) in the field of genetic engineering. By involving factors such as artistic methods, creative freedom and public involvement which is mostly not part of scientific methodology, it allows artworks such as *GFP Bunny* (2000) (fig 5) to open the discussion on ethical engagement in the field of biotechnology.

3.2 DESCRIPTION OF THE ARTWORK

In the following section, the processes behind the creation of Kac's fluorescent green rabbit are introduced. The consequence of the controversial nature of the artwork provides many stages which are discussed in detail. This encompasses the birth of the concept until the death of the artwork.

3.2.1 Historical background

Humans began to play a direct role in the evolution of the rabbit from around the sixth century AD (Kac 2000a). The rabbit was bred selectively to produce various sizes and fur colours. Selective breeding naturally produced the vast phenotypical[52] diversity of rabbits that is found today. Furthermore, breeding projects allowed certain variations of the species to flourish, even though they would not have been able to survive in nature. According to the artist (Kac 2000a),

> [t]he albino rabbit, for example, is a natural (recessive) mutation which in the wild has minimal chances of survival (due to lack of proper pigmentation for camouflage and keener vision to spot prey). However, because it has been bred by humans, it can be found widely today in healthy populations.

The main purpose of selective breeding projects is to benefit society by genetically manipulating better versions of the same species for the sake of food sources or functionality in terms of labour. The *GFP Bunny* (2000) (fig 5) project consisted of the fertilisation of the egg of an albino rabbit used as a symbolic gesture showing that humans have manipulated nature for their own benefit for centuries.

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[52] The term is defined as "[t]he expression of a particular trait, for example, skin color, height, behavior, etc., according to the individual's genetic makeup and environment" (*Biology-online* 2008. Sv "phenotype"). As opposed to the term 'genotype' which refers to the "entire set of genes in a cell, an organism, or an individual" (*Biology-online* 2008. Sv "genotype").

The artist's choice of using an albino rabbit for the artwork has further significance as throughout history, human preservation of the albino rabbit has also been connected to "…ancient cultural traditions; almost every Native American tribe believed that albino animals had particular spiritual significance and [they] had strict rules to protect them" (Kac 2000a). The complexity and layered origins of *GFP Bunny* (2000) (fig 5) is in itself symbolic of the responsibility that humans have to protect life that has been created or manipulated by them. In the case of the rabbit used for *GFP Bunny* (2000) (fig 5), it was obvious that she would not be able to survive in the wild as a genetically engineered rabbit and her chances of survival were therefore dependent on human intervention. The fact that *GFP Bunny* (2000) (fig 5) was an albino, traditionally seen as sacred, also initiates the debate on the issue of the sacrosanctity (or not) of superficially created life. The albino animal was celebrated and feared in ancient times for being different to the rest of the species. The *GFP Bunny* (2000) (fig 5) therefore may also have been regarded as symbolic of this sacred notion. Furthermore, the fact that the rabbit glowed when illuminated with the correct ultraviolet lighting, may have intensified the fear and wonder with which it was regarded.

3.2.2 The intended and unintended phases of *GFP Bunny* (2000)

The transgenic artwork *GFP Bunny* (2000) (fig 5) was planned in four phases, but only three phases were successfully executed. The first phase of the project was the public announcement of the concept and the intended development of the project at the Digital Festival of Avignon in 1999. The actual realisation or birth of the transgenic artwork happened in February 2000. The *GFP Bunny* (2000) (fig 5) was a living albino rabbit, genetically engineered to generate a luminous glow when illuminated with ultraviolet lighting.

Figure 5: Eduardo Kac, *GFP Bunny*, 2000.

The intended chronological phases for the *GFP Bunny* (2000) (fig 5) project were the following:

- The public announcement of the project in Avignon;
- The birth of the *GFP Bunny* (2000);
- The public dialogue provoked by the project;
- The social integration of a living green fluorescent rabbit.

The intended phase that never realised was the social integration of the *GFP Bunny* (2000) (fig 5). The unintended consequences that played out as a result are mentioned in section 3.2.7: The life and death of the artwork.

3.2.3 The public announcement of the project in Avignon

Public debates were fuelled as early as the announcement of the project in 1999 which revealed various voices surrounding the practices of transgenic art. One of the significant debates was whether the *GFP Bunny* (2000) (fig 5) should be considered as an artwork. In explanation, Kac's motive behind the project was that "[t]ransgenic art brings out a debate on important social issues surrounding genetics that are affecting and will affect everyone's lives for decades to come" (2000c).

In response to Kac's statement, Gigliotti (2005:29) argues that:

> [a]lthough the stated aims of some artists involved in these discourses are to question the anthropocentric standpoint while at the same time using the tools, methods, and assumed ideologies of biogenetics, the reality of animal use in both biotechnology in general, and in biogenetic art forms specifically, can only highlight in this work a fundamental misunderstanding of what a real commitment to anti-anthropocentric aims might mean.

Ironically, the artist intentionally introduced this project to the world before it was set in motion, in order to make the birth of the *GFP Bunny* (2000) (fig 5) a more effective vehicle for social comment on the genetic engineering of live animals.

In scientific and genetic research, the green fluorescent protein is primarily used as a biomarker which is defined as "…a distinctive biological or biologically derived indicator (as a metabolite) of a process, event, or condition" (*Merriam-Webster Encyclopaedia* 2015, sv 'biomarker'). Kac (2007d) points out that he used the green fluorescent protein as a symbol for a social marker, indicating and illuminating the realities of genetic engineering on live beings. The symbolism of the biomarker was to illuminate the invisible systems within the living body referred to earlier. This is not only on a physical level, but it also acts as a tool to explain new technologies made visible. According to Andrews (2007:126), transgenic artworks such as *GFP Bunny* (2000) (fig 5) "…can help society to confront the social implications of its biological choices". Seeing that the field of transgenic art is a relatively new and unknown phenomenon, Kac's intention was to approach the public on biological issues through the application of the medium.

3.2.4 The birth of the *GFP Bunny* (2000): The public dialogue ignited

The second and third intended phases of the *GFP Bunny* (2000) (fig 5) project, the birth of the *GFP Bunny* (2000) and the public dialogue provoked by the project, are presented as a combined point for this discussion. The birth of the transgenic artwork provoked public dialogue which resulted in a global awareness of transgenic art. One of the concerns raised included the impact that genetic engineering could have on society if not controlled through ethical systems and legislation. The birth of the artwork not only raised questions on what would happen if the same method of creation were to be applied to human beings, but also unfolded the impact on the

synthetic (engineered) being itself. Experiments on genetically engineered animals are not only anatomical but include a study of the behavioural and mental impact on the subject of the study. The effects on a transgenic creature, including the experimental phases before its birth, led to questions asked by Lestel (2007:153): "To what extent is it ethical for humans to manipulate animals for aesthetic reasons? Do humans have the right to manipulate an animal's body and behaviour for aesthetic or purely intellectual reasons?" Although Lestel is not necessarily against the genetic manipulation of animals when it comes to their physical enhancement for survival and for the protection of species for example, but these questions are valid when it comes to the physical genetic manipulation of animals for conceptual purposes. The creation of the artwork *GFP Bunny* (2000) (fig 5) portrays humankind's power and freedom to interfere with an animal's genetic material while simultaneously addressing the controversy around it by introducing ethical debate. In other words, the method used to create a living transgenic artwork that ignites ethical dialogue, becomes the ethical debate itself. The following question remains: Is it fair to use the body of another living being as a "site of artistic performance"? (Tomasula 2002:137). For the artist, the birth of *GFP Bunny* (2000) (fig 5) symbolised the genetic revolution which was a process with different phases and components that he wanted to make the public aware of. Whether the artist intended it or not, the *GFP Bunny* (2000) (fig 5) project presented the somewhat questionable realities of the transgenic artistic process.

3.2.5 The social integration of a living green fluorescent rabbit

The final part of the project was intended to be the integration and acceptance of the transgenic artwork by the public. Kac's intention was for the rabbit used for this genetic engineering project to settle with him and his family in Chicago (Kac 2000a). This was a vital part of the project for Kac because it symbolised the importance of caring for bioengineered life, respecting and nurturing the transgenic creature by allowing it to live a full purposeful life with its unique qualities. The rabbit in the *GFP Bunny* (2000) (fig 5) artwork was also known as Alba, a name chosen by Kac and his family to serve to show that domestication was part of the project. This could have been purposefully introduced to evoke emotion. But

Vallverdú is of opinion that the strong reaction of the public which may have been the result of the 'funny pet' label the rabbit received, was what stopped Alba from being moved to a domestic environment as was initially intended by the artist (Vallverdú 2006:10). Scientists would try to avoid this because such associations may compromise the integrity of scientific projects. The German and French press at the time associated the refusal of the laboratory to release Alba from where she was created with artistic censorship, while others called the rabbit 'decadent' art (Tomasula 2002:137; 143).

3.2.6 The science in *GFP Bunny* (2000)

The artwork *GFP Bunny* (2000) (fig 5) was genetically engineered by injecting an enhanced synthetic mutation of a green fluorescent protein found in a Pacific Northwest jellyfish (known as EGFP), into the fertilised egg of an albino rabbit. This specific EGFP generates "…two orders of magnitude greater fluorescence in mammalian cells (including human cells) than the original jellyfish gene" (Kac 2000a). This protein allows the genetically engineered rabbit to glow green when illuminated with the correct blue ultraviolet light.

The green fluorescent protein (GFP) was inserted into the fertilised egg of the rabbit for the *GFP Bunny* (2000) (fig 5) project and acts as a biomarker in many scientific practices and experiments. Even though Kac wanted the *GFP Bunny* (2000) (fig 5) project to be a visual symbolic gesture for the public (Kac 2000a), it soon became apparent that the useful biomarker characteristic of the protein was the only thing the scientists and genetic researchers of the laboratory where *GFP Bunny* (2000) (fig 5) was created were interested in.

3.2.7 The life and death of the artwork

The planned course of events of the artwork *GFP Bunny* (2000) (fig 5) had unforeseen interruptions due to the controversial nature of its creation. The lack of legislation to protect synthetically created life also influenced how the planned and unplanned phases of the project played out. One of these unforeseen interruptions occurred in the third phase of the project. The *GFP Bunny* (2000) (fig 5) project attracted media attention when the former director of the French institute where the

GFP Bunny (2000) (fig 5) was created, refused to release the artwork, firstly to an exhibition in Avignon in the south of France and then ultimately to Kac's family in Chicago (Kac 2007a:165). The reason for the refusal was never made clear even though it had a great impact on the international community. There has been speculation about the reason for refusing to release the *GFP Bunny* (2000) (fig 5) but no official report has been made public by the parties involved.

There were many battles between Kac and the laboratory where the *GFP Bunny* (2000) (fig 5) was created. After the rabbit's untimely death, many conflicting statements were made by Kac and Louis-Marie Houdebine, who assisted in the creation of *GFP Bunny* (2000) (fig 5). Houdebine said that the reason for the rabbit's death was unknown, but, according to Wire News, the rabbit lived for four years, which is the normal lifespan in such facilities (Philipkoski 2002). In contradiction to Houdebine's statement, Kac insisted that the rabbit was only two to two and a half years old when she died which is a very short lifespan considering that a rabbit's lifespan is usually between 6 and 14 years (Vella 2014). Houdebine rejected Kac's statement, saying that Kac "…simply picked a rabbit with a gentle disposition that was already in his lab" (Philipkoski 2002).

It has been suggested that the *GFP Bunny* (2000) (fig 5) was declared dead to put an end to the unwelcome media attention because the project became "…a global media scandal", sharing headlines in the Boston Globe with other news headlines as influential and popular as the 2000 Olympics and the Presidential debates (see figure 6). News articles about the project were published in every major country. The on-going attention allowed the debate regarding bioethics to flourish globally. These debates specifically included constituting the need for legislation to protect the rights of genetically engineered creations.

Figure 6: Eduardo Kac, *Free Alba!* (2001).

The final phase of the project, namely, to have the rabbit live in a domesticated environment with Kac and his family as a normal rabbit, was never realised. The end of the project came with the announcement of the untimely death of Alba. According to Philipkoski (2002), Houdebine admitted that there was a discussion on the preliminary plans for the project to travel to an art show in Avignon, but denied the fact that the rabbit was created specifically for Kac as a transgenic artwork. Houdebine insisted that Alba was one of many "…GFP rabbits generated almost five years ago to be used as a model to follow the fate of embryonic cells in developing embryos" (Philipkoski 2002).

On the other hand, by suggesting that the rabbit was not created specifically for Kac as an artwork "…would have been decidedly uncharacteristic for the artist, whose practice for over 20 years has focused on the creation of new art forms, not on the reuse of existing objects" (Anker, Lindee, Nelkin & Shanken 2008:309). This statement is an invitation to compare Kac's artwork *GFP Bunny* (2000) (fig 5) and

Duchamp's *Fountain* (1917)[53].

According to Anker et al (2008:310-311),

> Duchamp's *Fountain* (1917) recontextualizes a pre-existing object to give it a new meaning and reveal the discursive conditions of art. Kac creates a unique and unprecedented form of subject that opens up a new context for the negotiation of meaning and value with respect to both art and genetic science.

Both artworks gained attention by the placement of the unexpected within the realm of fine art, pushing traditional boundaries. Anker et al (2008:310-311) continue the comparison:

> Whereas *Fountain* gave an object a new meaning and, in the process, expanded the field of art, *GFP Bunny* not only gave a live, transgenic mammal a new meaning and expanded the field of art, but it contributed to broadening the discursive domain of molecular biology to include public debate over its social and cultural implications.

Houdebine's statements regarding the originality of the creation of the *GFP Bunny* (2000) (fig 5) as an artwork caused many artists and critics alike to question whether Kac could take credit for the project and whether the project could be seen as an artwork at all because "[f]or individuals and groups whose understanding of art is predicated on traditional aesthetic values of natural beauty and order, *GFP Bunny*, like *Fountain*, will not be considered art at all, much less good art" (Anker et al 2008:311).

As mentioned in Chapter 2: Literature review, Potter explores the relationship between art and science in relation to Leonardo da Vinci's life. According to Potter (2006:1308), the fields of science and art were "…aligned harmoniously" within Da Vinci and "[a]rt was guided by science, and science was expressed through art". By comparing the relationship that Da Vinci had with these two fields with Kac and his artwork, *GFP Bunny* (2000) (fig 5), it is apparent that there are some concerns to be raised when art and science are aligned under the same discourse. The intermingling and re-contextualising of the fields, as Kac attempted to do with the

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[53] Marcel Duchamp, *Fountain*, (1917). Glazed ceramic, 61 cm x 36 cm x 48 cm. San Francisco Museum of Art. (http://www.sfmoma.org/images/artwork/large/98.291_01_b02.jpg)

GFP Bunny (2000) (fig 5) project, causes both fields to lose credibility. The methodologies concerned are no longer recognisable and understood as they were before.

Another point which caused the contention between Eduardo Kac and the laboratory, was whether the photographs taken of the *GFP Bunny* (2000) (fig 5) were a true portrayal of the rabbit. The photograph (fig 5) was strongly opposed due to the alleged fact that "…the rabbit doesn't actually glow so brightly and uniformly" because the hair of the rabbit is unable to express the gene (Philipkoski 2002). Kac adamantly confirmed that the photograph was a real representation because the rabbit was photographed with the correct ultra violet lighting. Colour and lighting expert, Peter Barna, is of opinion that "…there is not enough information to know exactly how the image was created" (Philipkoski 2002). He is not ruling out the possibility that it could have been done genetically, but suggests that there may be other possibilities that could have made the rabbit glow in the photograph. The verification issues[54] surrounding *GFP Bunny* (2000) (fig 5) also influence the artist's credibility. However, the artist may have intended by to make the photograph of the artwork visually inviting because the fact that the rabbit glowed green was the most important factor that distinguished her and invited responses from the public.

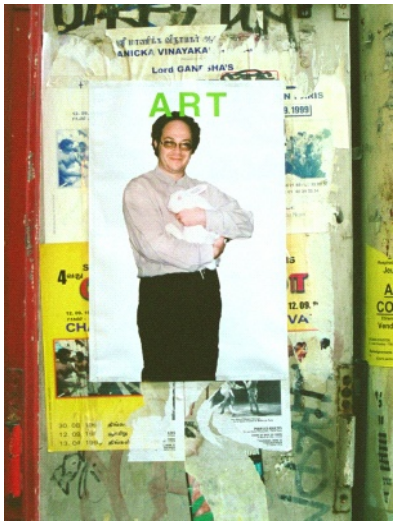
Some scientists "…join the aesthetic/genetic fray when they engage in manipulating their visual data as a means to enhance, communicate and persuade" (Anker et al 2008:278). Felice Frankel[55] assists scientists to bring their images to life with the latest tools. This illustrates the overlapping of aesthetics in both the fields of science and art. But, according to Stuart Newman (Philipkoski 2002), a member of the Council for Responsible Genetics, "…art misrepresents reality all the time," making

[54] The verification issues will not be discussed in-depth in this study and will be considered for future research projects.

[55] For more information, see Frankel, F. 2002. *Envisioning Science: The Design and Craft of the Science Image*. Cambridge, MA: MIT Press.

it clear that his opinion of Kac's role in the *GFP Bunny* (2000) (fig 5) project was that of an artist, not a scientist. Newman (Philipkoski 2002) does feel, however, that "…people are beholden to tell the truth" and he questions the role of the transgenic artist and, more specifically, the presentation of transgenic artworks. When dealing with the creation or manipulation of life, do presentations of transgenic artworks have to be truthful portrayals of what has been created? Transgenic art enters the realm of science where capturing the correct data is of utmost importance. Do the responsibilities of scientists shift to the transgenic artist? Do transgenic artists have the freedom to express and present their artworks freely? These questions examine whether artistic method and creative freedom are truly achievable within the realm of science.

The story of the *GFP Bunny* (2000) (fig 5) project was covered by news organisations worldwide and the facts were sometimes modified. The extensive coverage was reinstated and constantly resurrected when Kac launched the *Free Alba!* Exhibition in 2002 at the Julia Friedman Gallery in Chicago. The re-contextualisation was Kac's way of keeping the project alive. The *Free Alba*! Exhibition (Kac 2007b:170) captured the "…productive tension that is generated when contemporary art enters the realm of daily news". It included photographs (see figures 7 and 8) that dramatized the introduction of *GFP Bunny* (2000) (fig 5) in an effort to publicise the refusal of Alba's liberation. It was also intended to be a persuasive tool to free her from the laboratory (Kac 2007b:170). The body of work included drawings, flags, t-shirts and seven-series posters in an effort to spread awareness of the *GFP Bunny* (2000) (fig 5) project beyond the gallery walls (see figures 7 and 8). Kac wanted to create awareness of his personal battle to obtain custody of the transgenic animal.



Figures 7 & 8: Eduardo Kac, *GFP Bunny* (2000) - *Paris Intervention* (2000).

Kac once more attempted to keep the debate on *GFP Bunny* (2000) (fig 5) alive with his exhibition entitled *Alba & Edunia*, held in 2012 at the Tatiana Kourochkina Galeria d'Art in Barcelona, Spain. The exhibition included photographs of the front pages of newspapers from 2000 (see figure 9) which was an attempt by the artist to have the public relive the controversies raised by the *GFP Bunny* (2000) (fig 5) project at the time.

Figure 9: Eduardo Kac, *"Free Alba!" (New York Times)* (2001).

The exhibition included sculptures and drawings of Alba with the artist (see figure 10) in an attempt to reveal the emotional connection between the artist and the genetically created being. In choosing significant moments in the early phases of the project as subject matter for the artworks, it was also perhaps an attempt to re-ignite the public's response towards the first phase of the creation of the artwork, namely the birth of the *GFP Bunny* in 2000.

Figure 10: Eduardo Kac, *Featherless* (2006).

Alba continues to feature in new artworks by the artist in more recent exhibitions such as *Aromapoetry and Lagoglyphs* held at the Black Box Gallery, Copenhagen in 2013 (see figures 11 and 12). In an interview with Alison Brown, Kac (2013) explains the reason for this inclusion 13 years after the birth of the artwork:

> For me fundamentally it is to restate her presence because she is absent. Nature didn't make her, I made her, she was present on this planet, she touched a lot of people's lives in ways that continue to resonate, and here she continues to leave her legacy.

Figure 11 & 12: Eduardo Kac, *Aromapoetry and Lagoglyphs* (2013).

The controversial debate around *GFP Bunny* (2000) (fig 5) and her destiny reached millions of people over the years. The creation of *GFP Bunny* (2000) (fig 5) went beyond its original intention to only serve as a portal for debate. The rabbit became an icon. Sympathy for the iconic rabbit questioned the creator's respect and responsibility for life, be it the protection of natural life or caring and integrating genetically engineered life. The life and death of the *GFP Bunny* (2000) (fig 5) project allowed the viewer to not only see art as a form of life, but also to understand life through art (Costello & Willsdon 2008:17). For this reason, connecting transgenic art and ethics became clearly necessary.

3.3 THE ANALYSIS OF *GFP BUNNY* (2000)

The description of the execution of the different phases of the artwork led to an in-depth analysis which addresses the research questions and objectives of the study. This section describes the ethical issues in detail as intended and not intended by the artist, as well as the social response of these issues. I also explore the justification of Kac's methods and the purpose behind the artwork.

3.3.1 Ethical debates introduced by *GFP Bunny* (2000)

Vallverdú (2006:7) is of opinion that art has changed profoundly as a result of the rapid implementation of technological innovations. These innovations include a greater control of social media, one of the main forms of communication today.

Society has gained a vocal position which includes it in the discussion and subsequent decision making around ethical issues in genetic engineering and bioart partly because "…bioartists develop a special place in the social construction of those new meanings…They offer a space for an open debate about biotechnologies" (Vallverdú 2006:7). Transgenic art creates a communicative space for a variety of voices which range from deep concern to extreme enthusiasm for modern approaches to the life sciences. One of the reasons why the transgenic art of Eduardo Kac can be a vehicle to achieve this, lies in the fact that transgenic artworks such as *GFP Bunny* (2000) (fig 5) offer a "…fresh vision of new trends in science and also of their probable inherent problems" (Vallverdú 2006:7). This concept is also known as 'watchdog' art.

The purpose of this section is to determine whether *GFP Bunny* (2000) (fig 5) functions successfully as 'watchdog' by influencing societal responses to important decision making in the field of bioethics.

This analysis unfolds the intentional and unintentional debates caused by the *GFP Bunny* (2000) (fig 5) project. Each debatable question has been selected to support the aim of this study and is discussed individually in the form of a debate, focussing on different voices within each discipline. It is not the intention to persuade the reader in any way, but merely to shed light on various opinions about the controversial nature of the artwork which initiated specific bioethical debates.

Firstly, the level of public knowledge and awareness of the biotechnological revolution and how it will affect the human and animal genome in the future is probed. Secondly, the social impact of *GFP Bunny* (2000) (fig 5) which reveals the shortfalls of legislation around bioethics in the field of transgenic art. The unpredicted outcome, namely, the premature death of the living artwork, sparked the debate of whether science, as a medium for art, is justified and ethical.

3.3.2 Public awareness of the genetic revolution

Transgenic art questions whether ethical issues are considered and addressed in the rapidly growing field of genetic engineering. It also warns of the dangers of

scientific processes that could affect natural life as we know it. The genetic revolution is unstoppable, but debates within disciplines such as art, ethics, philosophy and law will enlighten and involve society and enable it to draw limits on processes which may threaten humanity.

The *GFP Bunny* (2000) (fig 5) project entails a "…complex social event that starts with the creation of a chimeral animal that does not exist in nature" (Kac: 2000a). The announcement of this project introduced the public to the actual creation and birth of the chimeral[56] animal that displayed the realities of this scientific development within art and science. Public responses (both positive and negative) at the time were based on emotions caused by the vulnerability of the animal used in the *GFP Bunny* (2000) (fig 5) project. John Fagan (Genetic engineering: a cautionary approach [sa]), internationally recognised molecular biologist and former genetic engineer, explains:

> We are living today in a very delicate time, one that is reminiscent of the birth of the nuclear era, when mankind [sic] stood at the threshold of a new technology. No one knew that nuclear power would bring us to the brink of annihilation or fill our planet with highly toxic radioactive waste. We were so excited by the power of a new discovery that we leapt ahead blindly, and without caution. Today the situation with genetic engineering is perhaps even graver because this technology acts on the very blueprint of life itself.

In order to find out how much the public knows of practices in genetic engineering, online surveys have been researched for this study. A survey entitled *Genetic Modification: Public Awareness & Knowledge Benchmark Survey* (2001) was done in New Zealand by Melissa Harsant & Emanuel Kalafatelis. The results showed that "…just over one half of the sample (53%) claimed to be informed about genetic modification, while almost the other half (43%) admitted to being uninformed. Most of those who claimed to be informed believed they were 'just informed'" (2001). A survey in America by the Genetics and Public Policy Center Mission (Hudson 2002:2) states that "[m]ost people are aware of developments in genetic technology,

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[56] The term 'chimera' in this case refers to "an organism containing a mixture of genetically different tissues, formed by processes such as fusion of early embryos, grafting, or mutation" (Oxford Dictionaries 2015, sv 'chimera').

but few are truly knowledgeable". In South Africa, a survey conducted for the Report of Public Understanding of Biotechnology in 2005 showed that, when the public was asked what the term 'biotechnology' meant, 82% did not know the meaning of the word (Langa & Rule 2005:4). Regarding genetic engineering, the general public seems to be unaware that only limited information about genes and gene sequences exists.

According to the Institute of Science, Technology and Public Policy in America (Genetic engineering: A cautionary approach [sa]), "…there is essentially no control over where in the human DNA strand the foreign genes will end up", emphasising the fact that the gene modification playfield is not necessarily as structured and solid as the public might think. Outcomes of experiments can be unpredictable. By exploring the field of genetic manipulation through art, the artwork is "…providing a voicing station for contemporary anxiety" (O'Donnel 2011). The *GFP Bunny* (2000) (fig 5) shows the unpredictability of experimenting with the genetic information of animals and a warning about what might happen when experimenting with the genetics of the corporeal human form.

From the surveys, it is evident that the international community is only partially aware of what the terms 'genetic engineering' and 'biotechnology' mean. Awareness of the threats that come with scientific advancement should be raised and discussed. Some public concerns that were identified included what might happen if genetic engineering is abused as a tool to obtain power and wealth, or used to obtain genetically engineered characteristics in babies. Other serious threats identified by Kac (2000a) include:

> the possible loss of privacy regarding one's own genetic information, and unacceptable practices already underway, such as biopiracy (the appropriation and patenting of genetic material from its owners without explicit permission).

With reference to the laboratory's opposition towards the *GFP Bunny* (2000) (fig 5),

> companies often employ empty rhetorical strategies to persuade the public, thus failing to engage in a serious debate that acknowledges both the problems and benefits of the technology (Kac 2000a).

According to the survey done in South Africa in 2005 mentioned above (Langa & Rule 2005:9),

> [n]early a quarter (23%) seemed to trust universities the most to tell them the truth about bio-technology. The second most trusted institution seemed to be the media (19%). The third most trusted institution was the South African Government, with 16% of respondents trusting it to tell them the truth about biotechnology. Only about a tenth (11%) did not know an organisation to trust to tell them the truth about biotechnology.

Kac is of opinion that certain private biotechnical companies are not always honest and transparent about their developments. This contributes to the problem of public awareness when it comes to possible threats from genetic engineered procedures. Two of the biggest concerns in terms of the abuse of genetic engineering are eugenics and biological warfare. The term 'biological warfare' is defined as "…the use of harmful bacteria as a weapon in war" (*The Oxford Advanced American Dictionary* 2015, sv 'biological warfare'). Biological warfare is a harsh reality and the public is afraid of the possible disastrous outcome if this practice is used. "This fear is legitimate, historically grounded, and must be addressed" (Kac 2000). Bioethical legislation and the law play an important role in addressing such possibilities.

According to Wolfe (2007:96),

> [b]io-ethics presumes to serve as the self-designated conscience for those contemporary biotechnical apparatuses and institutions that exert power over life and death, but the obvious problem here is that the functions of 'conscience' and those of establishing policies palatable to both state and economic power do not always or even go hand in hand.

Bioethics and the lack thereof in the *GFP Bunny* (2000) (fig 5) project are the starting point of discussions about these issues. How the institution and the artist handled the situation raised fears. The possibility of what would happen if the same fragmented system that failed the *GFP Bunny* (2000) (fig 5) was to be applied to genetically engineered humans in future, is a real concern. The platform created by transgenic art regarding the idea of tampering with the human genome and how it can be applied to power, war and economics is discussed.

The term 'eugenics'[57] refers to either 'negative eugenics'[58] which is defined as "…the improvement of the genetic make-up of a population by preventing the reproduction of the obviously unfit," or as 'positive eugenics'[59] which is "…a science that deals with the improvement (by control of human mating) of hereditary qualities of a race or breed". The artwork *GFP Bunny* (2000) (fig 5) reflects either of the two possible outcomes of eugenics. Firstly, the rabbit used in *GFP Bunny* (2000) (fig 5) was an albino animal and was not fit to survive on its own in the wild. However, with the interference of genetic engineering, the rabbit's natural DNA sequencing was modified to give the rabbit a new purpose and therefore allows her to survive despite what her natural fate ought to be. The jellyfish gene of *GFP Bunny* (2000) (fig 5) soon became a commercial product when Taikong Corporation presented its fluorescent fish (the result of genetic engineering) for sale as pets at $17 per unit (Vallverdú 2006:11). This caused the fields of art, science and commerce to overlap. Today, genetically engineered wildlife like black impala, golden hartebeest and white springbuck fetch huge amounts on game auctions in South Africa. These amounts are usually ploughed back into the wildlife industry to the benefit of conservation.

The awareness around the *GFP Bunny* (2000) (fig 5) project opens the possibilities for many projects like this, not only because of their commercial value and the public interest it generates but also because of the moral questions it raises for the conservation and protection of animals. An example of genetic manipulation on huge scale was shown by the catastrophic phenomenon of Myxomatosis. In Australia, the Myxoma virus was introduced to reduce the rabbit population but resulted in the most horrific disfiguration of these animals (The virus that stunned Australia's rabbits 2011).

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[57] *Merriam-Webster Encyclopaedia* (2015, sv 'eugenics').

[58] *Merriam-Webster Encyclopaedia* (2015, sv 'negative eugenics').

[59] *Merriam-Webster Encyclopaedia* (2015, sv 'positive eugenics').

Even though *GFP Bunny* (2000) (fig 5) as a project posed no physical threat to humankind, the project was used as a tool to make the public aware of the biotechnologies already available at the time. For a transgenic artwork to ignite debate and public awareness it probably has to address justifiable threats and the legitimate fear surrounding it. The social effect that the notion of nature tampering has on society is addressed in the following section.

3.3.3 The social effects of *GFP Bunny* (2000)

The emotional impact the *GFP Bunny* (2000) (fig 5) project had, and continues to have, on society is explored though the social media platform and blogs. This section reflects on the collective effect that the *GFP Bunny* (2000) (fig 5) had on societal thinking, as well three identified camps of thought.

Giffney and Hird (2008:365) state that Kac is "…aware that he might be accused of creating mere 'genetic *objets d'art*'"[60]. Kac, however, argues that his work is "…deeply philosophical, composed of a dynamic network rather than a static item" (Giffney & Hird 2008:365). The live, dynamic and interactive transgenic artwork *GFP Bunny* (2000) (fig 5) and society's reaction to the artwork's vulnerability reveals crucial ethical and moral debates.

The fact that the transgenic artwork was alive created both a feeling of connection and a sense of uneasiness in the viewer. Because of the fact that we, as human beings, naturally respond to other living beings, the viewer can identify with a living artwork, even if it is only on the basis of being alive. This identification opens the debate of whether the placement of a living being within the field of art is ethically acceptable. Is it ethical for artists to tamper with nature by playing with genes and their natural progression? The fact is that Kac used a 'bunny' which has an endearment quality by its mere existence.

[60] The term is translated in English as 'objects of art'. Genetic objects of art can refer to the genetic code of artificial objects or to products of genetic experimentation. In this case the term is used to describe Eduardo Kac's artwork as a static genetic object, focusing on the ethical debate of using live creatures for the production of artworks.

Furthermore, the question is raised whether tampering with nature for aesthetic reasons is ethical and justified.

Kac defended the creation of the *GFP Bunny* (2000) (fig 5) by applying the term 'aesthetic' in a philosophical way, focussing on the relationship between himself and Alba (Kac 2000). The relationship comments on the acceptance and subsequent social integration of synthetically created living beings.

The public's response towards the *GFP Bunny* (2000) (fig 5) and her planned release was enormous and emotional. According to George Washington (2008), the issue regarding *GFP Bunny* (2000) (fig 5) caused the debate to unfold in three ways:

> Some would say it is unnatural and an un-holy attempt to play god. Others would say it is just science and that it is nothing more but research. Some people would classify this creature as art.

Washington (2008) questions the intention of the *GFP Bunny* (2000) (fig 5) project:

> The way I look at it is 'why?' why is this necessary? Why do we need glowing bunnies? Art perhaps? In my opinion this is a living creature being toyed with, created and mutated by people. I wouldn't call this art but I would call it inhumane and uncivilized … How are we going to be benefited by a glowing bunny?

Dayle Hoyt continues to ask this question about Kac's intention with the project and is of opinion that Kac only claimed the project for the benefit of his own ego and career, not thinking of the animal at all. It was clear that the strong emotional effect *GFP Bunny* (2000) (fig 5) had on society was the public's strong opposition to the use of animals in artistic or scientific experimentation. Concerns were raised regarding the safety and well-being of the animal. According to Eileen Joy (in Cohen 2008:366), it is regarded as cruelty of the highest order to disturb the genetics of a living creature that "…lacks the language or gestural ability to give consent". Society feels unsure of the protection of these creatures in the experimentation and creation phases because of the lack of disclosure.

Hoyt (2001) criticizes Kac's intended third phase of the project, namely, to bring Alba home to a natural and caring environment and to provoke public dialogue:

> Let's say Kac finds a way to "free Alba" and mount this installation; what is this "performance" supposed to prove? That an adult man and his family can successfully take care of a rabbit? He ordered it, had it built to his specs and now deems it his pet. This is a great gesture? Most people care for their animals, even without an audience sharing in the "dialogue".

Hoyt suggests that the *GFP Bunny* (2000) (fig 5) cannot be deemed as art and that Kac's intentions with his proposed third phase is not worthy of public dialogue because to care for an animal as a pet is not something extraordinary. Hoyt's opinion of *GFP Bunny* (2000) (fig 5) is explored and compared with Joseph Beuys' installation entitled *Coyote: I like America and America likes Me* (1974). This installation consisted of the artist living with a coyote in an enclosed space built for the occasion in the Soho Gallery in New York for eight hours a day, for seven days. Prof. Caroline Tisdall compiled a book of the entire installation which documents Beuys' iconic dialogue with the coyote (see figures 13 and 14). According to the publishers of the book (Joseph Beuys: Coyote [sa]), the documentation of the installation showcased how "…man and beast developed a mode of wordless co-existence, a two-sided performance that became rich with assumed meanings". Hoyt (2001) explains that, in comparison to Kac's proposal of having the rabbit live with his family and making it possible for the public to view the rabbit in this environment, Coyote:

> also accommodated a steady stream of spectators during gallery hours, as would the "GFP" installation. The difference is that Beuys' thematics, the environment, cultural territory and living with a situation on its own terms—not re-engineering it according to your caprice and convenience—was dramatized every day, through a very real tension and peril. Compare this with the ... utopia which was promised by The Happy Bunny Family.

The difference between Kac's interaction with the rabbit and Beuys' relationship with the coyote is that Beuys and the animal lived as equals, showing respect to the animal and, in return, earning respect from the coyote. The integrity of the relationship between animal and human stayed intact, because the coyote, even placed within the realm of art, was free to act according to its natural instincts, whereas the problematic *GFP Bunny* (2000) (fig 5) was controlled even before its birth.


Figure 13 & 14: Joseph Beuys, *Coyote* (1974).

It is evident that people questioned whether Kac's *GFP Bunny* (2000) (fig 5) could be called art and voiced their concerns for the creature being caught up in the midst of this artistic presentation. Kac's aim and efforts to enlighten the public about transgenic art as a vehicle can be compared to another of Beuys' performances entitled *How to Explain Paintings to a Dead Hare* (1965) at the Galerie Schmela in Düsseldorf (see figure 15). There was a public perception that Kac had a similarly impossible campaign ahead by trying to justify his personal enthusiasm about the *GFP Bunny* (2000) (fig 5) project and trying to convince people to share in his joy. For some, the problem lay with creating life in the first place which cannot be justified by establishing a good relationship with the creation. Ironically, because of the fact that the *GFP Bunny* (2000) (fig 5) passed away, Kac's intention of having a relationship with the creature he created was as futile as explaining a painting to a dead hare. Furthermore, due to the animal's inability to communicate verbally and her untimely death, Kac will never be able to explain to her the purpose of her existence. His attempt to establish a non-verbal close relationship will never be realised. Hoyt (2001) explains that "people have every right to be mad … because the premise is as toxic as hell. No amount of dialogue or feedback is going to change that".

Figure 15: Joseph Beuys, *How to Explain Paintings to a Dead Hare* (1965).

It is necessary to question whether the public was aware of the fact that the public dialogue and emotions evoked are exactly what Kac intended with the *GFP Bunny* (2000) (fig 5) project. Kac observed different perspectives of his artwork which included disagreement.

In contradiction to Hoyt's opinion, Being Irfan (2010) finds *GFP Bunny* (2000) (fig 5) "the application of biological physics as an art form as a strangely intriguing and unique endeavour". He further explains that

> physics in biology is in many ways an art form—and worth appreciating on that merit alone. Indeed, Alba is a symbol of that very concept, and an eternal reminder that this field of research deserves more than just being perceived as simply esoteric (Being Irfan 2010).

Being Irfan explains that he is not entirely sure of his personal opinion regarding the situation of *GFP Bunny* (2000) (fig 5), but he can appreciate Kac's efforts and research in the fields of science and art.

There are two relevant viewpoints for this discussion: firstly, some parts of society cannot reconcile with the idea that a live animal has been used as part of a medium in an artwork. On the other hand, others can appreciate the research, even though

they are not entirely at ease with the idea and intention of the created creature. The comments from Alba's Guestbook shows that society is either very supportive or strongly opposed to the project. A common thread throughout most of the comments is the concern for the rabbit's well-being, whether Kac, as an artist, is supported or not.

The analysis of *GFP Bunny* (2000) (fig 5) shows the life of, the communication around and the emotions and awareness of the genetically engineered rabbit. An important aspect of *GFP Bunny* (2000) (fig 5) lies in the fact that the rabbit, just like any other rabbit, is "…sociable and in need of interaction through communication signals, voice and physical contact" and that the *GFP Bunny* (2000) (fig 5) "…makes clear that profound concept of interaction is anchored on the notion of personal responsibility (as both care and possibility of response)" (Kac 2000). Even though Kac had gone to great lengths to have Alba released in order to take personal responsibility for the created rabbit, it can be questioned whether this could have been prevented if there was a clear understanding and if legislation was in place to ensure the well-being of the creature. According to Andrews (2007:129), "[t]he techniques of emerging life-science art … bring to social consciousness issues related to individual rights, genetic manipulation, commodification and the dearth of regulation of biotechnologies". One of the individual rights of the rabbit that should have been in place beforehand came to light with the refusal of the release of the artwork *GFP Bunny* (2000) (fig 5). Her own well-being through her existence as a controversial artwork becomes a concern.

As discussed previously in the study, people seem to anticipate that scientific experiments on animals may lead to subsequent experiments on humans. Tomasula draws the parallel between the human obsession with plastic surgery for aesthetic reasons and says he can see no reason why people will want what is poetically or abstractly true in art to become literally true in practice. Tomasula (2002:141) asks whether, once gene technology is easily accessible to the public and applied for aesthetic reasons, "…will refusal to do so constitute an act of irresponsibility?". He also asks: "What does it mean to alter a natural evolutionary process millions of years old? How will people think of themselves, and their relations to others, once

boundaries such as *plant* and *animal* have been eroded?" (Tomasula 2002:138).

The successful process of injecting a foreign substance into the rabbit and the subsequent impact on the body of the rabbit, awakened strong emotions. From an overview of the blogs researched, it became evident that, on a subconscious level, people seem to be afraid of any tampering with the blueprint of life. Society wants some sort of protective boundaries in place regarding genetic engineering and transgenic art.

3.3.4 Exploring concerns: The protection of life through bioethical legislation

Bioethics in the field of genetic engineering is influenced by many factors in a fast progressing technological field. Bioethical legislation is difficult to determine, mainly because of uncertainty around the classification of genetically engineered life. This section focuses on existing policies regarding the genetic engineering of animals[61], because, in this specific case, an animal was used for the artwork.

A website called Bionet was consulted. The site was created by eight European science centres. It explores scientific developments, ethical issues, the comparison of the laws of different countries and the expression of opinions. Because *GFP Bunny* (2000) (fig 5) was created in France, some of the existing laws of the European Union on relevant issues will be expressed:

Is selecting an embryo for its genes legal?

It is made clear that there is no applicable EU law for this. The Convention on Human Rights and Biomedicine (1997) states that designing babies for anything other than therapeutic reasons, is forbidden.

Is it legal to select a particular embryo to provide a source of spare parts for another person?

There is no applicable EU directive.

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[61] This section will not focus on policies regarding the fields of genetically modified food, human cloning or medicine as it is not relevant to this study.

Is it legal to genetically engineer animals?

> There is no applicable EU directive specifically related to genetic engineering. Mice, pigs, dogs, cats, horses, sheep, cows, goats and (non human) primates are used for research in universities and laboratories (Bionet 2002).

Who makes and enforces these laws?

> The EU decision-making process is complex and there is more than one decision procedure. For matters of scientific and technological research, the co-decision process applies. To begin with, the technical work is the responsibility of the European Commission, which then makes one proposal. This proposal is then subject to discussion between the Council of the European Union (Ministers from the 15 member states) and the European Parliament, until an agreement is reached. Advice can always be asked from advisory groups (for example the European Group for Ethics in Science and New Technologies (Bionet 2002).

According to Perzigian (2003), "[c]urrently, there are few laws, in either the United States or the European Union (EU) regulating animal cloning and the creation of transgenic animals". Legislation by the United States of American and the European Union is considered because of the fact that *GFP Bunny* (2000) (fig 5) was created under the jurisdiction of the European Union in France and because the project was to be extended by having *GFP Bunny* (2000) (fig 5) released to Kac's home in Chicago:

> In the United States, most research and farm animals are excluded from federal protection. While the European Union (EU) ensures that such animals are treated more humanely than is the case in the United States, both the U.S. and the E.U. extend patent protection to the owners and creators of transgenic animal species (Perzigian 2003).

By giving patent rights to scientists, it ensures a continuous motivation to do research and develop transgenic animals for the benefit of health research. On the hand, with patent protection, "…researchers can now own and monopolize entire animal species, something unheard of prior to modern genetic engineering" (Perzigian 2003).

By exploring the patent protection of *Oncomouse*, we can identify ethical issues from existing evidence in the developing field of genetic engineering and apply it to the *GFP Bunny's* (2000) (fig 5) situation. *Oncomouse* was the first transgenic lab animal that was patented. The article, Bioethics and Patent Law: The case of the Oncomouse (2006), from the World Intellectual Property Organization explains the purpose for creating *Oncomouse*. In the early 1980s, researchers at Harvard Medical School (2006),

> produced a genetically modified mouse that was highly susceptible to cancer by introducing an oncogene that can trigger the growth of tumours. The *Oncomouse* was conceived as a valuable means of furthering cancer research. Harvard College sought patent protection in the United States and several other countries.

The creation of *Oncomouse* could benefit society with research in the field of cancer, so researchers at Harvard Medical School knew that the *Oncomouse* would become a sought after creation globally. By exploring the different approaches from different countries in the case of *Oncomouse*, ethical issues from different perspectives on the subject matter of patenting transgenic animals is extracted.

U.S. Legislation on the Animal Welfare Act (AWA) is the main federal legislation that regulates animal property in the United States and its aims are for "…creating and maintaining federal standards and regulations for the humane treatment of non-human animals" (Perzigian 2003). The Act, according to Perzigian (2003), provides protection for:

> [a]ny live or dead dog, cat, nonhuman primate, guinea pig, hamster, rabbit, or other warm-blooded animal, which is being *used*, or is intended for use for research, teaching, testing, experimentation, exhibition purposes, or as a pet but excludes birds, rats and mice "*bred* for use in research, and horses not used for research purposes and other farm animals, such as, but not limited to, livestock or poultry" from the Act's protection.

The selectiveness of animals protected by the Act makes it a relatively weak law and it has been criticised for its lack of extensiveness. Another reason for classifying the Act's protection as a weak law lies in the fact that genetically engineered animals usually consist of more than one animal's genes, such as the chimeral *GFP Bunny* which was the product of a jelly-fish gene and a rabbit. Perzigian (2003) states that:

> [s]ince the AWA extends no consideration for most of the species involved in genetic engineering research, legislation in the United States fails to regulate nearly all forms of genetic manipulation currently practiced.

Taimie Bryant (2008:134) further suggests that:

> [v]ery few animals are actually protected by anticruelty statutes, despite the fact that such statutes would seem to include most sentient animals because there are so many exemptions for activities humans value more than they value sparing animals any amount of suffering.

Patent laws in the United Sates are similarly unable to protect the well-being of transgenic animals. According to Perzigian (2003), patents for transgenic animals are being issued "…without ever addressing the environmental or ethical concerns posed by the use of patent protection for transgenic animal creations". It is evident that the EU, similar to the USA, lacks regulation regarding the patenting of genetic engineering in animals:

> The same Harvard mouse patented in the United States was the first transgenic animal patent awarded by the European Patent Office (EPO) in 1990. Although the EPO's requirements differ slightly in term, transgenic animals are equally patentable in Europe as they are in the United States (Perzigian 2003).

Practicing research in genetic engineering and animal cloning in the EU is permissible "only for objectives which are justified on ethical grounds and to the extent that the operations involved are effected on an ethical basis" (Perzigian 2003). This statement reveals the importance of the inquiry into the justification and ethics around transgenic art. According to Kac (2000a), the Green Fluorescent Protein that was inserted into the rabbit's genetics was harmless and has been successfully introduced in many host organisms for research. The ethical issue addressed here is therefore not only one of actual harm to the created animal, but rather the issue of using the technology to create a living animal as an "…invention of transgenic social subjects" as Kac claims for *GFP Bunny* (2000) (fig 5).

According to Bryant (2008:123), bioengineering, classified as science, "…receives preferential treatment under several laws, including anticruelty statutes, but [bio] art does not consistently receive similarly favourable treatment". It has been acknowledged that there are many debates around the classification of *GFP Bunny* (2000) (fig 5) as art. Kac and the laboratory scientists where she was created did not

agree on the issue of classification. The difficulty of classifying a bioengineered project as art or science becomes a "…necessary ... interpretive exercise if one is seeking to protect animals," but depends on the type of "…collaborative relationship that exists between bioartist and scientist" (Bryant 2008:123). The consequence of this classification disagreement resulted in the laboratory's refusal to release the genetically engineered animal to the artist so the animal did not get the chance to live a natural life. The main question is whether the rabbit could have been protected and released into a friendlier environment than the laboratory if the law (or patenting law) was clear on the care for bioengineered creatures and artworks. This would include an extension to protect genetically-engineered life that is created, not necessarily for the research of health benefits, but for the benefit of society in terms of information and exposure to the field of genetic engineering.

Perhaps the *GFP Bunny's* (2000) (fig 5) creation (unintentionally by the artist) and the refusal to release her identified a need for such legislation. The disagreement around the purpose of Alba's creation, whether for scientific research or as a transgenic art project, caused conflict. Either way, the EU legislation did not assist in the rabbit's well-being in terms of research, because of her untimely death, or allow her to live a normal life as intended by the artist and hoped for by society.

3.3.5 The justification of using genetic manipulation as a medium for art

It is evident from the previous section that created life is not yet protected by law as it should be. As long as this is a grey area, the issue of ethics and the well-being of genetically engineered animals will be contested. More specifically, the application of science to tamper with nature for the purpose of art will be under scrutiny.

Kac introduced the *GFP Bunny* (2000) (fig 5) project to society as a miracle of science as well as an object of transgenic art. Kac (2000) suggested that the definition of the term "transgenic art" is that genetic engineering is used to "…transfer natural or synthetic genes to an organism to create unique living beings". The ability of man's own power to create is under examination and questioned in depth in Chapter 4: Genesis. The *GFP Bunny* (2000) (fig 5) project included as part of the process of the art-making,

> the contestation of the alleged supremacy of DNA in life creation in favour of a more complex understanding of the intertwined relationship between genetics, organism and environment (Kac 2000).

With this statement Kac focused on the importance of placing genetic engineering in a social context in which the relationship between creation, socialisation and integration are all elements of the same scientific process as Kac (2000) explains:

> transgenic art offers a concept of aesthetics[62] 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.

Many transgenic artists focus attention on societal change. In a controversial artwork such as *GFP Bunny* (2000) (fig 5), Alba draws attention to herself. Because the rabbit will not be used for research in health benefits or any other medical condition, the purpose of a transgenic artwork such as *GFP Bunny* (2000) (fig 5) is seen as 'useless' and therefore such projects are classified as 'decadent' (Tomasula 2002:143). On the other hand, Tomasula (2002:143) shows that "…the inability (or refusal) of the specialist to look beyond the immediate concerns of the lab or the research grant" is often criticised in many journals.

Regarding legislation and ethics when it comes to genetically engineered animals, it is legal in UK to genetically engineer animals used for medical research in laboratories. The UK Medical Research Council (Bionet 2002), which funds most animal experimentation, stated that:

> UK law and animal ethical codes require researchers to use the least 'advanced' animals and the minimum number wherever possible. It is expected that genetically modified mice will remain the most important species where animals have to be used to help us understand disease and improve health.

The question raised from a philosophical point of view is: how is an animal classified as 'less advanced' and who determines this classification?

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[62] This quotation refers to Kac's previous statement that the term 'aesthetics' must be seen from a philosophical viewpoint that, in this case, focuses on the importance of the personal relationship between Kac and Alba. Kac has been known to criticise the ideologies of science, putting an emphasis on social responsibility.

If transgenic art is to progress and flourish, ethical issues around transgenic life will have to be addressed and altered. Kac (2007a:173) states that "…the dominant bio deterministic interpretation" of genetic engineering must be challenged, and that life should be seen as "…a complex system at the crossroads between belief systems, economic principles, legal parameters, political directives, scientific laws, and cultural constructs". The online research and surveys quoted in this study have indicated the emergence of a global individual. People no longer just accept the belief systems of their own societies. The internet, with its huge information and knowledge base, is informing the general public about these issues. Transgenic artists deconstruct the traditional metaphor of art as a reflection of life, with life itself and the public can become involved in caring for this synthetically created life.

There is a metaphorical message in Kac's choice of the term *bunny* in *GFP Bunny* (2000) (fig 5) which is usually associated with a child's pet. This is also apparent in the sculpture entitled *Code Noah* (1988) by Tony Cragg, in which children's toy animals are used to build a sculpture in the form of a DNA structure (see figure 16).

Figure 16: Tony Cragg, *Code Noah* (1988).

This implies that the power of creation also lies in the hands of children. Furthermore, whether it was Kac's intention or not, the artwork *GFP Bunny* (2000) (fig 5) has a strong voice of its own which opens a debate about placing the building blocks of life into the hands of incapable people. If one considers the extreme measures that Kac (as an experienced bioartist) took as the intended protector of the artwork, and that there were still unpredictable consequences that lead to the death of the bunny, it raises serious concerns if other 'creators' of living artworks do not take extreme precautionary steps to avoid such catastrophic situations. The role of the transgenic artist as creator must therefore be carefully considered and the artist must consider each field that the transgenic artwork may include, comment on or influence before embarking on the creation or manipulation of life. This will ensure that many unforeseen, unjustified or unethical creations that are developed through genetically manipulating life for the purpose of transgenic art, will be prohibited.

3.3.6 The responsibility of the transgenic artist in society

For the purpose of this section the artist's viewpoint has been considered to determine the merit behind the role of the artist in this specific type of artwork.

Transgenic art blurs the boundaries that existed previously between art and science. Kac (2000) explained that one of his objectives of the *GFP Bunny* (2000) (fig 5) project was his intention to initiate the following:

> an on-going 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.

The role of the transgenic artist can be seen as mediator and creator of a platform for conversation and discourse between these different disciplines. Furthermore, with the planned second and third phases of the *GFP Bunny* (2000) (fig 5) project, Kac (2000) believed that the rabbit was only "…a participant in the *GFP Bunny* (2000) transgenic artwork; so is anyone who comes in contact with her and anyone who gives any consideration to the project". It was intended that the four different phases of the *GFP Bunny* (2000) (fig 5) project ensured that the artist's diverse role fulfilled a variety of responsibilities that come with the creation of synthetic life.

Andrews (2007:139) questions whether transgenic artists should be held to "higher, the same, lesser, or different standards entirely than scientists". The responsibility to care for the well-being of synthetically created life falls on the creator, whether the role is filled by a scientist or artist. Apart from the many controversies around Kac and his role as the transgenic artist in *GFP Bunny* (2000) (fig 5), it is evident that he explored the responsibilities of the creator, intentionally or due to unforeseen circumstances.

The transgenic artist, by actively involving the public, persuades his/her viewers to confront their personal relationships with animals and the concept of new animals, that

> shifts as historical conditions are transformed by political pressures, scientific discoveries, technological development, economic opportunities, artistic invention and philosophical insights (Kac 2000).

The transgenic artist, in the role of inventor, can inform the public of new developments and their effects on social phenomena. According to Kac (2000), the transgenic artist has the responsibility to firmly reject the reductionist[63] view "…that life is purely a matter of genetics". The artist emphasises the importance of communication and the interaction of the conscious and the unconscious[64] life. The transgenic artist is preoccupied with the social existence of organisms and their relationships with other species or beings. On the other hand, Tomasula shows that genetic art does not own the moral high ground. He explains that "…just as there is modern kitsch, there will be genetic kitsch" (2002:144). A collective attempt led by the transgenic artist can help to define ethical borders. The awareness of our social existence in relation to other species and beings can prohibit a 'genetic kitsch' movement from happening.

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[63] *The Oxford Advanced American Dictionary* (2015, sv '*Reductionism*') defines the term 'Reductionism' as "the belief that complicated things can be explained by considering them as a combination of simple parts".

[64] The term 'unconscious' life refers to Kac's use of "sentient and nonsentient actants" of life (Kac 2000).

Kac (2000) sees the role of the transgenic artist as channelling the public's fears of technological development:

> Rather than embracing a blind rejection of the technology, which is undoubtedly already a part of the new bioscope, citizens of open society must make an effort to study the multiple views on the subject.

Kac's preoccupation with public debate and interaction is his belief that "…drastic consequences may result from hype, sheer opposition or indifference" (2000). Considering the responsibility of the transgenic artist, Kac is of the opinion that he took every precaution to safeguard the *GFP Bunny* (2000) (fig 5). According to his bibliography (Kac 2000), the artist's first emotional experience in this project was when he held Alba in his arms for the first time and there was an immediate "…strong and urgent sense of responsibility for her well-being". He often places emphasis on the individuality of the rabbit and that she must be appreciated "…for her own intrinsic virtues" more than her whimsical otherness (Kac 2000). By that, Kac is referring to the rabbit's 'glow in the dark' quality.

Alba's final destiny is officially unknown to the public and was said to have been out of Kac's control. The *GFP Bunny* (2000) (fig 5) project was a forerunner of more radical genetic interventions, even human cloning, and the discussions of subsequent responsibilities of the creator (whether it is the artist or the scientist) of such a project. What Kac insisted on was an exploration and construction of an identity for the genetically engineered animal. The same might apply when technologies regarding human engineering become more evolved. By giving the created creature or being an identity, a sense of self-worth and respect is attached to that creation which enables others to recognise the created creature or being as part of our societal existence. Whether it is the actual identification or the awakening of the need to respect genetically created life, this becomes the role of the transgenic artist.

3.4 CONCLUSION: THE PURPOSE OF THE ARTWORK *GFP BUNNY* (2000)

The *GFP Bunny* (2000) (fig 5) reveals several issues that arise with the responsibility behind creating or manipulating life. The process of interfering with natural life becomes the discourse. The action and interaction between, firstly the literally created being and the public, and secondly the created being and the artist, has, at its core, the purpose of sharing information and initiating a dialogue with new concepts. On the other hand, by blurring boundaries between scientific experiments and artworks, the *GFP Bunny* (2000) (fig 5) conceals the fact that the artist did not foresee certain problems and that he was therefore not completely in control of the process behind his creation. Whether these problems, that kept *GFP Bunny* (2000) (fig 5) from leading a natural life, have shown the need for proper legislation and ethical systems, is questionable. They also question at what cost will transgenic artists manipulate or create life, especially if the strict methodologies of science are not necessarily applied and if creative freedom comes into the question. The ethical debates discussed in this chapter form part of the aim of the study which is to show the need for enlightenment on the subject.

New media was introduced and harnessed by the artist to get his message across. Genetic engineering was applied to create a controversial work of art. Digital and manipulated photography were used to bring it to the attention of the public and the media. Internet blogs were used to estimate the public's opinion and emotions regarding the controversial artwork. This resulted in a public debate which was Kac's ultimate aim. The spontaneous media hype around this transgenic artwork formed an integral part of the execution of the work, perhaps becoming a new type of media. Critical discourse was an inevitable result of an artwork that became publically known as the 'luminous green bunny'. It became an awareness campaign for new research in biotechnology and essentially for bioethics in the fields of science and transgenic art alike.

In his biography, Kac discusses the purpose of transgenic art in relation to 'teleonomy' which is defined as "…the quality of apparent purposefulness of structure or function in living organisms that derives from their evolutionary

adaptation" (*Merriam-Webster Encyclopaedia* 2015, sv 'teleonomy'). By "…moving beyond the metaphor of the artwork as a living organism into a complex embodiment of the trope, transgenic art opens a non-teleonomic domain for the life sciences" (Kac 2000). Kac (2000) insists that the *GFP Bunny* (2000) (fig 5) did not "…attempt to moderate, undermine or arbitrate the public discussion" around her, but wanted to form a new platform from which it will become clear that transgenic animals are regular animals who need social integration and nurturing as much as any other animal. Whether this new type of species will be accepted by both society and complex environmental systems can only be proven through practical application.

Catts and Zurr (in Kac 2007a:245) ask the question:

> What kinds of relationships are we going to form with these entities? Will we care for them or abuse them? Where will semi-living objects be positioned in the continuum of life and how will this affect our value systems with regard to living systems, including our own bodies, human or otherwise?

Transgenic art re-evaluates the value systems and conceptual constructs that we have accepted as normal or natural. The social value of transgenic art lies in the fact that it can be "…at once inside and outside of the operational realm of molecular biology" (Kac 2000). The genetic code becomes flesh, taking theoretical scenarios and anchoring them in real experience. It widens the context of created life. It places more emphasis on the environment of created life. The artist and his fundamentally symbolic instrument of art try to accommodate the domain between science and culture.

This chapter shows how Kac is robbing biotechnology of its pragmatic function and re-contextualising it as aesthetics. A new focus on the nature and purpose of art is introduced by the *GFP Bunny* (2000) (fig 5) project. The artwork *GFP Bunny* (2000) (fig 5) did not only raise issues on a new form of nature, but became a platform for us to re-evaluate our place as human beings in nature and our ever-evolving ecological system. Regarding society's active participation in the subsequent decision making or definition of ethics and legislation, it becomes necessary to look at the realm of independence that art functions in. In the scientific

field of genetic engineering, reason is given too much responsibility, especially when considering that the field is rapidly moving towards human application. When genetic practices ultimately lead to the tampering of the human body, the purpose of transgenic artworks like *GFP Bunny* (2000) (fig 5) will have given us a guideline to apply such technologies with great care and caution, or, at least, it would have given us a platform and a voice to establish the need for a collective responsibility when it comes to the moulding of our own natural existence.

CHAPTER 4: GENESIS

4.1 INTRODUCTION

The analysis and subsequent discussion of the artwork *Genesis* (1999) (fig 17) by Eduardo Kac was chosen for this chapter of the study for its integration of biotechnology and belief systems. The previous chapter engaged in dialogue with the public over moral and ethical issues in bioart whereas this chapter questions societal transformation and challenges existing belief systems regarding the perception of creating and/or manipulating life. The intention is not to support bioethical, theological or, for that matter, a philosophical position regarding transgenic art, and the so-called right to create life. It is merely a platform for discussion and for introducing information for the South African art public where the concept and practice of transgenic art is still relatively new. According to Davidkremers (2007:297), "[g]ood artists today do not paint sermons, they engage in conversation".

The artwork *Genesis* (1999) (fig 17) deals with the theme of religion and contemporary art, specifically transgenic art. As mentioned in the introduction of the study, it may be that Kac joins historical artists such as Mondrian, Kandinsky and Pollock in their use of theosophical art in pursuit of the truth. Kac used the unconventional method of genetic manipulation in the context of the sacred text of *Genesis* (1999) (fig 17), thus exposing himself to the possibility of being accused of blasphemy. However, his aim was to get to the truth behind humankind's dominion over nature, joining the abovementioned artists in their motto: "There is no religion higher than truth" (In pursuit of the divine: Religion and Contemporary art 2014). Traditionally, *Genesis* (1999) (fig 17) challenges the simplistic God of classical theism, the one God who is in control of the creation.

The fields of art and religion, much as art and science, are neither dissociated nor opposed to one another. However, the shape of the dialogue between these fields of faith and contemporary art keeps changing. In the case of *Genesis* (1999) (fig 17), the application of an unconventional method of transgenic art was used to enlighten a religious theme. This chapter focuses on belief systems that are explored and

challenged in the artwork. The chapter comments on the artwork in relation to its title, *Genesis*, which implies the possibility of new beginnings.

The artwork *Genesis* (1999) (fig 17), just as *GFP Bunny* (2000) (fig 5) does, blurs the boundaries between natural and synthetic life as a result of progress in biology, more specifically, bioart. The artist questions the possibility of a new beginning, a new age where life can be engineered for the sake of art and art can be engineered for the sake of life. The term 'translation', as a tool to orchestrate the engineering of synthetic life or manipulating natural life, forms an integral part of the analysis of the artwork. The artist used the interactive space of the internet to apply this translation through public participation. The interactive space was applied in the same way in which sacred spaces like churches and cathedrals "…communicate a sense of time and eternity, of the finite and the infinite" (In pursuit of the divine: Religion and Contemporary Art 2014). The progress in technology has made the internet an infinite and unlimited platform for the exploration of belief systems.

4.2 DESCRIPTION OF THE ARTWORK

4.2.1 Introduction

The transgenic artwork *Genesis* (1999) (fig 17) was first exhibited in 1999 at the O.K. Center for Contemporary Art in Linz, Austria and was commissioned by Ars Electronica 99. More recently, the artwork was exhibited at the Espacio Fundación Telefónica in Madrid in 2013.

Because the scientific processes involved in the creation of the artwork are so complex, the artist's technical description is mainly used to ensure that no information might be lost or misunderstood as mentioned previously. The transgenic artwork *Genesis* (1999) (fig 17) forms part of a series of works relating to the same theme. The other artworks included in the series will not be analysed in this study.

Eduardo Kac used three different forms of language translations to invite public participation and portray the message of his artwork. The purpose of the interaction with the artwork *Genesis* (1999) (fig 17) became a symbolic gesture of the role of human intervention in nature.

Firstly, the use of a specific sentence from the biblical book of Genesis, “Let man have domain over the fish of the sea, and over the fowl of the air, and over every living thing that moves upon the earth” (Gen 1:28), is explored in terms of meaning and the context in which it places the artwork *Genesis* (1999) (fig 17). The sentence is explored as a metaphor for the beginning of creation, more specifically, humankind’s first realisation or instruction to have dominion over nature (and therefore all ecological systems). Firstly, the translation from text into Morse code in the artwork *Genesis* (1999) (fig 17) is applied symbolically to portray the dawn of the information age. Secondly, the translation into DNA base pairs uses genetic engineering to portray it as the most recent form of human intervention in natural life. This translation was done according to a conversion principle developed specifically for Kac. Through the combined processes of translation, a synthetic gene known as the artist’s gene, which does not exist naturally, was carefully manufactured by Kac.

Once the artist’s gene was created, Kac realised that, in order for the gene to have meaning, it had to be placed into context (Kac in Clüver 2010:176):

> The content of the gene is the body of an organism, and the context of the organism is its environment. In the case of my *Genesis*, the organisms are bacteria...and their environment is at once their dish, the gallery and the Internet.

The dish refers to a petri dish that was displayed in a gallery (see figure 17). The petri dish contained two types of bacteria into which the artist’s gene was inserted. Both types of bacteria were genetically engineered to glow when illuminated with the correct ultra violet light.

Kac (1999) describes the context of the artwork:

> The gallery display enables local as well as remote (Web) participants to monitor the evolution of the work. Remote participants on the Web interfere with the process by turning the UV light on. The energy impact of the UV light on the bacteria is such that it disrupts the DNA sequence in the plasmid, accelerating the mutation rate. The left and right walls contain large-scale texts applied directly on the wall: the sentence extracted from the book of Genesis (right) and the Genesis gene (left).

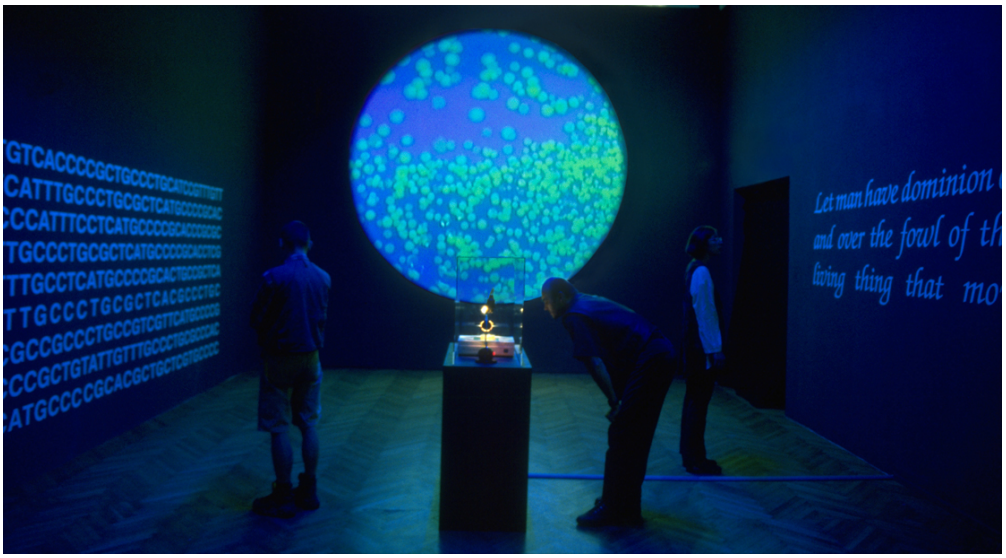

Figure 17: Eduardo Kac, *The gallery display of Genesis* (1999).

The stages of language were then reversed by translating the DNA sequencing back into Morse code and ultimately back into English text. The reversed translation was explored as a new language, a new way of communicating and understanding concepts and practices of genetic engineering. The translation of the biblical text by human intervention metaphorically suggested new ways of thinking or the adaptation of out-dated systems to the technological age to prevent the blind dismissal of scientific practices that could be beneficial for society. The power of the public voice deepened this concept and was investigated through transgenic art's purpose of explaining and exposing scientific practices. Ultimately, the role of transgenic artworks such as *Genesis* (1999) (fig 17) to assist society to understand ecological systems through ecological intelligence, is investigated to draw conclusions on society's actual involvement in the development of an ethical system in the field of genetic engineering.

4.2.2 The Science in *Genesis* (1999)

The artwork *Genesis* (1999) (fig 17) consists of a series of scientific practices. This section explains these processes as laid out by Eduardo Kac in the order of the creation of the artwork. This information is included in the study to explain exactly how the transgenic artwork was created and how this contributes to the analysis of the meanings and metaphors in the following sections of the study.

4.2.2.1 The Genesis gene

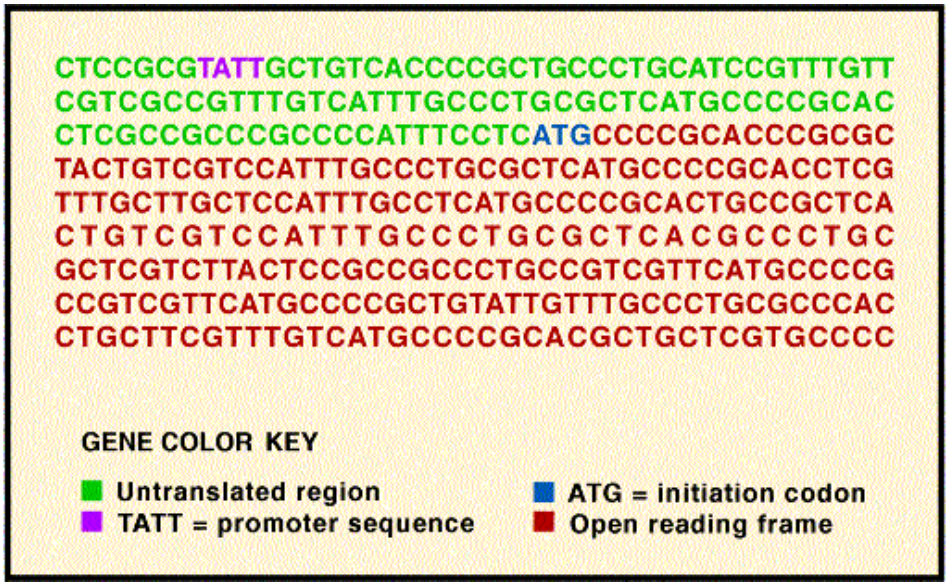

Figure 18: Eduardo Kac, *The Genesis gene* (1999).

"The illustration above shows the structure of the Genesis gene. The initiation codon (ATG, in dark blue) is the site where translation begins, i.e., where the protein starts to be built" (Kac 2000b). A codon is a combination of three letters that relates to a certain instruction to synthesise a specific piece of protein. This process happens in a cell called the ribosome. Ribosomes and their associated molecules are the translational apparatus relevant for the methodology of the artwork. The initiation codon is the starting point for the synthesis of a protein emphasising the notion of new beginnings in Genesis. Before the instruction to start the synthesis of the protein, there are codons that are not to be translated into protein but are only responsible for initiating the process. The promoter sequence is a part of the DNA code that starts the entire process of synthesis while the open reading frame is usually a long strand of DNA that does not have any codons that will stop the synthesis, as Kac (2000b) explains:

> Before the ATG initiation codon we see an untranslated region (in green) with a promoter sequence (TATT, in purple). After the ATG initiation codon we see an open reading frame (in brown), i.e., codons that do not code for termination. The *Genesis* gene is completely synthetic and does not exist in nature.

4.2.2.2 The transformation of the Genesis gene into Morse code

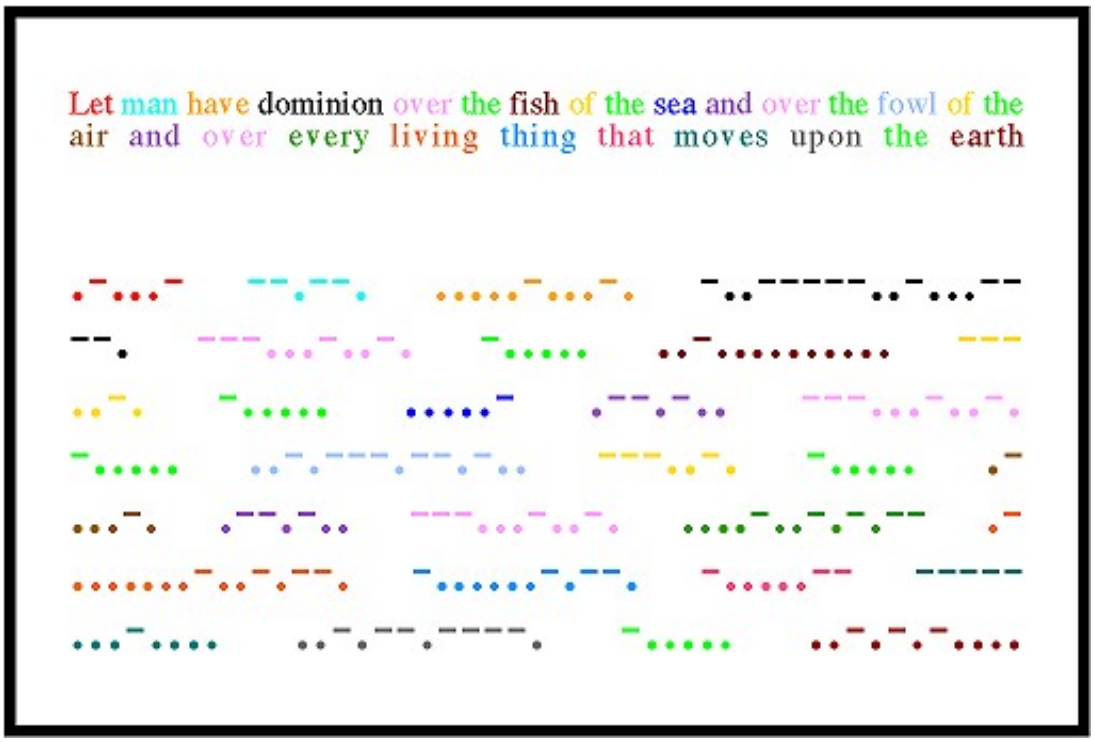

Figure 19: Eduardo Kac, *Genesis code into Morse code* (1999).

Morse code was used by the artist because it indicated the beginning of global communication. Morse code transmits information as a series of dots and dashes with the sequences representing letters or numbers. The sentence from the Bible text in *Genesis (1999)* was converted into Morse code (see figure 19). Kac (2000b) explained the process:

> The next step was the conversion of the Morse code into DNA: Dashes were represented by the letter T (thymine); Dots were represented by the letter C (cytosin); Word spaces were replaced by the letter A (adenine); Letter spaces were substituted by the letter G (guanine).

4.2.2.3 The cloning of the synthetic gene into plasmids

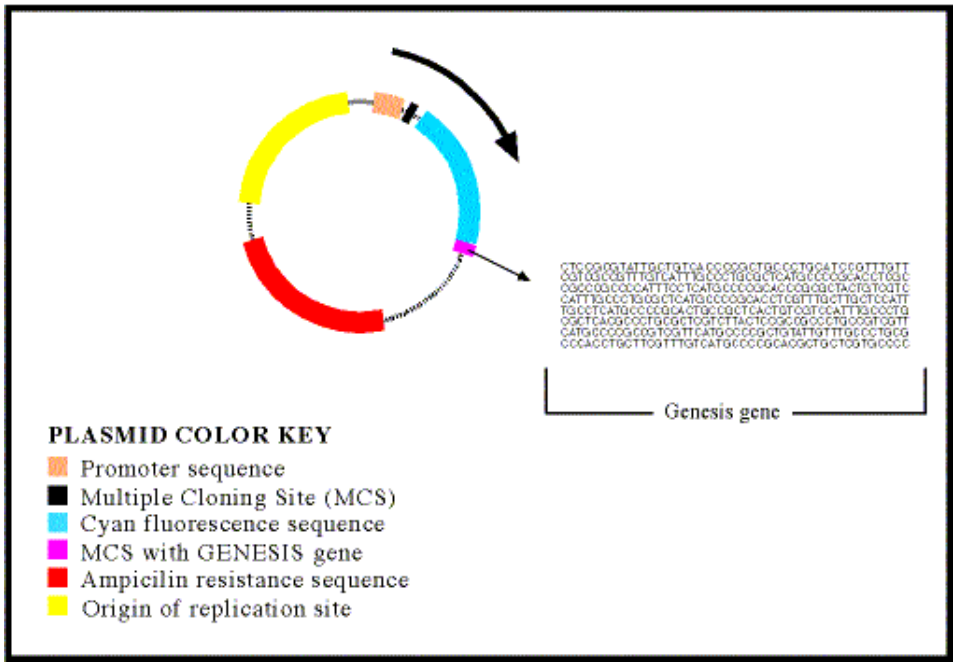

Figure 20: Eduardo Kac, *The cloning of the synthetic gene into plasmids* (1999).

A plasmid is an extra chromosomal ring of DNA (Kac 2000b). A chromosome is a structure that holds DNA in cells, so an extra chromosomal ring means that the DNA is free floating from the cell nucleus. “The black circular arrow at the top of the plasmid indicates the direction of transcription (i.e., the process by which one strand of DNA is copied into a single strand of RNA)” (Kac 2000b). RNA refers to ribonucleic acid, a large biological molecule that is responsible for gene synthesis and regulation. In figure 20, Kac’s course of action is explained though the following steps in order to clarify the process:

1. Promoter sequence: starts the protein synthesis.
2. Multiple cloning site: where the necessary additives are combined to start the cloning process of the bacteria.
3. CFS (cyan fluorescence sequence): the area of the plasmid that will allow the cells to glow fluorescent.
4. MCS (multiple cloning site): the site where the *Genesis* gene was added to the plasma.
5. Ampicilin resistance sequence: a part of the plasmid that allows resistance to antibiotics which is needed to replicate the *Genesis* bacteria later on in the process.
6. Origin of replication site: here the strand that has originally been copied is replicated to make more and more of the same proteins, an essential part of the artwork (Kac 2000b).

4.2.2.4 The transformation of DNA into bacteria

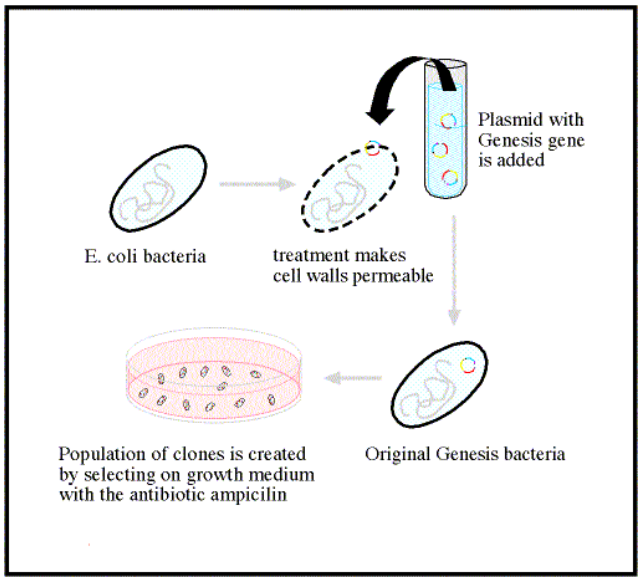

Figure 21: Eduardo Kac, *The transformation of DNA into bacteria* (1999).

Kac (2000b) explains this process:

> The plasmid with the Genesis gene was incorporated into E. coli bacteria. Genesis bacteria have cyan fluorescence and share a petri dish with another colony of E. coli bacteria that have yellow fluorescence but which do not have the Genesis gene. Transgenic bacterial communication evolves as a combination of three visible Scenarios: 1 - Cyan bacteria donate their plasmid to yellow bacteria (and vice-versa), generating green bacteria; 2 - No donation takes place (individual colors are preserved); 3 - Bacteria lose their plasmid altogether (become pale, ochre colored).

4.2.2.5 The new protein: The Artist's gene

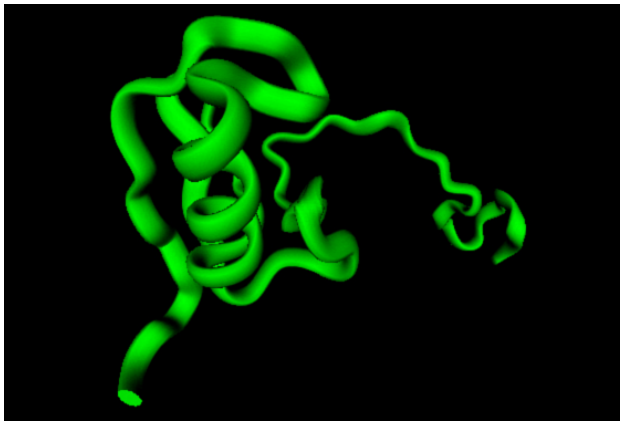

Figure 22: Eduardo Kac, *Genesis protein* (2001).

A new unique bacteria was created as the *Genesis* gene was able to slip into the bacteria by weakening its membrane. The E. Coli bacteria now became unique. This process led to the first *art* protein. Figure 22 is a depiction of the three-dimensional structure of the *Genesis* protein. Protein visualisation was carried out with the assistance of Charles Kazilek and Laura Eggink, BioImaging Laboratory, Arizona State University, Tempe (Kac 2000b).

4.2.2.6 The fluorescent element in the artwork Genesis (1999)

> Two kinds of bacteria are employed in the work: bacteria that have incorporated a plasmid containing ECFP (Enhanced Cyan Fluorescent Protein) and bacteria that have incorporated a plasmid containing EYFP (Enhanced Yellow Fluorescent Protein). ECFP and EYFP are GFP (Green Fluorescent Protein) mutants with altered spectral properties. The ECFP bacteria contain the synthetic gene, while the EYFP bacteria do not. These fluorescent bacteria emit cyan and yellow light when exposed to UV radiation (302 nm). As they make contact with each other plasmid conjugal transfer takes place and we start to see color combinations, possibly giving rise to green bacteria (Kac 2000b).

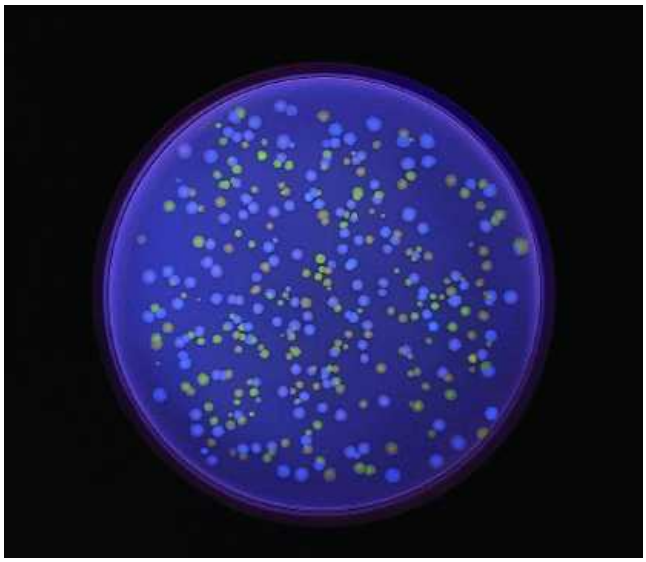

Figure 23: Eduardo Kac, *The fluorescent element in the artwork Genesis* (1999).

The plasmids combined to merge their different DNAs and produce the colours associated with the plasmids that have been engineered (see figure 23).

4.2.2.7 The gallery and the associated website

> The gallery display enables local as well as remote (Web) participants to monitor the evolution of the work. This display consists of a petri dish with the bacteria, a flexible microvideo camera, a UV light box, and a microscope illuminator. This set is connected to a video projector and two networked computers. One computer works as a Web server (streaming live video and audio) and handles remote requests for UV activation (Kac 2000b).

Figure 24 portrays the website where public participation occurred. The website allowed the viewer to control the UV light that influenced the growth and illumination of the bacteria in the petri dish.

> The other computer is responsible for DNA music synthesis. The local video projection shows a larger-than-life image of the bacterial division and interaction seen through the microvideo camera. Remote participants on the Web interfere with the process by turning the UV light on. The fluorescent protein in the bacteria responds to the UV light by emitting visible light (cyan and yellow). The energy impact of the UV light on the bacteria is such that it disrupts the DNA sequence in the plasmid, accelerating the mutation rate (Kac 2000b).

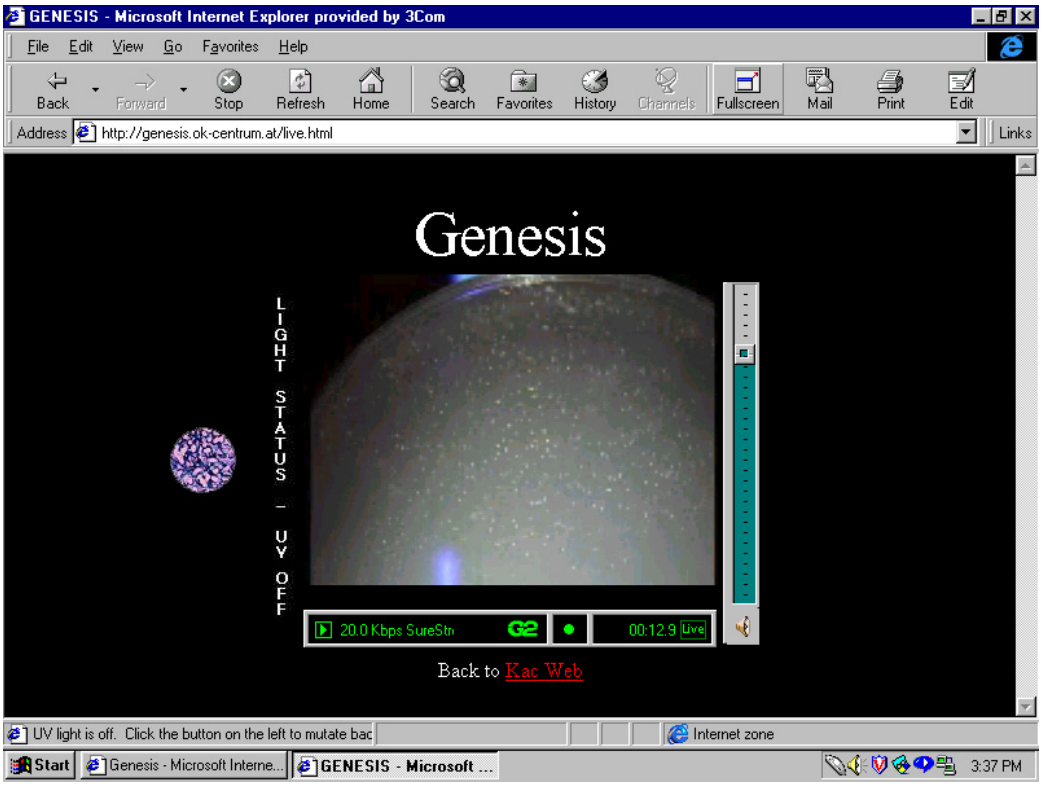

Figure 24: Eduardo Kac, *Screen shot of the Genesis Web Interface* (1999).

4.2.2.8 The effect of the introduced UV light on the strain of bacteria

The bacterial clones underwrite the methodology of the artwork:

> Remote participants on the Web provoke real bacterial mutation in the gallery by turning the UV light on. The energy impact of the UV light on the bacteria is such that it disrupts the DNA sequence in the plasmid, accelerating the mutation rate and changing the original meaning of the biblical passage. A live video and audio stream from the gallery can be accessed online through an interface embedded in the Genesis Web page (Kac 2000b).

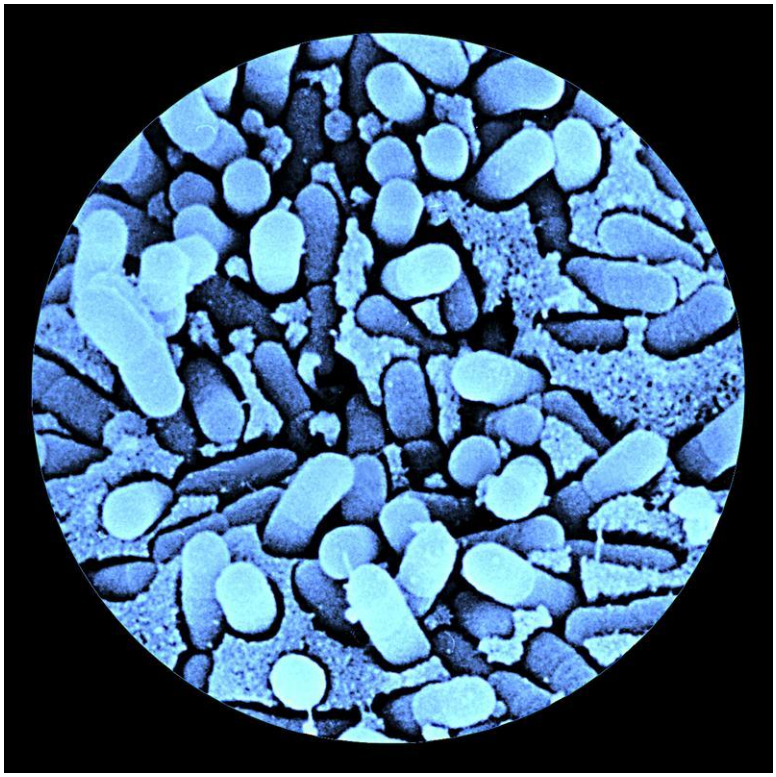

Figure 25: Eduardo Kac, *Electron micrograph* (1999).

The peak of fluorescent light, where it emitted most light, happened when the plasmids were exposed to a certain wave length of light (see figure 25). All light has its own unique wave length. The Genesis bacteria had peak ‘excitement’ and thus brightness at a different level from the non-Genesis bacteria.

4.2.2.9 The display of the petri dish

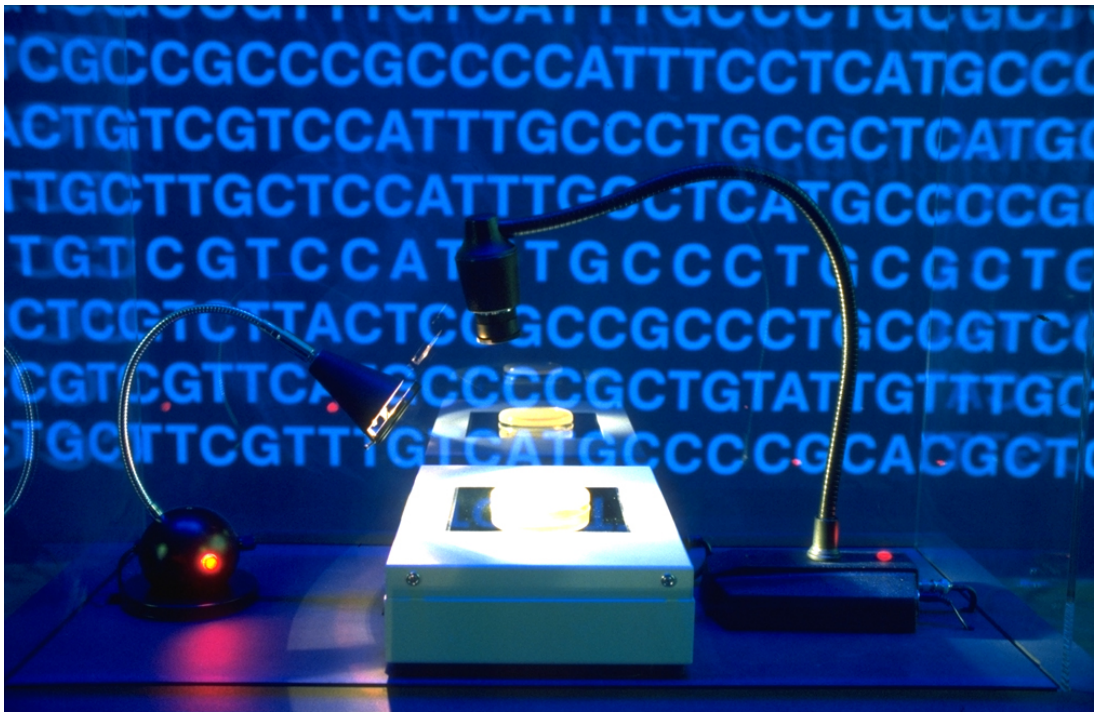

Figure 26: Eduardo Kac, *The display of the petri dish* (1999).

> The gallery display enables local as well as remote (Web) participants to monitor the evolution of the work. This display consists of a Petri dish with the bacteria (center), a flexible microvideo camera (right), a UV light box (center), and a microscope illuminator (left). This set is connected to a video projector and two networked computers. One computer works as a Web server (streaming live video and audio) and handles remote requests for UV activation. The other computer is responsible for DNA music synthesis. The local video projection shows a larger-than-life image of the bacterial division and interaction seen through the microvideo camera. Remote participants on the Web interfere with the process by turning the UV light on (Kac 2000b).

4.2.2.10 The sequence of the mutated Genesis gene

The following image (fig 27) shows the translation process from the gene, into Morse code and back into English. The value behind this translation lies not in the final text presented, but rather in the method of manipulation.

Mutated *Genesis (1999)* gene:

CTCCGCGTACTGCTGTCACCCCGCTGCCCTGCATCC
GTTTGTTGCCGTCGCCGTTTGTCATTTGCCCTGCGC
TCATGCCCCGCACCTCGCCGCCCGCCCCATTTCCTC
ATGCCCCGCACCCGCGCTACTGTCGTCCATTTGCCC
TGCGCTCATGCCCCGCACCTCGTTTGCTTGCTCCAT
TTGCCTCATGCCCCGCACTGCCGCTCACTGTCGTCC
ATTTGCCCTGCGCTCACGCCCTGCGCTCGTCTTACT
CCGCCGCCCTGCCGTCGTTCATGCCCCGCCGTCGTT
CATGCCCCGCTGTACCGTTTGCCCTGCGCCCACCTG
CTACGTTTGTCATGCCCCGCACGCTGCTCGTGCCCC

Translated to Morse code:

.-.. . -/.- .- -./.... .- ...- ./-.. --- -- .. -. .. --- -./--- ...- . .-./- .... ./..-. .. ../---..-./- .... ./... . .-/.- -. -../--- ...- . .-./- .... ./..-. --- .-- .-../--- ..-./- .... ./.- .. .-./.- -. -../--- ...- . .-./. ...- . .-. - .--/.-.. .. ...- .. -. --./- .... .. -. --./- .... .- -/.. --- ...- . .../..- .-/. --- -./- .... ./. .- .-. - ....

Translated back to English:

"LET AAN HAVE DOMINION OVER THE FISH OF THE SEA AND OVER THE FOWL OF THE AIR AND OVER EVERY LIVING THING THAT IOVES UA EON THE EARTH"

Figure 27: Eduardo Kac, *Translation from the mutated gene to English* (1999).

4.3 THE ANALYSIS OF *GENESIS* (1999)

4.3.1 Historical background: The God of classical theism

As its name implies, *Genesis*, the first book of the Bible, traces the origin of the human race and its "…relationship with the divine. It is a story of beginnings; the beginning of the world, of the human race…" (Armstrong 2011:7). The term 'Genesis' is a Greek word meaning 'origin' or 'beginning'. The first word in the Hebrew text, *Bereshith*, means 'in the beginning'. According to Armstrong (2011:7), the authors of the book of *Genesis* were less interested in historical accuracy, "[i]nstead they bring to the reader's attention important truths about the human predicament that still reverberate today". Kac in his artwork *Genesis* (1999) (fig 17) addressed one of these predicaments: what does this mandate about dominion over creation imply and what can be seen as new beginnings? Armstrong (2011:7) states that the book of *Genesis* provides us with a God of a conventional religious worldview: "We find a single God in center stage, the sole source of power and life, totally in control of his creation".

The artwork challenged this control. It did, however, explore the concept of God and His creation. The words were translated into Morse code, manipulated and retranslated back to words. The God in *Genesis*, the scripture, was the "…God of classical theism. The world he created has pattern and meaning" (Armstrong 2011:10). The hierarchical pattern was challenged in the artwork *Genesis* (1999) (fig 17) by illustrating the change in pattern when genetic manipulation was applied. The book *Genesis* separates: day from night, dry land from water, focussing clearly on boundaries because "[e]verything must keep to the place allotted to it and must not transgress its limits" (Armstrong 2011:10). The biotechnological revolution has, however, proven to blur those boundaries. Classifications of specific species are no longer accurate. According to Bec (2007:83), "[t]his bio-logic is formed because the living imposes itself as a material subject that deals with itself, even beyond representation and current artistic and scientific categories". The artwork *Genesis* (1999) (fig 17) seemed to warn the public against a simplistic conception of the divine, and the spectrum of humanity's domain given to him by the divine.

4.3.2 Natural life versus synthetic life

Charles Darwin depicted nature as a material system in which all living things exist in relation to one another (Gessert 2001:16). This material system includes "…humans and all of our creations, from language and ideas to agriculture, technology, and art" (Gessert 2001:16). With relevance to this chapter of the study and to compare natural life with synthetic life, the concept of 'ecological intelligence', a phrase coined by Ian Maccallum, is explored.

The term 'ecology' refers to the "…study of the relations of living organisms to their environment; study of ecosystems; study of the environmental conditions of existence" and the term 'intelligence' refers to the "…capacity to learn from experience, to think in abstract or symbolic terms and to deal effectively with one's environment" (Maccallum 2005:7). The combined concept (ecological intelligence) instructs us to explore our ecological systems by not merely accepting scientific facts, but to explore it from an intellectual point of view.

A collective understanding of ecological systems will allow us to deal effectively with our environment (Maccallum 2005:7). More specifically, ecological intelligence will allow us to revisit the foundations of the dominant order, human beings. According to Gessert (2001:16) the dominant order's,

> economic, legal and social arrangements ignore or downplay ecological relationships—this in spite of widespread public concern, decades of work by conservationists and environmentalists, and overwhelming scientific evidence that human activities are causing a tidal wave of extinctions.

On the other hand, Dawkins (2000) is of opinion that we, as human beings, can attempt stewardship over the earth because "…our brains (admittedly given to us by natural selection for reasons of short-term Darwinian gain) are big enough to see into the future and plot long-term consequences".

This study, by presenting *Genesis* (1999*)* (fig 17) as a platform, asks: if humankind has been proven to be the dominant order, does it have the ability to preserve and protect that which it is dominant over? As we have explored in the previous chapter on *GFP Bunny* (2000) (fig 5), it is the role of society, including scientists and artists,

to protect life (be it natural or synthetic). It is not one or the other, but rather a collective attempt to re-establish humankind's role to protect and preserve life. Hence, Kac, in his quest to define the new authority of the dominant order, might agree with Dawkins' view (2000):

> The human brain … can see across the valley and can plot a course away from extinction and towards distant uplands. Long-term planning—and hence the very possibility of stewardship—is something utterly new on the planet … The future is a new invention in evolution. It is precious, and fragile. We must use all our scientific artifices to protect it.

This means that the scientist becoming artist, or the artist becoming scientist, might be the future stewards of life.

Science has steadily been progressing towards the creation of synthetic life. Humankind has influenced the complexity of the ecological system through the practice of selective breeding and domestication of certain species (Bec 2007:84). Human-guided evolution has therefore led to the increasing complexity of our ecological systems. As explored in the previous chapter, practices of biotechnology and genetic engineering are fundamentally the same as human-guided evolution (be it selective breeding or domestication), through human intervention. The use of new technologies in the information age is a tool of human intervention in all living organisms. This chapter explores the intervention of genetics, the latent map that defines all living organisms. The use of these tools is not limited to the role of the scientist and transgenic artist but society at large is becoming increasingly involved in this ever-evolving branch of applied science.

4.3.3 Translation and manipulation

In the artwork *Genesis* (1999) (fig 17), the viewer was made aware of different and new interpretations of old text. John Barton (1996:5) is of opinion that "[w]e should see our methods as a codification of intuitions about the text which may occur to intelligent readers. Such intuitions can well arrive at the truth". According to Ronald Hendel (2010:4), in reading and interpreting text, we should use multiple methods,

> which diverge and converge in illuminating ways. This is not a lazy eclecticism but rather a methodological pluralism that befits the complex phenomenon that is

> the focus of our investigation: the task of reading *Genesis* in—and for—the modern age.

Seidman (2010:10) expands on how translation complicates text interpretation. It not only "…entails loss of the original, but it is also transformative because it creates new meanings". This refers directly to the theme of the artwork. In *Genesis* (1999) (fig 17), the viewer or participant was moved towards the translation by involving him/her in the process. This process resulted in a different interpretation of the old text, as Seidman (2010:160) says "[t]he world we live in, in many senses, was created in the image of the Bible, just as the Bible is remade in the shape and image of the world that reads it". The intention was that the viewer of the artwork *Genesis* (1999) (fig 17) consider that the task for humankind, "to have dominion over the earth", may hold a different meaning as a result of modern technology. Kac uses a verse from Genesis for a reason:

> More than other documents of antiquity, The Bible continues to hold meaning for contemporary readers, maintaining and often increasing its status as sacred text. Its reception, in other words, is critical to its cultural meaning (Seidman 2010:163).

Kac's work, by involving the viewer in the outcome of the artwork, supports Seidman's view on the "…unpredictable give-and-take … of living conversation" (2010). Willis Barnstone (in Johnston & Kelly 2007:9) is of opinion that the process of translating scriptural text to favour cultural development is an inevitability. The artwork *Genesis* (1999) (fig 17) investigates the question: is a different interpretation of scriptural text inevitable rather than wrong as time and culture progresses? As Seidman (2010:174) says, it might be "…a potentially fruitful feature of human diversity rather than glaring evidence of cosmic disapproval". To illustrate the necessity for adaptation, the Catholic Church, which once vigorously opposed comic depictions of the Bible and even funded public burnings of these comics in the 1940s, later recognised the appeal of this visual form for the younger generation and started publishing its own comics relating to stories from the New Testament (Hajdu 2009). As David Hadju (2009) explains: "For the most part, the idea of Bible comics was to simplify and clean up the text for children, reducing the cryptic sometimes dark poetry of the scripture to juvenilia".

Kac used Morse code, which is symbolic of the dawn of a new age, as a tool to translate the original sentence from scripture. Bioart and biotechnology are part of the dawn of yet another new age. Seidman (2010:175) offers the following two viewpoints on Kac's artwork, *Genesis* (1999) (fig 17): Firstly, "I invited a reading of translation as loss, as a process of moving away from the truth towards something secondary, fallen, and lesser". Seidman (2010:175) also believes that the vision of scriptural text offered "…suggests that the meaning of the Bible is not found in some moment of origin but rather in its movement through time, in its reception by individuals".

4.3.4 The exploration of the interactive space of the internet

The integration of communication and information technologies has caused a paradigm shift in the way that art is produced and received. Citizens of the internet, or 'netizens' (as referred to by Vallverdú 2006:13), have radically influenced the way we communicate. Easy access to multiple sources, the interpretation of information and the redistribution, or rather, re-contextualisation, of information form part of the construction of collective knowledge. This section explores the effects of participation in the realm of interactive art. The fusion of the roles of the artist and the viewer leads to questions of authorship, challenges presented for the participating viewer and the possible transformation of the desired outcome of interactive artworks.

In the case of the artwork *Genesis* (1999) (fig 17), the viewer actively participated in the transformation of a synthetic gene. The viewer (whether aware of the fact or not), implicated himself/herself in the creation of new life (David Hunt 2001). The artwork, *Genesis* (1999) (fig 17), was dependent the viewer's participation, causing the viewer to take on the partial role of artist and the artist to lose his autonomy. Vallverdú (2006:7) refers to this phenomenon as "…the existence of the collective creation of the work of art in electronic environments". Shifting the autonomy of authorship of an artwork created through collective participation raises a concern, expressed by Landi Raubenheimer (2011:35): "When art sacrifices all autonomy and is subsumed into social life, it becomes merely social and indistinguishable from

that which is not art". Bioartist Adam Brown (2013) explains the need for conceptual ownership over his artworks, even when the artworks are executed through a collective practice. It raises the question of whether having only conceptual ownership of an artwork is enough to keep the integrity and role of the artist intact. Contemporary artist Elaine Frances Sturtevant furthers the question of autonomy and authorship of art by repeating other artists' artworks and concepts. "Her work did not center on the pure imitation of an artwork, rather she was more interested in the imaginary space that opens up behind it and thus kindles a critical debate on the surface" (Gräfling & Stemmler 2014). Just like Stutevant's artworks, *Genesis* (1999) (fig 17) is dependent on the relinquishment of autonomy and dependant on the input of others, whether it be physical or to engage with the discussions presented. The actual outcome of public involvement, in exciting the bacteria to react to specific wave lengths of light, is a metaphor for humankind's dominion over natural life. By giving a person the platform to alter the genetic material of bacteria (life), that person becomes an autonomous deity with power over life and death.

In the case of *Genesis* (1999) (fig 17), infinite space, in this case, the internet, replaced traditional sacred spaces and, ironically, has the same characteristics as a sacred space. The internet is unquestionably the largest network that links several billion people on devices worldwide. It carries extensive information and creates platforms for public interaction on an unimaginable level. This interactive cloud in digital space allows for timelessness, is unbounded, measureless, indestructible and eternal. Just as a sacred or religious space can transform through the experience of the holy, the interactive space of *Genesis* (1999) (fig 5) becomes a metaphor for the internet as a tool of transformation.

4.4 *GENESIS* (1999) AND ETHICS

4.4.1 The interactive space: platform for ethical debate

The previous chapter explored the public's perception and acceptance or rejection of the *GFP Bunny* (2000) (fig 5) project which played a critical role in the final outcome of the project. Whereas the previous chapter focused on marketing the

concept of transgenic art through digital media, *Genesis* (1999) (fig 17) magnifies the relationship between society and transgenic art by proving that human interaction can alter the outcome of transgenic artworks and subsequently its meanings and intentions.

In 2011, the artwork *Transport*[65] by British sculptor Anthony Gormley was installed in Canterbury Cathedral in the UK. Reverend Robert Willis (In pursuit of the divine: Religion and Contemporary art 2014) stated that "…it also suggests the way in which sacred spaces communicate a sense of time and eternity of the finite and the infinite". When looking at the serene space that Kac created for the exhibition of *Genesis* (1999) (fig 17), it might well be that he was putting art into a religious space where life can be created by the presence of a deity, in this case, humankind itself.

Sacred spaces such as cathedrals and churches have always been the home for art, even contemporary art that might redefine the traditional perception of a sacred space. One such an example is the artwork by Andres Serrano entitled *Piss Christ* [66] created in 1987. The artwork depicts a photograph of a small crucifix dipped in what appears to be a bath of milk, blood and urine. The artwork commented on the commercialisation of Christ and the artist defended the photograph as "…criticism of the 'billion-dollar Christ-for-profit industry' and a condemnation of those who abuse the teachings of Christ for their own ignoble ends" (Chrisafis 2011). Even though the artist's intention was not blasphemous, it was perceived to be an attack on that which is sacred to those practicing the Christian faith. A media campaign was launched to have the artwork removed but it was eventually attacked by vandals with hammers.

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[65] Anthony Gormley, *Transport*, (2011). Iron nails, 210 cm x 63 cm x 43 cm. Installation view Canterbury Cathedral, Kent, England. (http://www.antonygormley.com/news/item/type/news/id/127#p1)

[66] Andres Serrano, *Piss Christ*, (1987). Cibachrome, silicone, plexiglas, wood frame, 165,1 cm x 114,6 cm. Photograph courtesy of Paula Cooper Gallery, New York, (http://www.artnet.com/usernet/awc/awc_workdetail.asp?aid=424202827&gid=424202827&cid=121254&wid=425106388&page=1)

The interactive web space created by Bionet lets the public explore, debate and learn about the latest discoveries in life sciences and biotechnology. Eight European science centres are involved in the project. The site offers a platform to explore science, look at ethical issues, compare laws and express opinions. In 2012, the Human Fertilisation & Embryology Authority in the UK launched a public debate on its website[67] to encourage the public to debate whether the clinical benefits of an experiment around designer babies will outweigh the moral, ethical and health concerns. The results of this debate helped to inform a decision made by the Health Secretary on whether to legalise 'three parent babies', as the experiment is labelled. This fertility treatment uses DNA material from a third parent to assist in eliminating genetic diseases. The third parent functions as the protector of the new life, exercising the responsibility of dominion over the natural process just like Kac's three-way debate does between the creator, the created and the responsibility towards the creation.

Chair of the HFEA at the time, Professor Lisa Jardine (*HFEA launches public consultation, Medical Frontiers: Debating mitochondria replacement* 2012) stated the following:

> We find ourselves in unchartered territory, balancing the desire to help families have healthy children with the possible impact on the children themselves and wider society … We will use our considerable experience of explaining complicated areas of science and ethics to the public to generate a rich debate that is open to all.

Will tampering with genetics affect a child's sense of identity? At the forefront of unchartered territory, this question was considered in 1999 by the artwork *Genesis* (1999) (fig 17).

4.4.2 Belief systems and contemporary art

Religion influences the art of both Pollock and Mondrian. Pollock, was influenced by Shamanism, "…regularly using its associated state of religious ecstasy in the production of his drippings" (In pursuit of the divine: Religion and Contemporary

[67] For more information see www.hfea.gov.uk

Art 2014). Mondrian used religion "…to consider the metaphysical—touching upon a religious dialogue in doing so" (In pursuit of the divine: Religion and Contemporary Art 2014).

Kac uses art to question religious concepts and ethical beliefs regarding the creation of life. The artwork *Genesis* (1999) (fig 17) explores and considers belief and ethical systems regarding the creation. According to Gerfried Stocker (1999),

> Kac does not attempt to change traditional artistic patters and behavioural schemata, but rather to re-invent them. His strategy for this is to approach the topic with ever new premises from constantly changed perspectives.

The subject matter of the artwork *Genesis* (1999) (fig 17) suggested the re-imagining of belief and ethical systems in alignment with our ecological system by the use of the story of the creation. Genetic engineering was explored at the time as a new system that functioned in contradiction to traditional belief systems. Science, as a new religion, was metaphorically unfolded in Eduardo Kac's artwork.

The artwork *Genesis* (1999) (fig 17) explored transgenic art and genetic engineering as a new system to re-evaluate our position in the dominant order in the technological age. This exploration was deepened by focusing on the role of the transgenic artist and transgenic art as a tool to make the paradigm shift between public enlightenment and actual public involvement. Whereas the previous chapter focused mainly on transgenic art as a tool to open up public debate regarding ethical issues in genetic engineering, the artwork *Genesis* (1999) (fig 17) introduced the possibility of an entirely new ethical and belief system. This alternative ethical system, brought to life through the artwork *Genesis* (1999) (fig 17) that forced public participation, allowed a deeper understanding of society's role in exploring and defining ethical systems as genetic engineering enters the cultural sphere. As explained by Claus Clüver (2010:178),

> [r]ather than explicating or illustrating scientific principles, the *Genesis* (1999) project complicates and obfuscates the extreme simplification of standard molecular biology descriptions of life processes, reinstating social and historical contextualization at the core of the debate.

Kac used new technology of the internet to ignite change, challenging traditional

ways of thinking. The influx of information available on the internet allows access from and to new insights. The widespread assessment of new knowledge in which the internet and media play a major role, contributes to raising questions and to pose challenges to faith communities. Global awareness[68] influences individuals and their ways of thinking, perceiving and interpreting. Today people are enabled to experience and interpret information from around the globe. The access to information opens up choices to reject or adapt traditional and new ways of thinking.

The artwork *Genesis* (1999) (fig 17), being an interactive artwork, became a portal for the viewers to be made aware of technology and how it challenges our ways of thinking. The interaction of the participants with the artwork *Genesis* (1999) (fig 17) amplifies the purpose of the artwork: to determine whether traditional belief systems can retain its relevance in the biotechnological era and how it is challenged through the sometimes incomprehensible array of continuously emerging new bioconcepts.

4.5 CONCLUSION: THE PURPOSE OF THE ARTWORK *GENESIS* (1999)

The artwork *Genesis* (1999) (fig 17) is layered with metaphors, not only because of observable elements such as the title, the scripture or the associations and implications it carried. The public participation involved in the creation and successful execution of the artwork opened a deepened discussion on bioethics. By placing scientific methods within the realm of artistic presentation, Bec (2007:1) asks the following question:

> What are the actual conditions in which the almost-living can become the object of aesthetic categories while the cultural and social context excludes any questioning of its fundamental, ethical, epistemological, and theological values? What conditions are necessary for technological objects of the almost-living to become a part of our reality, beyond virtual special effects?

[68] In the discussion of Eduardo Kac's work, the Internet is considered as the epicentre of increasing global awareness of average individuals through the sites and blogs on political, ethical and social issues that launch themselves into consumers' consciousness. On the one hand, social media create opportunity for wide access to information and can instigate new opinions about a variety of issues; but it must be acknowledged that such information is not necessarily unbiased and agenda-free. However, such debates fall outside of the scope of this dissertation.

The viewers' participation in *Genesis* (1999) (fig 17) formed part of the creation of a synthetic gene. The viewers were involved in the creation of synthetic life. The act of 'playing God' in a new translation of humankind's dominion over nature as referred to in the artwork, shifted from that of the scientist to the viewer. This was the intention of the artist: to show that society needs to become involved in the discussion on bioethics, because it affects all living beings. The installation has been running for 14 years and has been exhibited in various different locations. It is perhaps an attempt by the artist to, once again, continue the conversation, as he does with the constant revival of the *GFP Bunny* (2000) (fig 5) project in his latest exhibitions. The artwork *Genesis* (1999) (fig 17) provides a glimpse of a future way of living and, due to the time duration of the installation, becomes a vehicle to make sense of new concepts, especially when they affect belief systems.

In a recent scientific documentary, *Futurescape*, the adaptation of belief systems and ethical systems was presented. The series took place in the 'near future', with a crowd of people protesting a robot's right to vote. The robot referred to was a genetically and mechanically enhanced human being (see figure 28). The adaptation of belief and ethical systems is not a new phenomenon. During the 1920s, less than one hundred years ago, women were given the right to vote in the United States of American (Woods 2014). As recently as twenty years ago in South Africa, black people were given the right to vote for the first time.

Figures 28: James Woods, Still frame from the documentary *Futurism* (2014).

The artwork *Genesis* (1999) (fig 17) functions as a vehicle to enlighten the public to become involved with discussions about biotechnology and the ethical systems that need to be implemented, especially when the technologies are already being applied to enhance natural beings, whether animal or human or almost-living beings. The technologies that involve the enhancement of intelligence in children or to produce disease free babies by involving the genes of a third parent, are already realistic and can be used as part of the creation and manipulation of natural life. (In January 2015 the UK government voted a go ahead for the three parent baby project, allowing doctors to include the mitochondria of a third female parent in the genetic make-up of a baby to eliminate disease carried by the original mother). The public participation through the manipulation of processes to create and purposefully execute the artwork *Genesis* (1999) (fig 17), becomes a metaphor for the irreversible consequences for our actions. Perhaps as a warning, it once again contributes to the purpose of transgenic artworks such as *Genesis* (1999) (fig 17), allowing participants to discover their importance in the authorship of establishing an integrated ethos for future scenarios.

Such scenarios include the definition of the natural, the identity and placement of the self in the future and the integration of synthetically created beings and surface on platforms presented by artworks such as *Genesis* (1999) (fig 17). “Attempts to reveal the biological, genetic, and biosemiotic roots of culture—though still diffuse—are forcing societies to re-evaluate their cultural foundations” (Bec 2007:84). Kac (2007a:173) states that “…we must continue to consider life to be a complex system at the crossroads between belief systems, economic principles, legal parameters, political directives, scientific laws, and cultural constructs”. Knowledge of the impact of biotechnology will enable the viewer to take part in the collective discussion for much needed bioethical systems. Fortunately, communication technologies such as the internet make a space for a collective discussion. The purpose of transgenic artworks such as *Genesis* (1999) (fig 17) is therefore to present us with relevant questions for these discussions. Finally, as a global society, we could produce a new versatile global language that asks and hopefully answers underlying ethical questions presented in the transgenic artwork *Genesis* (1999) (fig 17).

CHAPTER 5: CONCLUSION

> Knowledge cannot be unlearned, so the best way to oppose the villains is to have lots of heroes on your side (And man made life 2010:11)

Because knowledge can never be unlearned, there is no turning back from genetically engineered life in art. As discussed in the study, transgenic artists are at the forefront of artistic movements, so the question must be asked whether their work has a meaningful purpose today. The study concludes that transgenic artists create platforms for discussion and enlightenment so that guidelines can be put in place to ensure that both the villains and the heroes in the field of biotechnology, the artists and the scientists, behave responsibly. This responsibility should manifest as a set of international rules, legislation brought about in a democratic manner which implies a universal code of ethics brought about by public engagement. To leave this responsibility to the artist or scientist, philosopher or lawmaker alone would be an unrealistic approach to achieve a well-rounded code of ethics.

The section on bioethics was approached by researching an overview of ethics from the Ancient World (700 BCE - 250CE) to contemporary philosophy (1950 – present), in order to establish what can best be explained as ‘harmful practises’. The in-depth research on ethics, and ultimately, bioethics, led me to the conclusion that society has an active role to play in these fields. This will allow the public to acquire a balanced view on these matters. Knowledge and continuous critical discourse will always be the strongest vehicle to ensure that harmful and distasteful practises are discouraged. Transgenic art is ‘watchdog’ art. It informs the public about the possibilities of scientific development and, more importantly, it gives meaning to this information by connecting it to ethics, philosophy and aesthetics.

As mentioned in section 2.4.2.2 in the literature review, Pre-modern art functioned as a facilitator and a reflector of the ethos of the people of that time. “Art was a comprehensive source of enculturation in the sense that it very frequently engaged the whole person … (one’s senses, emotions, desires, and pleasures)” (Carroll 2008:90). In the eighteenth century, as modernisation was unfolding, art attempted an autonomous stand, insulating itself from other social initiatives that tried to make

inroads into its very purpose. Utility and political significance are examples of these social initiatives (Carroll 2008:92). The autonomy of art remains but the question of whether art needs to be ethical, is still an open debate. Art, in whatever form it took, has always been a strong vehicle for social commentary. Perhaps the strongest motivational influence for art to occupy the position of social critic would be the issue of government funding. To practice transgenic art is expensive, and it may involve other parties such as scientific laboratories, collaborations and sponsors. To refer to the debate of whether art should be ethical, the autonomy of transgenic art is already challenged when it is financed because sponsors or institutions may be held liable for unethical practices. This agrees with the opinion of Carroll (2008:100) that social criticism is the "…one thing that art should do. That is one way in which the art world needs to reclaim its connection to ethics". Carroll (2008:100) makes a strong point for the artist to bring forth positive works which society can see as worthwhile guides and "…ways of making sense of their lives".

My research also led me to the conclusion that it is not merely good, but essential, that synthetic biology progresses, despite the trial and error of the process. This process, in any case, has been the subject of imagination long before it came into existence which gives one a sense that synthetic biology has undergone its own organic growth process. One such a literary work that used this concept is Mary Shelley's *Frankenstein* that is mentioned briefly in the introductory chapter:

> In the end there was no castle, no thunderstorm and definitely no hunchbacked cackling lab assistant. Nevertheless, Craig Venter, Hamilton Smith and their colleagues have done for real what Mary Shelley merely imagined. On May 20th, in the pages of *Science*, they announced that they had created a living creature (And man made life 2010:11).

The study recognises the many positive outcomes of genetic engineering, among them are predictive medicine, views on health and the prevention of suffering. If the transgenic artist plays a role in informing the public on these possible outcomes, transgenic art serves a purpose.

Chapter 3 explains how Kac robs biotechnology of its pragmatic function and re-contextualises it as art. The study shows that, however much Kac wanted the GFP

bunny to lead a natural life, the concept of ‘natural’ is challenged at its core. The chapter concludes with the issues that arise from manipulating life. The emotional impact on society when the fluorescent rabbit’s life was compromised, is a precursor to the need for proper planning, legislation, and also the blurred boundaries of the authorship of artworks.

Authorship in transgenic art, as it evolves in the study, concerns knowledge of production and ownership. In an environment of created life, copies, clones, and digital abundance, where everything is commodified, the issue of origin and value is debatable. At the heart of the Kac’s *GFP Bunny* (2000) (fig 5) lies the question of legitimate ownership of manipulated life. The work of contemporary artist Sturtevant that challenges the autonomy of art, has, at its core, the notion that society has a collective responsibility to contribute to a common knowledge bank, and to make this available to the public. This is exactly the debate that Kac proposes. Whereas traditional art takes the podium and authorship, transgenic artists, by surrendering authorship, take the platform to allow debate and discussion. For transgenic artists, like Kac, authorship had to be shared with the scientific team he worked with, which eventually caused the rabbit’s premature death. The study demonstrates Kac’s desire to integrate and nurture the transgenic animal as any other pet, and shows how the outcome could not be predicted.

In *Genesis* (1999) (fig 17), the authorship was shared with the public through their participation in the mutation of the new gene. The artist did this intentionally, because the public’s participation in the translation and subsequent mutation of the gene showed the need to establish bioethical rules and legislation where new scientific and technological territories are concerned. This study introduced a perspective of translation as part of the process of the artwork to show the need for the public to be able to adapt to an ever-changing world. Chapter 4 also addressed the adaptation of belief systems as a result of paradigm shifts.

This study portrays how the artwork *Genesis* (1999) (fig 17) in its complexity and multi-layeredness succeeds in its purpose. It addresses many cutting-edge issues like ‘playing God’, the adaptation of belief systems, public involvement in translating

these belief systems and the challenges that the religious concept of humankind's dominion over the earth bring. Kac wants this artwork to force society to re-evaluate its cultural foundations.

By making the public conscious of its power to alter life, Kac makes it aware of the necessity to take responsibility and to control its own destiny when it comes to gene manipulation. Subtly he portrays the message that the power to establish boundaries is also the hands of the public.

Both of Kac's artworks discussed are a plea from the artist to enter into conversation so that consensus can be established between humans and synthetic beings. Transgenic art projects should be investigated to clarify their agenda,

> to help honestly evaluate the effects of such experiments and art endeavours on those other humans, part-humans, posthumans, and nonhumans with whom we cohabitate and whom we will increasingly seek to perfect and control (Becker 2000:47).

There is no question that transgenic art can, and is, shaping public consciousness about genetics and reproductive technologies. If Edward Steichen's art of flower breeding in 1936 was viewed by himself as useful because it was meeting people's needs, how much more can the transgenic artist be useful in promoting useful practises of genetic engineering?

Catts (2004), on the other hand, looks at where art should not go. It is made clear that the artist's research is not always conducted in a scientific way, but is often developed and executed as a cultural action. Whether the transgenic artist questions the scientific profession's sovereignty over these practises, or whether this results in an imaginative 'fools rush in where angels fear to tread' approach, needs to be seen. This perspective addresses one of the objectives of this study which is to determine if unconventional methods of art-making relate to the purpose of the artwork because,

> we find ourselves in an area where actions are eminently provocative and potentially dangerous. We don't see how we can allow artists to proceed with experiments that are forbidden to scientists …Yet freedom of the imagination sometimes receives a surprising exemption from the social responsibility process (Michaud 2007:392).

As a result of research in bioengineering, biomatter is easier to manipulate, therefore "…life is becoming a new palette for artists, designers, hobbyists and amateurs" (Catts 2004:6). It may be that traditional art has exploded in boredom (Flusser 2007:372).

However, the practice of transgenic art poses certain real dangerous questions. Are we blurring the lines between species by creating transgenic combinations? What are the long-term effects on the environment when transgenic beings are released? What ethical, social and legal controls or reviews should be placed on such research? These are recommended for further research in the field of transgenic art.

The very recent occurrence of the terror attack on January 7 2015 on the offices of Charlie Hebdo, the satirical magazine in Paris, provided food for thought on the artist's right to freedom of expression because it was an attack on artists. It raised questions on the artist's right to lampoon what others may find sacred. This connects strongly to the section of the study that discussed the notion of sacredness and society's view thereof. In a way, transgenic artists do question the sacredness of life but are also themselves also interrogated by those who have different views. How transgenic artists interact with what society perceives as sacred is a matter for further study. To question whether art must be ethical led me to the opinion that although transgenic art cannot (and must not) be prescriptive in terms of ethics, its function in society is to become a 'thinking tool' for people to engage with.

For the practical component of this study, a conscious decision was made not to apply the method of transgenic art but rather to work with traditional imaging, not as a point of view of anti-science as much as pro-humanities. This decision was made after a critical analysis of existing scholarship regarding the regulation of transgenic art practices. In South Africa, there is a lack of guidance when it comes to manipulating life as a medium for art. I want to re-awaken the consciousness of individuality of all living beings, in essence, to show that this can be reached with non-bioart. The practical component produces simulacra, specious imitations of possibilities in the form of portraits and animations in dialogue. Because of the impact this study made on me by enlarging my respect for life, I decided to create

portraits of a selection of great apes, specifically of the *Pan troglodytes*, also known as the chimpanzee. Portraiture is historically and traditionally reserved for human beings for various reasons, such as to signal social prominence, record events and preserve individual and collective memory. By placing the chimpanzee persons in portraits they are represented as and given a status of individuals. However, these portraits do not display power or significance of their status, but are rather the conveyers of disempowerment and vulnerability of nonhuman persons whom we made dependant on our experimental resources and technological might. There is also a reason for the incompleteness of these chimpanzee portraits and its off-centre placement in the negative space of the background of these portraits. These portraits are unorthodox experiments, unfinished projects, which reflect the creator's responsibility towards what he/she has created. The incompleteness portrays absence instead of quintessence, no absolute embodiment of anything but the sadness and suffering of animals used in research experiments.

The concept of my practical work emerged through the research of this study. The seriousness of the matter became a reality to me when I was deciding whether to apply scientific methods to my own artworks. I realised that it is one thing to research the matter, but when actual application and manipulation of life emerged as an option, I consciously decided not to pursue transgenic art for the practical component of this study. Without this study on ethical issues that could arise from transgenic art practices, I would probably have been very willing and eager to be an apprentice of Eduardo Kac, but this research has equipped me with a platform to make my own informed decisions. The responsibility as creator is placed at the centre of my conceptual and visual choices.

I appreciate the innovative and exciting avenues that transgenic art offers, but believe that protective boundaries against practices of transgression should be in place. If this is addressed in future, I would consider exploring avenues to hopefully make a worthy contribution. This study recognises the innovations in the transgenic artworks of Eduardo Kac, but, more importantly, acknowledges the importance of opening up a discussion on ethical issues that inevitably derive from the adventurous and dangerous power of practicing transgenic art.

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