SPECIAL LECTURE

THE INTERMITTENCIES OF LIFE: AN ANALYSIS OF LONGEVITY IN TALES OF BIOTECHNOLOGY[I]

"La finitude de l'homme se profile sous la forme paradoxal de l'indefini"
(Foucault, Les mots et les choses p. 325)

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ABSTRACT

Stem cells are fundamental devices of biomedical practice based on the notion that the body is able to supply the medication necessary to prolong life. Consequently, the concept of biotechnological autonomy is formulated, which is important for our analysis of longevity, an analogy to the analysis of finiteness. In this paper, discourses were evaluated in which these practices are interpreted as "technologies of hope" or "of longevity", stem cells being the means by which the biosciences promise to postpone death and control various diseases. We have sought to show how a mentality of aging and decrepitude is being overcome by the idea of longevity, forged by technologies that aim to recover the embryonic atavism of rebirth.

RESUMO

Células-tronco são artefatos fundamentais à prática biomédica apoiados na noção de que o corpo pode suprir a medicação necessária ao prolongamento da vida. Consequentemente, o conceito de autonomia biotecnológica é formulado, se mostrando importante à análise da longevidade, que é também uma analogia à análise da finitude. Neste artigo, foram avaliados discursos nos quais essas práticas são interpretadas como "tecnologias de esperança" ou "de longevidade", em que células-tronco se configuram nos meios através dos quais as ciências biológicas prometem adiar a morte e controlar diversas doenças. Procurou-se mostrar como a mentalidade do envelhecimento e decrepitude está sendo suplantada pela ideia de longevidade forjada em tecnologias que objetivam recuperar o atavismo embriônico do renascimento.

(I) This is the English translation of the book chapter "As Intermitências da Vida: uma analítica da 'longevidade' em histórias da biotecnologia", previously published in Portuguese in 2008 by EDUFBA in the book Cultura, Saúde e Tecnologias Médicas em Perspectiva Antropológica, organized by the anthropologist Carlos Alberto Caroso Soares. This secondary publication was autorized by EDUFBA.

Submitted on 07/12/2016 and accepted for publication on 08/15/2016
DOI: 10.17267/2317-3386bjmhh.v4i3.1047

It was New Year's Eve and following tradition, many people were getting ready for the party, while others did not expect the new day to dawn. While no doubt babies were born to the joy of some, the relatives of the dying prepared themselves for the wake, tears and lamentations. However, an inexplicable phenomenon suddenly altered the natural order of things, changing habits and making grief something of the past. By some strange whim of fate, the Grim Reaper silently disappeared, leaving life hanging by a thread and the country in complete turmoil. The obstacles caused by this intermittency are narrated by Saramago[1]. From one moment to the next, all the inhabitants lose their right to die. Diseases, murders, accidents and suicides are no longer able to end life. Even individuals considered incurable by the doctors, those for whom all hope of living was already lost, are surprised by the extension and renovation of their existence. Ironically, as the pages turn, we read of mankind's dream of immortality as if we were looking into a reverse mirror inasmuch as dying becomes the obsession of the inhabitants of that place. Those who would revolt against the precepts of this involuntary immortality and attain eternal life in death would need to cross frontiers, seek respite in other shores. Before long, enticers appear offering illicit crossings. Nevertheless, those in charge of population planning and control were unable to hide their perplexity at the potentially unstable balance: without death, the country would suffer a severe population explosion over the next few generations, as well as environmental problems, and crises in the work force and in social security. Therefore, the comforting dream of achieving an eternal, healthy life here on Earth began to turn into a nightmare. Without the threats of evil and the fear of disease; if pain and suffering are now to be mere memories and if accidents no longer seek drunks driving their vehicles at high speed; then the jobs carried out by those who spend their lives concerned with death are condemned to inutility. Funeral directors, drug manufacturers and pharmacies, insurance salespersons, doctors, healers, blessers, the Minister of Health, religious leaders and the relevant social institutions all become obsolete. The archbishop fears that religion will disappear altogether, since when death left, it took heaven and hell away with it. With no souls to pray for or to send on their way, with no fear of hell and no desire for heaven, Catholicism will be no match for unbridled hedonism. The Prime Minister tries to save the nation, looking for a new manner in which to "take care of the citizens". Ironically, death has to be brought back for the country to be put back on the tracks of history; death is an essential player that allows us to understand ourselves as people, and to plan and conduct our lives. And what about the scientists, biologists, geneticists and laboratory scientists and their revolutionary discoveries? Better send them off to another country; who knows, perhaps there they will continue to wage war against disease, suffering and death as they have done since time immemorial. We will not give you any clues as to how the book ends so as not to spoil the pleasure of those interested in the story that we have used here as a torch to illuminate something irremediably mortal in our lives. The paraphrase merely summarizes the way in which the story alters the usual interpretation of science by analyzing finitude: eternal life, rather than sudden death, becomes the greatest fear, a problem for which a solution has to be found.

If immortality is a chimera or even a nightmare, longevity constitutes the coming-to-be of the undefined to which Foucault refers. In this text, we analyze longevity by means of an analogy to an analysis of finitude[2] at the frontier of the so-called life sciences, particularly biotechnology in order to acquire a better understanding of its situation in contemporary society[3].

The term biotechnology covers various domains: bioengineering of food, new drug development, organ transplant, medical patents, and biotechnology capital and values. Therefore, any analysis of "biotechnology" in contemporary society is always incomplete given the diversity of the different disciplinary practices that range from farming to stem cell research involving human embryos. For this reason, we will not analyze the practices themselves that involve the technology of living substances[4], but rather as a metaphor for longevity within a conceptual dimension.

The Intermittencies of Life

A recent story taken from biomedicine bears a resemblance to Saramago's fictitious tale. It has nothing to do with fiction but refers to someone who was born two years before the birth of the Portuguese writer. Henrietta Pleasant was born in a

town in Virginia, USA in 1920. She died of cervical cancer in 1951 at 31 years of age after adopting the surname of her husband, David Lacks, with whom she had five children. Her death occurred in the Johns Hopkins Hospital in Baltimore; her burial in an unmarked grave belonging to the Lacks family in Lackstown[5]. She lived at a time when there was no legislation regulating the use of organs and tissues removed from individuals undergoing medical treatment. For this reason, cells from the tumor that took her last breath were removed without her and her family knowledge. The case became known worldwide as the first successful culture of human genetic material, stimulating the improvement of in vitro techniques already documented at the beginning of the 20th century.[6:59,7]

Henrietta Lacks could not have imagined becoming the first line of human cells "immortalized" by science and christened with an acronym of her name, HeLa[6:128]; nor would she have imagined contributing towards the modern concept of regenerative medicine. She would have been unable to imagine the debates surrounding the ethics and regulation of the manipulation of human genetic material, a discussion that is very far from being irrelevant. A woman who had never travelled to unfamiliar places had replicas of her cells distributed among laboratories all over the world as a result of their currently inexhaustible capacity for multiplication. This posthumous "diaspora" was motivated by the initial interest of scientists in understanding cancer cell reproduction in order to develop new drugs to inhibit the process. This cell line was also widely used in vaccine research in the 1950s. In the mid-1970s, allegations were made with respect to other cell lines that had been contaminated by HeLa as a result of inappropriate manipulation; HeLa colonized experiments in laboratories all over the world. There is no need to describe the turmoil caused by this scandal[5,6:168-70,178]. In 1981, Anderson et al.[8] announced that they had successfully mapped human mitochondrial DNA from a cell composite of placental tissue and HeLa[8,9], thereby creating new horizons for understanding population genetics.

Lacks' death was also arrested in documentaries, newspaper articles and scientific papers[9,10]. The study of HeLa(s) extrapolated interest in science to render it synonymous with knowledge on cell life, offering answers to cytology. The HeLa line gained autonomy; it socialized, escaped the confines of the laboratory. History created precedents for disputes over other immortalized lines[11]. Symbolically, through these histories, the cell turned into an individual, autonomous by virtue of the "complete life" of the individual. Later, we will see some narratives on HeLa systematized by Landecker[6]. From these, we will extract elements for our analysis of longevity within the interface between death and **immortalization** – the term preferred to immortality since it is derived from the verb immortalize and gives an idea of **action** in order to achieve, in this case to achieve the immortality desired for living, self-aware substances. As a noun, immortalization is immediately associated with its antonym, the condition of mortality. In this sense, it is associated with a fixed state, a still-life, a monument, something that may only be conceived as a social memory. Immortalization, on the other hand, is a process, a transition, an attempt, a yearning, a project, a goal or a discourse. HeLa illustrates the last point well, since stating that something is immortal is tantamount to claiming to know for how long it will continue to multiply itself. Moreover, it is difficult to affirm that an exponentially replicated fistful of cells removed from the tumor of an individual is indeed that person, based solely on the common genetic code. At any rate, the discussion is stimulating for our analysis on longevity and we will return to it later in this manuscript.

Some years after the death of Lacks, Canguilhem published "La Connaissance de la Vie", a compilation of articles dedicated to the analysis of the "universal relationship between human knowledge and the living organization"[12:14]. One of the chapters deals with the cell theory. We do not know whether Canguilhem was aware of the HeLa story, but it is a good example of the relationships that he was attempting to establish: "the cell is a notion that is sometimes anatomical and sometimes functional, [...] such as elementary material and individual, partial and subordinate work. Affective and social values of cooperation and association lurk more or less discreetly in the background of the developing cell theory"[12:61]. HeLA story is as an example to illustrate the fascination and fear that exist with respect to lives in/of the laboratory and how commonly used language has become infiltrated with scientific words and descriptions. Any person with a few years of schooling is able to understand the word "cell", for example, as representing a fraction of a human

being and a means by which individuality can be recognized[13].

From 1998 onwards, a class of cells has grown in popularity in the media: stem cells. In the field of research into new drugs, they are fundamental for the development of "regenerative medicine"[14-16]. They gained particular attention after appearing to be potentially therapeutic for degenerative and incurable diseases such as Alzheimer's, Parkinson's, diabetes, scleroses, etc., thereby giving greater visibility to more biotechnology-related subjects that had hitherto remained hidden in the recesses of the laboratories. In this paper, we discuss longevity using the debates around stem cell research to improve understanding of the position of this scientific character, so highly celebrated in contemporary society and seen by many as a panacea for almost all ills. As social scientists, we are interested in the politicizing of the concepts of life and death in the light of the category "hope" as part of contemporary sociality based on the consideration of questions born of social practices in the form of discourse[17-19].

The private life of the body as a spectacle of science

Research in regenerative medicine gained prominence within biotechnology in general from the 1990s onwards, propelled by the results of the genome project and by the idea that the body itself was able to supply the medication it required[20,21], attracting scientific research previously dedicated to other sectors[22-24]. Biochemical pharmacology began to assist regenerative medicine, altering hierarchies and lines of investment[25]. Previously, studies in genetics described morphological, anatomical and cytological characteristics of diseases, providing information for the development of new drugs. For regenerative medicine, on the other hand, genetic research seeks the potentially selfregenerating mechanisms of the cells themselves to put them into operation. The grafted stem cells are programmed to copy the genetic code of the organ to be repaired, generating cells identical to those that existed prior to the disease or lesion. It is as if the grafts waken the memories of the sick cells, obliging them to return to the time before their degeneration; a kind of "journey into the past" to reprogram the future.

The story of Henrietta Lacks reminds us of these relationships between the different branches of stem cell research because these studies and the studies on cancer share the characteristic of self-reproduction that may be discovered and therapeutically controlled[26] - with one difference: only cancerous cells reproduce themselves "indefinitely"[6:167].

Linguistic expressions such as "they may help", "they may cure" and "they have the potential to treat" are found in scientific papers: "human embryonic stem cells have so far justified the hopes that they had raised"[27:5]. Science's discourse is inscribed under the prism of promise, hope, quality of life, longevity and refinement. Stem cells may be a means of "attenuating physical and psychic pain, preventing disease, improving health and perfecting performance"[28]. Within this perspective, they have surpassed the concept of a drug and become social objects since they permit us to glimpse human life within the context of contemporary social mentality. They are a form of "liminal lives"[29], i.e. life that selftransforms procedurally. Liminality is a human condition from embryo until death. If it is a challenge for science to transform this limit in a distant event, then stem cells represent this "technology of hope"[30,31] or "technology of longevity"[32-34] by which death from disease may be delayed. Nevertheless, if it is impossible to be immortal or to selfrenovate ad infinitum, as the HeLa cells may have supposedly revealed, it is viable to extend life. Therefore, the discussions surrounding stem cell research may be interpreted as technologies of hope in an analysis on longevity, since they measure finiteness and eternity/immortality.

Toward an anthropology of hope

In Greek mythology, hope remained hidden in the box opened by Pandora in obedience to the determinations of Zeus, who was obsessed with punishing mankind with a terrible fate, full of tragedies, disease, unhappiness and, finally, death. Pandora is also associated with childbirth, fertility, resurrection and longevity[35-37]. Analogously, childbirth is related to legacy and to memory, hence to hope and to dreams, raw material for projects, according to Heidegger[38], our primordial existential condition. Pandora was the first human being created by the gods, and she was blessed with

many qualities including seduction and beauty, and many flaws, among them the deceiving powers of seduction and beauty. While disease spread from her box, her womb gave birth to life. In this sense, legacy, memory and longevity are attained in this virtual immortality. Pandora is birth, death, disease, suffering; she is longevity but **not aging**. Amidst so many associations, this disassociation stands out. How can the long-lived outdistance the old? In contemporary biomedicine, it becomes possible by the promised capacity for selfrenovation. According to Brown[30,39] "discourses of hope in modern biomedicine, as much as in religious eschatology, are tied into what represents a meaningful response to death and dying. Central to the semantics of hope is the cultural apprehension and negotiation of mortality itself"[30:22]. We have added a pinch of Heidegger[38] with respect to the hope-project-tedium relationship: if the project is hope, tedium is capitulation. In the philosophical analysis of biotechnologies, hope and expectation are registered in the semantic field of the project, therefore belonging to life, whereas risk and uncertainty belong within the signature of death or, at least, of frustration[40].

In an analysis of discussions among individuals with Parkinson's disease or their relatives, Leibing[41] presents discursive strategies according to which the risk associated with experimental treatments is submitted to the hope of achieving a cure or, at least, an improvement. The incurability of a disease leads to positive interpretations of risk and uncertainty, potentiating them as a function of hope. If, in addition to being incurable, the disease is degenerative, this evaluation increases and is based on the lack of choice of those receiving a discouraging prognosis, those expressing themselves as "considered hopeless by the doctors", i.e. there is nothing more to lose. If the illusion of remaining hope is a form of protection, disillusionment is despair. In an extreme situation in which there is no choice and nothing to lose, the risks are underestimated as a result of the individual's desire for any treatment, encouragement or life expectation. This may be the basis for "therapeutic misconception", which we will discuss later.

Brown[30,42] proposes to evaluate the phenomenon of hyper-expectation that has built up around hope, with the new cell therapies as a backdrop. He emphasizes the role of the media in the production of this "hype for hope". The texts of scientific publications translate "laboratory life" for the general public based on a language of films and adventure: the slow, precarious development, the wasted efforts, the negative results and the undesirable side effects are generally transmuted in the advances that cause hope to be reborn for millions of individuals in need of sophisticated treatments in the website of the McGill University, there are good examples of this narrative style[43]. Hope is, therefore, the "prima donna" under the spotlights, whereas uncertainty, anguish, frustration and failure are played out behind the scenes. For this reason, investigators should be rigorously vigilant with respect to the publication of scientific data, limiting information that could allow hope to be understood as merchandise and the substance of discussions containing the promise of immortality, not as dystopia but as quality of life intrinsic to longevity, a seductive combination for societies regulated by the ethics of individual achievement and personal recognition. When poor prognosis corresponds to disillusionment, hope is the last to die, tending to reappear as merchandise listed in a futures market[44]; including research financial issues. Although the media and the scientists themselves are brokers of these biotechnological stocks and shares, this relationship cannot be understood simplistically[14-16,45-47].

The metaphors in the media reveal other filigrees of this discussion. In an article found on a website belonging to a research institute[48], stem cells were compared to the joker, the most flexible character in the deck of cards, since it may be used in place of any card, always adapting itself to the combinations required by the game. It is easy to imagine this analogy stimulating the dreams and desires of those suffering from uncurable diseases or whose treatments are of little effect, expensive or physically unbearable. Unfortunately, the current status of clinical trials highlights another peculiarity of the joker in card games such as gin-rummy: the card saves the player in a situation of crisis, but "spoils" the game when it corresponds to a suit that is different from that of the hand or when it is of the same suit but the cards are above the number eight. Grafts carried out with stem cells, just as a joker in a hand of gin-rummy, are fairly adaptive, but ironically may represent a risk for the development of tumors. Investigating "the practical problems and potentialities" of human embryonic stem cells

consists exactly in recognizing this liminality[27]. Stem cells are compliant, which is both an advantage and an onus that imposes limits on the idea of finding the cure for endogenous diseases within the human body. Therefore, if the investigators publish the risks involved in experiments with stem cells, they will place the procedure under suspicion. Consequently, there is perhaps a non-explicit agreement in scientific circles and in the media for trials to be presented in a positive way so as to avoid affecting the trust of society, the importance of the subject and investments in research.

It is equally necessary to resolve the ethical issues related to the social questions[49,50]. However, it is not our intention here to deal with all the aspects of the scientific data and technical applications produced with respect to stem cells up to the present time. Principally, we are interested in those categories of debate related to research in order to learn more about its gravitational field and the social mentalities attracted to its orbit, the intensity of the debates and the condensed rhetoric surrounding its multiple practices. Debates have been stimulated by oft exaggerated beliefs, criticisms or hopes; they attract a great flow of financial capital to themselves[51]; therefore, they constitute a relevant sociopolitical issue.

Long life for HeLa: Chronicles of a glorious death

"when the unwanted guest arrives […]perhaps
I might be afraid…"
Manuel Bandeira, A Light Supper.

"No one achieves glory without suffering"[52]. With these words, Miguel do Matão summarized the long story of his life and suffering as a religious leader of a house of Afro-Brazilian worship in a small town in Bahia. Glory is a reward, social recognition for sacrifice. The reader who is interested in the subject will be aware that this is a recurrent theme in narratives of martyrs of varying lineage. The glorious deed is made public by an exalted and compassionate narrator. Memory is a narrative act; it battles against forgetting the name, the exploit, the biography. We will not generalize the suffering-glory relationship in narratives of suffering as a form of spiritual elevation or social recognition, since there are other, more gratifying and narcissistic ways for a person to become famous. However, glory depends on peer recognition, on the speeches of chroniclers, narrators, analysts, investigators. The record elevates the personal fact to the condition of social monument, something noteworthy, an oral, written or visual reinterpretation throughout time, fundamental elements for the comprehension of longevity[53].

In this section, we will take the points raised in the narratives on Henrietta Lacks as related in two chapters written by Landecker[6:1] in a book dedicated to "the story of twentiethcentury ideas and practices of plasticity and the temporality of living things [...] [and] how novel biotechnical subjects such as eternally proliferating cell lines affect concepts of individuality, *immortality*, and hybridity". The life-death-immortality of Henrietta Lacks consistently interests us through the "immortalization" of HeLa with respect to the conceptual relationships chosen by the author to confer senses to her way of reading and interpreting historical facts and the respective debates. Her narrative clips memorable events and events of global repercussion from the history of the cell. She mounts her exhibition based on objects collected in such disciplinary fields as virology, embryology, cancerology and assisted reproduction within the context of North American laboratories. For example, she summarizes the scientific battles waged on behalf of the poliomyelitis vaccine in the first half of the 20th century. The chapter culminates with the success of George Gey and his team in cultivating and distributing HeLa lines in the Johns Hopkins Hospital in Baltimore.

Information on Lack's life is punctiliously presented at the beginning of this manuscript and, with respect to the HeLa line, it is sufficient to say for the moment that it was crucial for the eradication of poliomyelitis, since it permitted the vaccine to be tested on a large scale, and was much cheaper than other experiments and more effective since it was genetically compatible with human beings[6:136-37]. Speed of reproduction and low maintenance costs are two advantages of this line whose diaspora reached 600,000 cultures in the first 21 months of mass replication[6:136]. As a secondary effect of the vaccine, a new branch of commerce and services was developed: the production and distribution of

laboratory material, a forerunner of "biotechnology capital"[44] and "economy of tissues"[54,55]. A long life for HeLa…

Our interest intermingles with that of Landecker in these questions: what does HeLa's "immortality" represent? Why was genetic material "personified"? How did the woman's identity become subordinated to that of the cancer cells that took her life? Let us proceed to the narratives…

First: samples of cervical cancer taken from a woman's body reproduce themselves and have revolutionized post-war scientific concepts and practices.

Secondly: a housewife was transformed in a heroine of biomedicine in the 1950s, contributing to the future eradication of poliomyelitis. HeLa has been a character in various fields of study ranging from biochemistry to radiotherapy and astronomy[6:165].

Third: HeLa almost turned into a plague, contaminating experiments in laboratories all around the world, starting at the beginning of her diaspora in the 1950s[6:168].

Fourth: in the 1960s HeLa was an Afro-American woman exploited by white scientists. The synthesis between her racial history and the contamination produced a sub-plot of dangerous miscegenation[6:169].

Fifth: in the 1970s HeLa was autonomous, refractory to scientific control. Between the lines, these "indefatigable", "voracious", highly plastic and adaptable cells are also "promiscuous"[6:171].

Sixth: in the 1980s, neither HeLa nor her family received any financial benefits or the equivalent social recognition for their contributions to science. This story serves as the framework for a discussion on individual rights and genetic patrimony. Welcome to the era of professional biotechnology capital.

As she describes them, Landecker is uncomfortable with the personification of HeLa instead of Henrietta Lacks. For her, it is a question of "keeping the singularity of one (person) and the multiplicity of the many (cells) together in the same image to grasp the new technical possibilities for the mass reproduction of cells and their distribution in space and time"[6:177]. From our viewpoint, this is an approximation between a scientific object and the desire for long life, particularly because, according to Landecker, scientists and lay-persons personify her. Irrespective of contextual and pragmatic feelings, perhaps the persistent, humanized image attributed to the "immortalized" cells reveals our envy of HeLa: autonomous, fascinating, famous, controversial, longevous and constantly selfrenovating; the likelihood, self-recognition or desire that HeLa will provide some kind of elixir of life. In this case, the metonymic relationship between HeLa and Henrietta Lacks constitutes a powerful metaphor for longevity, fully capable of giving birth to or strengthening the myth[56] of the boundless possibility of self-regeneration or a return to the eternity enjoyed by mankind prior to its separation from the gods; times in which death, labor and physical deterioration were unknown and life was almost idyllic. If HeLa is human and potentially immortal, then there is a light at the end of the tunnel to distance us from the dead, and the personification would be an ideal backdrop for stem cell research.

Why, then, did the name Henrietta Lacks remain a secret for so long. Let us consider the story. Everything occurred as if a life had been consciously sacrificed. A woman ironically becomes a heroine because of her executioner. Her suffering was rewarded by the glory of her cells, which revolutionized medicine. The cancer that destroyed her life interrupted death and freed millions of children all over the world from paralysis. Here, HeLa gains autonomy and swallows up the individual, Henrietta Lacks. In this type of story, Henrietta Lacks is doubly immortal: immortalized in the replicas of her abnormal cells, while equally crystallized in the echoing narratives. Firstly, identity fragmented in HeLas spread all over the world; then, the unit that is Henrietta Lacks is artificially reconstituted in the projection of her body mass[57], calculated at 400 times its original value, if it were possible to add all the samples and exclude "all kind of heterogeneous descendents of the first biopsy tissue"[6:177] and chemical substances used for culture and preservation.

Let us remember the difference between immortality and immortalization. To say that HeLas are potentially immortal because they were submitted to conservation and multiplication does not mean to say that they are, in fact, immortal cells. It is necessary to add the notion of eternity, since it corresponds to the

lack of temporality only with respect to the end. As a caricature, the story of Henrietta Lacks may be quite linear and ordinary: she was born; she grew up; she reproduced; she died. A well-defined beginning and end lead to an analysis of finiteness. However, intermediated by technology, the cells, reproduced and conserved until the present time, suppress linearity: Lacks died and reproduces, reproduces, reproduces… From the linear of life to the spiral of death, she makes herself eternal. Impossible to be eternal? Be "eternal while it lasts". The condition of being eternal reduces the turmoil of the double suspension of the duration of life and of death. In her millions of samples, Henrietta, or rather HeLa, is eternal in her fragmentation. In the metaphor on "immortality", the cells swallow up the woman by their plurality as if they were fitting lives for a biography; Henrietta is singular, just as is death; an inevitable enunciation of our finiteness. As we get closer to HeLa, the utopia, we try to distance ourselves from Henrietta, our undefined certainty. As long as we are unaware that our "time has come", our desire is to extend our life. Like the millions of samples? Not quite, at least as a force, a potentiality, because "force has become the modern representation of being. Being permitted itself to be defined as a calculable force, and mankind […] by being hidden under this representation of force, defines itself as a quantifiable power"[58:59]. Here, the potentiality of the cell is extended to the individual; from the potential of multiplication (Derrida's quantifiable dimension) to the potentiality of existential realization before Foucault's "undefined". Only in this way perhaps do we fail to be afraid when the Bandeira's "unwanted guest" appears before us.

Henrietta Lacks, or rather HeLa… For years, the name of the "sacrifice" was kept secret. For many, an ethical requirement of research; for Derrida[58], a requirement of the ethics of sacrifice, the ambivalence between secret and responsibilization. In "Donner la Mort", he talks of the secrecy surrounding the name of the donor as representing generosity, infinite love and goodness with respect to the beneficiary of that donation. In this case, to die for the other is to impose on the "survivor" the responsibility for this death/life donated without meaning to die instead of the other, since death is a singular phenomenon. The conscience of death humanizes us and makes us responsible for our existence, since only "a mortal is responsible"[58:64]. This explains why the acronym HeLa, and not the human name, has persisted. If a human life was sacrificed for humanity, then we would all be tributaries of this generosity that obliges us to reciprocity. However, for the image to prevail in an unlimited and nonspecific set of cells, our responsibility for the sacrifice and obligation with respect to the "mort donnée" disappear together with the character of Henrietta[55]. This may be the reason why there was no financial reward for the Lacks family, not only because HeLa was never patented and without patents it is difficult to establish an economical value[6:172] in line with the benefits obtained from the donation, but because of the difficulty in accepting the involuntary sacrifice without feeling responsible.

It may be easier to assimilate the image of a pile of cells than to accept a transubstantiated body. To transfer the identity of Henrietta to infinitely multiplied cells would be almost to fabricate consecrated Hosts representing the sacrificed body of the founder of Christianity. By accepting the Host, the devout Catholic accepts guilt for the death of Christ. However, by extending our tongues to receive the droplets of an anti-polio vaccine, for example, or any other benefit made possible by HeLa, these autonomous and impersonal cells, we feel no guilt for the death of Henrietta.

HeLa and genetically modified identities

The story is also fascinating by its omnipresence. It stimulates the imagination with respect to a breath of life after the last breath. For the dualist religious traditions, while the body rests under the soil "in wait for the Resurrection, the soul is at the mercy of the celestial joys or the punishments of hell"[59:287]. HeLa is neither in heaven nor in hell; neither in limbo nor in purgatory. HeLa is in the laboratories around the world, hard at work. Therefore, to consider the paths walked by HeLa satisfies our curiosity with respect to the unit Henrietta, symbolically extendable to the human race. A kind of life after death.

Is it possible, however, to maintain the unit, the identity, between HeLa and Henrietta, the individual, her social experiences, her biography? How can we overcome the temporal discontinuity between the individual and the cell? Let us consider cells cultivated in a laboratory and used in transplants. When

they are separated from the original body and as they await transplantation, between collection and cultivation, the cells gain autonomy; and there is an obligatory legislation to support these relationships between the biologically possible and the socially acceptable. Serving as markers of limits, there are, for example, the concepts of biocompatibility between the donor and the receiver and brain death that are fundamental for medical and legal decisions within the context of organ transplant[19,60-62].

Stem cell transplants are based on a mimesis. The graft should "imitate" or "copy" the genetic identity of the receptor and "learn" to live pacifically at the new address, reducing the risk of rejection. However, this learning is not evident; in some cases, rejection may occur years after a transplant and stem cell grafts may induce the appearance of cancer or autoimmune diseases. Gallagher and Forest[63] found twice as many occurrences of cancer among individuals who had been submitted to cell therapy for some types of leukemia. When the graft exceeds the limits of what is expected and for what it has been programmed, the cell is seen as a "rebel" with respect to the available technology. A result of defective "learning"? No-one knows. Lack of control? Perhaps cells that are both autonomous and differentiable cannot be controlled. Between the differentiation that is desired and the changes that must be avoided there is a long path to walk. Perhaps that is the origin of the long-lasting fascination with HeLa: its metamorphosis, its insubordination.

However, this is not the only problem encountered with the "learning" of the cells. In a clinical trial that is planned to be carried out soon in the Baylor College of Medicine, Texas, Brenner et al. will attempt to combat the side effects of an allogeneic stem cell transplant for Fanconi anemia. This consists in a problem known as "graft versus host disease", a term that describes the attack on the different tissues of the receptor body by the grafted cells: *"when the new stem cells (graft) recognize that the body tissues of the patient (host) are different from those of the donor. When this happens, cells in the graft may attack the host organs, primarily the skin, the liver and the intestines"*(II). Ironically, the body does not reject the foreign cells but the graft becomes a "colonizer", forcibly taking over the territory and physically and politically rendering the previously existing population, treating them as an enemy to be confronted and overthrown.

Improvement in the techniques of autotransplant using autologous cells would resolve the problem of rejection and the debate with respect to the use of human embryos in research, since only "ethically cleansed" material would be used[64]. On the other hand, it would not eliminate the risk of cancer or of little-known medical conditions, particularly autoimmune pathologies, nor would it resolve other problems related to clinical trials, such as *"therapeutic misconception"*, the common tendency among volunteers of clinical trials who often fail to fully comprehend the risks of aggravating their disease, since they are unable to differentiate between a research study and clinical treatment[65,66].

These two situations show that "hype for hope" needs to make way for "hype for prudence". However, attention is called to the contribution of social scientists to the "hype" that they intend to criticize. The literature on Science and Technology Studies (STS) offers examples of when the potential of recent technologies to modify social mentalities is exaggerated, forgetting the primacy of society over technology. The entrails of the human body exposed by technological apparatus have contributed towards changing the definitions of what is normal and what is pathological, expanding the limits of comprehension of the body in time and in space. What was once scatological awakens new curiosity and, with time, may become natural[67-70]. The circulation and popularization of biomedical knowledge transforms evaluations of commonly associated risks and calculations into definitions of health and disease.

But is Webster[40] correct in asking "have medical technology and health been dramatically transformed through the advent of more complex science and technique?" The phenomenon does not appear to be new or exclusive to our time. If we follow Foucault[71], we may trace this interference back at least until the 19th century when statistical methods began to be used to virtually aggregate masses of

(II) Study ID Numbers: H9938; MAFIA, last updated: April 9, 2007. Record first received: April 8, 2003. ClinicalTrials.gov Identifier: CT00058565. Food and Drug Administration. ClinicalTrials.gov processed this record on July 25, 2007.

individuals into biopolitical taxonomies[72]. Therefore, any technique or practice may be considered "technology" and may interfere in individual lives or populations in varying scales. Technology does not, in this case, oppose or threaten social dynamics, neither is it an exterior force inflicted on society. A contemporary of Foucault, Gilbert Simondon[73] argues something similar using two different approaches. For him, technological versus social opposition subordinates the latter to the former and is the result of incomprehension incessantly reproduced by a certain humanism founded in the notions of human authenticity and singularity. We add another opposition: technological versus natural, and curiously the social realm is incorporated into the natural. And so a new expression of biotechnological power[74] begins to be understood as a difference that has become natural. In this way, we understand why authors such as Franklin[23], Waldby[57] and Webster[40] interpret technology as an almost autonomous and supreme reality with respect to the social realm. In some cases, it is a threat; in others, it radically alters the supposed natural capacity of the social realm to self-organize. A contradictory interpretation? A question of theoretical referential? Any criticism of the rhetoric of hope must admit the excessive optimism that exists with respect to the therapeutic applications of research, since to attribute the power of social transformation to stem cells without them having been widely applied is, at the very least, to overestimate their importance. Fascination for the subject of study…

Both Foucault and Simondon, on the other hand, consider the "technique" to be a social practice, almost an art; know-how, interconnecting it with technological achievements. Unlike Franklin[23], we are able to imagine life before Dolly, but not before technique, which began with the first intentionally-made tools in distant times in regions of Africa. Discussions renewing the nature versus culture dichotomy also appear out of place. The latter would be in favor of technology or the radical transformation of nature, while the former would encompass the social realm. In "The Birth of the Clinic", Foucault exposes clinical practice as a form of organizing or regulating the social realm. Likewise, the development of psychiatry is related to sanitary administration. For Rose[75], a similar interpretation may be extended to psychology, a normative discipline of individual and social behavior. The so-called last-generation psychiatric drugs have served to emulate new forms of individuality in a, let's say, post-psychotherapy era. However, this does not mean founding new individuals or a new society; on the contrary, they merely represent new forms of mediation or devices of control.

Psychoanalysis and anti-depressives were the materialization of "care of self" in the psychosocial perspective. Regenerative medicine, i.e. based on a body that reprograms itself and is able to provide the means to regenerate itself, glimpses another "care of self", "biotechnological autonomy"; sociopolitical and psychological autonomy, rational choice and responsible behavior and the biological resources of the individual his/herself. Longevity would be the reward, minimizing the decadence of coming to be. Therefore, new forms of "self-government" return to other phenomenological dimensions of the body: "the soma, [...] the flesh, the organs, the tissues, the cells, the gene sequences, and molecular corporeality", affect our "understanding and managing ourselves as human beings"[76:105] by modifying the intervention between social institutions and the body without radical reformulation of the finalities. For this, expressions such as "life *now* appears to be open to shaping and reshaping"[77:315] or "life was different after Dolly in both its social and biological senses…"[23:105] sound exaggerated coming from social scientists who intend to criticize "hype for hope".

Longevity and stem cells: biotechnological merchandise

Among the marvels of HeLa that have already been mentioned – her ability to eradicate diseases and to generate controversies and debates including immortality as a metaphor for our analysis on longevity – is the establishment of the provision of services for scientific research; or how genetic material came to feature on the stock market. In vitro life offered a new perspective to global economy. Cooper[33] formulated a Marxist analysis on biotechnological value based on the relationship between the scarcity of natural resources, the paucity of new drugs and the aging of the population as a result of the fall in birth rates as emergency conditions for stem cell research and the consequent financial speculation.

Subject to market fluctuations, biotechnology capital enters the speculation game inherent to capitalism. To analyze biopolitics, Foucault[72] considers mankind-health relationships as ways of accumulating vitality, phenomena coextensive to capitalist production. If we extend this analysis to our subject, the cell will be the materialization of this vitality to be recovered. Longevity marks the cells-social order continuum and the biotechnological values emerge as economically important merchandise, since regenerating means to live longer and better.

A parallel between the capacity of the body to regenerate itself with stem cell grafts and the work force in the capitalist production regime permits this concept of greater worth to be extended to the production of biotechnological values. This transformation from a work force supported in the body as a whole to another based on cell life is evidence of the new means of exploitation of "human resources": the plasticity and the capacity of regeneration are the future of humans between pontentiality and merchandise.

Unfortunately, when health becomes merchandise it generates a rather dangerous "hype for hope". The economic vitality of the current pharmaceutical and biotechnological industries on the stock market are proof of the ambivalence attached to the promotion of novelties or alleged scientific revolutions involving stem cells. Perhaps the scientists turn a blind eye to the dangers of this "hype", since medical matters considered a priority in public health attract research and financial resources[22,23,44,78]. From a sociopolitical point of view, countries such as China, Brazil and India have invested in research of this nature to guarantee access to these technologies and to escape the dominium of the biotechnology companies of rich countries, owners of the majority of the patents of genetic therapies that have already been produced[79,80]. Political objectives guide scientific decisions, a lesson learned from the dispute on generic drugs for the treatment of AIDS[81-84].

Finally, let us return to the aging of the population. Those who would like to have an idea of the seriousness of the issue should read Saramago[1]; you will find the prime-minister in despair at the calamity in the eventide homes chock-a-block with the elderly demanding "more and more people to take care of them [...], *a gigantic mass of the elderly up there, always growing, swallowing the new generations like a python*". Surely, "it is the worst nightmare that a human being could ever have dreamed of [..] rather death than that fate"[1:34]. If the promise of regenerated bodies was fulfilled by genetically compatible material, aging would no longer be a problem from the social and personal points of view. Death would not be intermittent, but potentially facultative. Therefore, recharging the vital energy of an individual would benefit his/her productive capacity without threatening the coming generations. This would already justify the massive investment in research that promises to minimize this social cataclysm. Without doubt, the aging of the population represents a significant impact on the economy; a brilliant analysis by Cooper[33]; however, she limits herself to the "infrastructure". We must look for other nuances. According to the individual perspective, to become old is to walk in the direction of the "unknown", leaving behind us the earthly paradise we have helped construct; a motive for anguish and fear of the "unwanted guest". Stem cell research would represent this struggle between the patient spatula that restores the picture frame and the painting and the Grim Reaper from whom we are unable to escape. These cells would be a surgeon's scalpel that would give the freshness of new fruit back to mature bodies. The equilibrium of the population balance, permitting individuals to work longer and live healthier, would be a secondary gain to the practical awareness of a hedonistic ideal that could not be underestimated. We are beings destined for death, as Heidegger said, but aging is the intermittency of undesired, slow, relentless, universal life.

We are not innocent or blind when faced with the greed of the pharmaceutical and biotechnology industries; the race of scientists for prestige and recognition; the interest of governments in maintaining their states in order and working well at a low cost. These are pragmatic motivations for whoever is directly involved in the laboratories, in the industry, in the stock market, in the financial institutions or research regulatory agencies. However, attention must be paid to the individuals in the "real world", the sick, their families, any one of us, mere mortals with no suicidal tendencies, to understand why a story such as that of HeLa comprises part of the biomedical imagination of our society; why

many couples freeze their embryos, donate any remaining ones to research; why others preserve the umbilical cord blood of their newborn infants for any extreme therapeutic requirement, although they hope never to need it[85]. In a more humanist point of view, biotechnological values are attempts to stop time through their amplification. However, long life is still a rare and even an uncomfortable phenomenon, particularly for those who end their days in "eventide homes". However, if dying is a nightmare, longevity is synonymous of decadence and perhaps for this very reason even "death [...] knows not what to say when faced with that greatest of human pains"[1:132].

Longevity and hope: The battle for life and the path to death

"Do not forget, Mr. Prime-Minister, outside the borders of our country people continue to die quite normally, and this is a good sign. A matter of point of view, Sir, perhaps out there we are considered an oasis, a garden, a new paradise. Or as hell, if they are intelligent" (José Saramago, The Intermittencies of Death).

How can we understand longevity in the midst of these intermittencies of life and death in just one blow? Let us rest our eyes from science, from our time. Let us travel to remote islands, distant times. Arriving at ancient Greece, let us seek details of the history of the Trojan War in the version related by Vernant[86].

As Vernant said....this war began when Helen, daughter of Zeus and Leda, decided to run away with Paris, her lover, prince of Troy, son of Priam and Hecuba. Her inconsolable husband, Menelaus, succeeded in mobilizing the warriors of Greece, always ready for combat. For some, war was the warriors' reason for living; for others, an imposition of the gods to contain the increase in the population of men after the separation of men from gods; for many the antithesis of aging. A warrior does not age; he dies and becomes eternal; he attains glory through his suffering. Long life without glory is not authentic; it does not correspond to the way in which a warrior expects to end his days. To die in combat is an ideal of historical and social longevity. To die of old age is to die of boredom and be condemned to oblivion. Longevity, as a consequence of the brevity of existence, is increased by the notoriety of actions. Ironically, a long life without glory becomes suspended, frozen and intermittent; the risk of a glorious death is seductive to the youths who go to war. Longevity without achievement is a life penalized by decrepitude, of going forth into decadence and negative memory, recorded dishonor. On the other hand, those who confront the risk of suffering in the name of another deserve social esteem and reciprocity in the name of sacrifice, this being the underlying reason for the men's oath to the one chosen by Helen.

However, this was no ordinary war, no dispute for territory or power. It was motivated by a king's honor stained by a woman who had promised him descendents, but who had presented him with death in the form of war. Ever since Pandora, the female figure has been associated with birth, but also with destruction, disease and tragedy[87]. We have already mentioned the association of Pandora with longevity (through her descendents), but not with aging; when men go to war they fulfill the plans of the gods as long as they multiply themselves in the womb of a woman. This creation of Zeus was born of clay to definitely mark mankind's mortality, the mark of their humanity. Death is, therefore, part of the analytics of differentiation. Without it, we would be condemned to limbo, to the unclassifiable. Death permits the physical discontinuity between men and the gods, favoring the phenomenological bodily unit of the former[86].

The Trojan War allows us to understand the relationship between a womb that gives life and a vessel that confers death, vessel here metaphorically associated with funeral urns. Men born from Pandora's womb/box are condemned to eternal youth because of the womb of another woman, Helen, a mixture of god and mortal. This female figure of death would render another paper. For a moment, let us consider the personification of such a female figure in Helen for having condemned men to war; in the monstrous feminine representation of Medusa with her paralyzing eye; in Pandora, who brought death in her box and life in her womb; and in the unmistakable woman "with all her shapes, attributes and characteristics" of Saramago's book[1:134]. It is forgivable to doubt; death must really be a woman[88]. She gives life but she also takes it away. An incessantly interchanging role. Pandora is death because she brought birth. Saramago's

intermittent death gives life because it interrupts itself temporarily. Medusa's eye is mortal because it petrifies; a form of freezing, suspended time[89]. Those who glimpse it die but cannot be buried; they are transformed into statues. In this state of crystallization, they become living memories since they are visible and touchable, as a monument. Death imposed by Medusa extends life from death in a static longevity to be appreciated by later generations. The distinction of the dead is manifested in the eyes of others. In this sense, the death of Henrietta Lack; the unbridled replication of her cells; the repetitive and changeable retelling of the tales; are exchanges of glances with Medusa. Irrespective of the meaning of the individual narratives, the freezing of HeLa permitted the ascension of an Afro-American housewife to the pantheon of the most significant myths of the history of contemporary science. Just as if she were a statue, she has become a reference and has conquered the reverence of all who observe her.

If we continue to accept this association between womanhood, longevity and death, the story of Helen has an aggravating factor: it involves a descendent of Zeus. Perhaps for this reason, when the war against Troy was announced, even the most astute among the experienced warriors, Ulysses, and the fastest and bravest of the younger ones, Achilles, tried to lay down their arms even before they took them up. The first cheated by pretending to be mad and was discovered by Nestor when he threatened to throw Telemachus over a cliff. The second hid himself among individuals of the opposite sex, but was discovered by the garments and body ornaments exhibited by Ulysses to attract the attention of the real women on the island of Skyros, the place where Peleus, the father of Achilles tried to keep his androgynous and still beardless son hidden. Let us linger on the story of Achilles. Son of the goddess Thetis, he was a hybrid between a human and an immortal. His body was armored in the waters of the Stynx, "the infernal river that separates the living from the dead", the bath of life and death that "reveals to us the conscience of human existence, limited, separated, divided [...] a drama in which light and shadows, happiness and pain, life and death are indissolubly mixed"[36:112]. Achilles had to choose: to live the ephemeralness of life in its plenitude or immortality through a glorious death; or to reject his place in the pantheon of heroes for a long life without achievement.

Memory is the intervention in the drama between undignified longevity and youth interrupted by a brutal death "in a civilization of honor in which each one is identified in life with their own fame and will continue to exist if it is imperishable, instead of disappearing into the anonymity of oblivion"[87:506]. The story does not end in the Iliad. Achilles goes to war and falls in battle; his victorious companions return home across the seas. Ulysses is on his way to Ithaca. He has to be skillful and knowledgeable to overcome the obstacles and find Penelope, his son and his homeland again[36]. One passage is of particular interest: after leaving the island of Circes he is taken to Hades by the oracle of the prophet Tiresias, where he finds the repentant Achilles again[36:130-1]. The experience of death and the gloomy Hades has taught Achilles to appreciate the value of the long, ordinary life of a farm laborer, which no longer seemed shameful compared to the brevity and sacrifice of the hero.

Since we have assumed that longevity is associated with hope, then we should consider the story of Penelope, the character in the Odyssey. As she waited for Ulysses to return, she wove a shroud to keep her suitors away and to pass the time. The garment took life during the day but found death at nightfall in the same hands that had woven it. Its fragile existence was linked to hope, the passage of time in the shape of a ball of yarn; a beautiful metaphor for hope in the context of "regenerative medicine". Stem cells, for example, may be considered a form of "self-made human being", a person who (re)weaves his own shroud each morning. This "self-made human being" is one who, as well as governing him/herself psychologically, politically and socially, resorts to his/her potential for genetic regeneration. If we continue with linguistic explorations in English, by changing one letter stem cells become step cells. Step may mean a stage, phase, pace or something that takes the place of something else. A good synthesis for the concept of regenerative medicine in the light of the idea of longevity: we repair, substitute as the path becomes longer; life extends itself; the mission becomes accomplished by the shrouds, fabrics in the form of projects that keep us distant from death.

To transform cells in medical technology is to try to resolve the paradox of decadent natural longevity, of the autophagy of the body itself and the incessant

consumption of vital energy. Biotechnological longevity is, therefore, to look Medusa in the eye, to prolong existence without turning to stone, and to extend Penelope's shroud without unraveling it.

The intermittencies of the text

The expression "stem cell" is translated into French as "cellule souche", which is the equivalent of "source cells". Let us concentrate on this image of the cells as a source at which beings may renew life in a derivation of the sense of hope. By semantic extension, following the discovery of this source, animal life rejects its own limits, offering some consolation for the "undefined" of the epigraph on the first page of this text.

For those who suffer from chronic, incurable or degenerative diseases, cell therapy represents the hope of increasing the limits of the duration of life. Consequently, those who do not suffer from any of these ills may also take advantage of these biotechnological "advances", who knows, enjoy a little more of what life has to offer[31,39]. So, are we prepared to live longer? Is it possible to imagine a happier and less anguished future? Will these "conquests" be universal and available to all human beings?

Some narratives on biotechnology, such as those of HeLa, rats with human ears, hybrid pigs or cows with our DNA, make us imagine a world full of absurdities[90-93]. It is almost the equivalent of dystopia or horror fiction, a branch of literature constituted more systematically after the 19th century[94,95]. Where the frontiers between life and fantasy are blurred, we see horror fiction appear together with a decline in religious authority with respect to the human body[2,96]. Mary Shelley's "Frankenstein" and Stevenson's "The Strange Case of Dr. Jekyll and Mr. Hyde" are testimony to the surprise and social stupefaction to the biomedical naturalization of life and death[97-102]; a good context in which to understand the mentality through which biotechnology may offer new ways of overcoming pessimism in a disenchanted world[103]. By offering rational versions on the origin, trajectory and end of the human being, the history of biotechnology creates stories so fantastic as to be almost true.

Within the pages of 19th century British literature, we find a painting hidden in a cellar; it is covered with a thick black cloth. We remove the covering. We are surprised to find the image of an old man of almost monstrous appearance. Frightened, we rush away. We close the door and climb quickly up the steps. In the corridor, we bump into a young man who seems quite perturbed; he says he wants to die because he can no longer bear the weight of all these years. We look at his handsome face and the similarity to the image in the painting in the cellar. We conclude that the two are related, but the young man tells us that he is, in truth, the same person. He then tells us his story. We learn of the drama of Dorian Gray, a famous character born in the imagination of the dandy Wilde. His dream of living eternally young and handsome while the painting grew older became a nightmare, since he had seen and lived too much; because of the excessive memories.

Unequivocally, the biosciences, of which the branch of biotechnology is currently fairly strong, have won battles against death and the tragedies that have escaped from Pandora's box. However, care must be taken to ensure that these victories in technology do not produce existential nightmares, as they did for Dorian Gray, or social and political domination, as in Saramago's book.

Tired of the complaints of the humans against its implacable activity that spared not nobles, statesmen or millionaires, death offered them a truce. By laying down the scythe, the Grim Reaper intended to "offer these human beings [...] a small example of what to them would be to live for ever, that is, eternally". Nevertheless, given the lamentable result of the experience from the moral, philosophical and social points of view, the gorgeous lady returned "the supreme fear to the hearts of men"[1:105,106], and everything returned to normal in that remote country. Life was put back on its natural course, that is, the course of death. In the words of the Prime-Minister, "if we do not go back to dying, we will have no future"? In addition to regulating the population balance, if we personify death as we did with respect to HeLa, we will see the Grim Reaper as the only omnipresent and omnipotent being, regulator of morals "because if human beings did not die, everything would then be permitted"[1:38]. Without it,

we would not be eternal or immortal, a privilege of the immaterial gods, but condemned to inhumanity[86]. How to escape from this impasse and continue to die, preserving our humanity for future terms, but avoiding the sorrows of a long and decrepit life? Let us look at the reply of Victor Frankenstein, the chemistry student who invented the creature that meddled with his own identity:

> "Under the guidance of my new preceptors I entered with the greatest diligence into the search of the philosopher's stone and the elixir of life; but the latter soon obtained my undivided attention. Wealth was an inferior object, but what glory would attend the discovery if I could banish disease from the human frame and render man invulnerable to any but a violent death!" (in Mary Shelly's Frankenstein, italics added).

This passage highlights the story of biotechnology in the last two centuries: mediation between these two intermittencies, life and death, based on the promise of less frightening and fearful longevity. In these pages we have sought to show how a mentality of aging and decrepitude is being overcome by the idea of longevity forged by technologies that recover the embryonic atavism of rebirth.

ACKNOWLEDGEMENTS

All the authors and the possible readers of this text are tributaries of these advances. For example, we belong to the poliomyelitis and variola-free generation, to name but two of the many intermittencies of death, disease and suffering.

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