Cloning: The Human as Created Co-Creator?
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Certain events settle themselves in the collective memory of humankind where they keep functioning for decades as points of reference for future generations. The announcement of the successful cloning of Dolly was such an event. Every one of us will remember this thought-provoking occasion or will, at least, be confronted with the extended media coverage of this breakthrough in medical science. Immediately, world leaders reacted and the question was raised how long it would take before the shepherd was cloned. More important is the sequel to this medical breakthrough: the successful Dolly experiment led to the possibility of human embryonic and adult stem cell research. In 2000, the Pontifical Academy for Life took a position on this additional and innovative research.

At the same time, understanding these technological innovations takes a lot of time as a result of the immense scientific complexity of these new technologies. In this article, we want to clarify the technological possibilities as well as the moral, theological and ethical issues involved. To some, it seems that humans usurped the Divine Creator's place and, by doing this, crossed a border. To others, this medical breakthrough is in line with previous reproductive technological innovations (the birth of Louisa Brown, the first test-tube baby was for some already one step too far but this has not compromised the proliferation of in vitro fertilization).

1. A terminological clarification

Some terminological clarifications could help us to focus on this subject. Cloning refers to a clone, from the Greek word for twig, and by extension, cutting and graft. In science it originally referred to a neutered animal or plant. In the current setting, the word 'clone' is used to specify a genetically identical copy of a gene, a molecule, a cell, a plant or an animal. 'Cloning' refers to, if applied to an organism, the production of one individual or a group of individuals that share a number of genes identical to the genes of the organism that lie at the basis of the reproduction. The production of completely identical organisms is an everyday practice in plant breeding where the cloned organisms are commonly referred to as 'varieties' rather than clones. The reproduction of numerous important plant varieties is carried out starting from small cuttings of other plants. In zoology, this form of reproduction occurs only to minimally evolved species. In the case of vertebrates, the occurrence of identical twins is a spontaneous form of cloning. Monozygotic twins come into being by embryo splitting during one of the earliest phases of development. Because they originate from one zygote that resulted from the fertilization of one ovum by one sperm cell, monozygotic twins are identical. Nevertheless, they differ from their parents.

Molecular cloning refers to a routine technique in molecular biology that consists of cloning the molecular basis of heredity, the DNA. DNA fragments are copied and amplified in a host organism, usually a bacterium. This technique has led to the production of such important medicines as insulin, growth hormones, erythropoietin (necessary to treat anaemia associated with dialysis for kidney disease) or tissue plasminogen activator (tPa) to dissolve clots after a heart attack. In cellular cloning copies are made of cells derived from the soma, or body, by growing these cells in culture in a laboratory. The genetic makeup of the resulting cloned cells, called a cell line, is identical to that of the original cell.
This too, is a highly reliable procedure, which is also used to test and sometimes to produce new medicines, such as those listed above.

It is also important to keep in mind that there is usually a distinction drawn between reproductive cloning and therapeutic cloning (although this is not completely correct; see below).

1.1.1 Cloning by blastomere separation

Cells of an embryo created by means of ‘old-fashioned’ sexual reproduction — i.e., the fusion of an ovum with a sperm cell — are separated from each other in the 2 to 8 cell stage. Each cell, called a blastomere in this early phase, is able to produce a new individual since blastomeres are considered totipotent. The embryos and organisms thus produced are identical to each other though not identical to the donors of the gametes, i.e., the parents. At the October 1993 congress of the American Fertility Association, an attempt to produce human twins by means of blastomere separation was presented. Even then, one dreamed of cloning human beings.

1.1.2. Cloning by somatic cell nuclear transfer

Cloning by means of somatic cell nuclear transfer (SCNT) consists of replacing the ovum's haploid nucleus with a diploid one coming from a differentiated somatic cell, originating from a child or an adult individual. With this type of cloning, there is only one genetic parent, i.e., the donor of the nucleus. The experimental process, which led to the birth of Dolly, can briefly be described as follows. First, cell cultures were derived from the mammary gland of an adult sheep. They starved the donor cell line by removing all nutrients from the medium prior to nuclear transfer. Under these starvation conditions, the cells exit the cell cycle and enter the so-called “G0” state (Gap phase 0) in which chromosomes have not replicated. Fusion of G0 nuclei with eggs ensures that the donor chromosomes have not initiated replication prior to fusion. From a second female sheep, eggs were isolated and enucleated. Then, electric impulses induced a merger of mammary gland cell and an enucleated egg, thereby reactivating the genes of the mammary gland so that it could control the growth of the fused cell. Later, the growing embryo is implanted in the uterus of a third sheep and in the fifth month, all this gave rise to Dolly, a lamb identical to her genetic mother. To attain this successful birth, 277 attempts were undertaken.4

1.1.3. Comparison of both cloning techniques

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<th>Somatic Cell Nuclear Transfer</th>
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1.2. Therapeutic cloning

Therapeutic cloning is a compound concept that can cause confusion. Given the similarity between therapeutic and reproductive cloning techniques (both use SCNT), there is a methodological problem concerning the term ‘cloning’. To distinguish between them, one has to gain insight into the researcher's intentions. The difference between reproductive and therapeutic cloning implies that, for the latter, one limits the process to the development of the embryo in vitro and, thus, does not proceed to the implantation in the uterus for the purpose of giving birth to a child. We prefer to speak about cloning with either a reproductive or a therapeutic objective. This opens up new and interesting perspectives for transplantation medicine, where tissue compatibility is of vital importance.
In order to adequately understand the therapeutic purpose, we also need to mention the most important means, i.e., stem cells. Stem cells are cells that can divide to produce either cells like themselves (immortality), or cells of one or several specific differentiated types (potentiality). Stem cells can be found throughout every stage of human development from embryo to adult, but their potentiality decreases with age: embryonic stem cells (ES cells) are considered to be pluripotent, whereas adult stem cells are less versatile, which is called multipotent. On the one hand, ES cells are most promising while retaining the greatest potential to develop into a wide range of tissues. On the other hand, the so-called immortality of ES cells — their capacity to undergo prolonged undifferentiated proliferation — gives researchers ample time to add or delete DNA precisely. Thus theoretically, a human ES cell could be genetically altered. Then, by means of somatic cell nuclear transfer, the genetically altered ES cell could be fused with an enucleated egg to create an embryo. That embryo would then give rise to transplantable tissue: therapeutic cloning has occurred.

Before examining this matter thoroughly, we want to indicate that a different type of cell nuclear replacement could be used to help women avoid the birth of a child with inherited mitochondrial diseases. Mitochondria are small energy-producing structures in the cytoplasm of every cell. The cytoplasm can be thought of as a jelly, which holds the nucleus of the cell. Although the vast majority of the DNA is contained in the nucleus of the cell, the mitochondria also contain DNA. We now know that mitochondrial DNA affects a number of important functions related to the role of mitochondria in providing energy for the cell. Tissue with high demands for energy, such as muscle, heart, brain and eye are particularly vulnerable to mitochondrial defects. There are more than 50 inherited diseases of the metabolism that are known to be caused by defects in mitochondrial DNA. A baby only inherits mitochondrial DNA from its mother because mitochondrial DNA in the sperm does not appear to pass through the process of fertilization. If the maternal mitochondrial DNA carries a disorder then it will always be passed on to the child. It may become possible to prevent the child from inheriting the disease by the cell nuclear replacement technique. This would involve inserting the nucleus of the mother's egg into a donor egg that has healthy mitochondrial DNA and which has had its nucleus removed. This new egg could then be fertilized by the sperm of the woman's partner by IVF. Any child born would have received its nuclear DNA from its mother and her partner but would have healthy mitochondrial DNA from the donor egg.1

1.2.1. Human Embryonic Stem Cell Research

The Belgian National Bioethics Advisory Committee states that "Embryonic Stem Cells (ES cells) are cells deduced from the inner cell mass of the blastocyst, which will form the foetus. Those cells are pluripotent and can differentiate into all cell types of a human adult." We will try to analyze this definition in the subsequent paragraphs.

A possible approach to human stem cell research would be to derive stem cells from very early embryos (pre-implantation embryos). About five to six days after fertilization, embryonic stem cells can be taken from the inner cell mass of the blastocyst. The blastocyst begins to form as a 15-20 cell cluster just beginning to separate into identifiable parts that will go on to form the placenta, foetus and other associated tissues. A blastocyst can be compared to a hollow ball of cells. The outer layer of the blastocyst's cells go on to form the placenta, while the inner cells form the embryo and its membranes. Blastocysts used for the isolation of stem cells would probably have between 150 and 200 cells. After the blastocyst stage, the opportunity to extract stem cells is grad-
ually lost as the stem cells start to become specialized and no longer have the potential to become all types of tissue. Research suggests that human stem cells can give rise to many different types of cells. They raise the possibility, therefore, of major advances in health care. For example, stem cells could be used to generate replacement cells and tissues to treat many diseases and conditions, especially those cells that can no longer be renewed by an adult body, for instance heart muscle cells to treat heart disease, nerve cells for the treatment of Parkinson's or Alzheimer's disease, insulin-producing cells to cure diabetes, bone marrow for leukaemia patients, etc. In short, if ES cells could be directed to differentiate into particular tissues and immunologically altered to prevent rejection after engraftment, they keep alive the hope for treatment or cure for the most important lethal diseases of this century: neurodegenerative disorders, cancer, heart and coronary disease.

But the isolation and growth of ES cells in culture also raises ethical problems. Human embryonic stem cell research is inextricably bound up with the generation of embryos solely for research purposes. The major point of controversy is the origin or source of the embryos to be used in research. The “Convention on Human Rights and Biomedicine” of the Council of Europe — the most important European consensus document, though not yet approved by several European countries — explicitly prohibits the creation of embryos solely for research purposes (article 18, part two).

1.2.2 Adult Stem Cells

The current technical obstacles of human cloning technology, combined with the ethical controversy about using embryos for research purposes, have stimulated the scientific discovery of 'embryo-saving' alternatives, i.e., adult stem cells. Scientists had known for decades that certain kinds of stem cells lurk in adult tissues, for example in skin. Wounded skin heals out of a special cell layer in the epidermis, which has the capacity to cover the wound and to heal fast. One could consider cultivating cutaneous stem cells to treat skin covered in burns. Until recently most scientists had assumed that the adult-derived cells have a limited repertoire. Just as years of training usually commit a concert violinist to a career in music, so scientists had assumed that when a young cell takes on an identity and turns various suites of genes on or off, that genetic programming irreversibly commits it to becoming one of just a few cell types. But in 1999, the British Medical Journal reported that signals in the immediate environment could sometimes overwrite a cell's genetic history, implying that adult stem cells will receive the versatility of an embryonic stem cell (pluripotency). This way, stem cells isolated from the bone marrow of an adult patient, could become blood, brain, muscle, cartilage and bone cells.

Using adult stem cells for transplantation medicine increases human tissue compatibility and immune tolerance, because donor and patient are one and the same person. But even adult-to-adult cell therapy does not liberate us from the ethical and legal entanglements that invoke the moral status of the human embryo. Reprogramming an adult stem cell to the pluripotent state of an embryonic stem cell requires further research on the molecular regulation and differentiation that can only be reached by cultivating embryonic tissue. In other words, the simultaneous development of both research strategies — adult and embryonic stem cell research — is preferable, considering that research on ES cells probably will contribute to speeding up and optimizing clinical applications of adult stem cells. These reflections cast doubt on the opinion of the Pontifical Academy for Life that gives preference to adult stem cell research. One will have to take into account the chance that alternative options, i.e., adult stem cells, have the
same broad applicability as ES cells from pre-implantation embryos, which is a rather small chance.

2. Response from within society

It is quite remarkable how quickly international organizations have dismissed the possibility of reproductive human cloning. However, a recent decision of the British Parliament (with the vote in the House of Lords on January 23rd, 2001) to allow therapeutic cloning indicates a rather moderate attitude. Let us first take a look at some reactions to the cloning of the sheep Dolly. Almost immediately after the press release of this scientific experiment, the UNESCO conference adopted a declaration entitled “Universal declaration on the human genome and human rights”. After a referral to a set of general principles on the universal protection of human rights and democratic ideals, the text starts with the acknowledgement that human genome research and its applications open immense perspectives for the improvement of humankind in general and for human health in particular. However, the text’s body is mainly devoted to the limitations and the risks of this kind of scientific research. In article 11, it is specified that “practices opposed to human dignity, such as the reproductive cloning of human beings, are not tolerable”. Therefore, states are invited to take necessary measures.

On January 15th, 1998, the European Parliament accepted a resolution that invites the member states to ratify legislation that forbids human cloning by criminally sanctioning each violation. At the same time, the EP invites the member states and the European Union to work towards a worldwide and clearly sanctionable ban on the cloning of humans.

The Belgian National Bioethics Advisory Committee observes that the above-mentioned recommendations and resolutions are not imperative law, irrespective of the important institutions that have formulated them. For that reason it is useful to pay specific attention to the work of the Council of Europe. On January 12th, 1998, a “Supplementary Protocol on the Convention of Human Rights and Biomedicine” was signed in Paris. A group countries including France, Luxemburg, the Netherlands, Denmark, Sweden, Finland, Portugal, Spain, Italy and Greece, signed this protocol.

The same advisory committee, in their tenth advice addressed to the Belgian government, agreed to the following consensus: “The analysis of these arguments has led the members of the committee to the unanimous opinion that, irrespective of other considerations, the allowance of human cloning can at present not be considered. Given the scientific, technical and ethical uncertainties bearing on the technique of reproductive human cloning, the committee recommends a clear ban on every attempt that in the short/long term aims at the realization of this type of cloning. The committee wishes that psychological, philosophical, medical and ethical studies concerning cloning have to continue, hereby facilitating the public opinion to come to terms with human cloning in a reliable and informed manner. All the members of the committee agree that if illicitly a human clone were fathered, he or she would be fully human and none of the arguments here presented could be used to challenge his or her human dignity.”

These statements refer basically to reproductive human cloning. The decision of the British Parliament indicates a more moderate view on so-called therapeutic cloning. It is important to notice that the British lawmakers for the time being only accept stem cell research on human embryos originating from IVF. In the United States too, therapeutic cloning is debated. One of the issues there is whether the government should fund this kind of scientific research.

All this makes it clear that policy-makers take a
conservative attitude towards reproductive cloning but that there is a more moderate view on therapeutic cloning. The same applies to the opinion of the European Group on Ethics in Science and New Technologies, addressed to the European Commission on 14 November 2000.

3. The Ethical Debate

3.1 Terminological ambiguity leads to ethical obscurity

There is a fear that once the human cloning technique is optimized through research on human embryonic stem cells, scientists are only one small step away from growing full human beings (reproductive cloning) instead of human tissues (therapeutic cloning). We already mentioned that we prefer to speak of a single cloning technique, with either a reproductive or a therapeutic objective. The notion 'therapeutic' implies a goal: to treat or to cure, as in the Latin proverb *medicus curat, natura sanat*. The difficult problem consists in the fact that it is only by means of controversial research on human embryonic stem cells — i.e., by a subsequent destruction of the human embryo — that one can gain insight into the origin and eventual treatment of a (genetic) disease. It seems obvious that advocates of the inviolable integrity of each individual human life, including an embryo, cannot agree with the 'healing' purpose of human stem cell research.

The ethical debate surrounding human stem cell research can be compared to a Faustian bargain: the possibility of curing lethal diseases versus the instrumentalization of the human embryo. Can one turn a blind eye to research with embryos for the sake of the development of stem cell research? In short, we are obliged to consider the moral status of the human embryo.

3.2 The moral status of the human embryo

The nature and the moral status of the human embryo is a vast and difficult subject in Roman Catholic moral theology. The idea of the inviolable integrity of a human embryo has led the Congregation for the Doctrine of the Faith to repeatedly condemn an instrumental attitude to the origin of human life (*Donum Vitae*, 1987; *Evangelium Vitae*, 1995). While the official magisterium still rejects any nuances, it must however be acknowledged that the debate on the moral status of the human embryo inside the Roman Catholic community remains open. Already in the early seventies Karl Rahner mentioned “the uncertain rights of a human being whose very existence is in doubt.”

Recently, some Catholic moral theologians such as R.A. McCormick, P. Verspieren and J. Mahoney all accepted the distinction between genetic and developmental individualization. The former is certainly present from the earliest beginnings of life; the latter is not: “Developmental individualization is completed only when implantation has been completed, a period of time whose outside time limits are around fourteen days”.

This implies a more open attitude to research with supernumerary human embryos before the moment of individualization (pre-embryos). This viewpoint also has brought more diversity into the Catholic approach to *in vitro* fertilization, genetic diagnosis, human gene therapy and obviously also to human embryonic stem cell research. For the sake of clarity, the theologians just mentioned still oppose the creation of human embryos solely for research purposes. They prefer using 'spare embryos' from an infertility treatment. These embryos are normally discarded, but instead they may be donated for research. One could question, however, whether there is a fundamental moral distinction between, on the one hand, using supernumerary embryos in research and, on the other hand, the generation of embryos for research purposes: techniques like IVF would not have been possible without research on embryos solely
created to enhance the success rate of such an infertility treatment.

3.3 Reproductive cloning: crossing a boundary?

Although we would like to concentrate on stem cell research, it seems useful to recall the three most important concerns about reproductive cloning. First, are there any medical risks? As cells divide and organisms age, mutations in the DNA will inevitably occur and will accumulate with age. Sporadic somatic mutations in a variety of genes can predispose a cell to become cancerous. The risks of such events occurring following nuclear transfer are difficult to estimate. Second, children who are produced through cloning might suffer psychologically and socially from an overwhelming burden of expectation that could interfere with the freedom necessary to develop a full sense of identity. Third, ethically there is a fear of the rebirth of eugenics: can we decide which human traits and characteristics would be favoured? An analogy can be drawn with the issue of sex selection: here also the aim is to interfere with a fundamental human trait which undermines human freedom. The Kantian principle that we treat "humanity in your own person or in the person of any other never simply as a means but always at the same time as an end" is applicable in this context.

Moreover, cloning does not guarantee a particular phenotypical manifestation of the genes, nor a carbon copy of behavioural traits such as character, personality, intelligence, etc. After all, little is known about the complex correlation between genes and their environment.

3.4 Playing God

Equally important, many of the issues that stem cell research raises have significant theological components and therefore require a religious and theological response. For people of faith, the impact and implications of these new medical developments cannot be addressed apart from fundamental theological precepts about humans standing before God and their role in creation. The phrase 'playing God' has come to be used as shorthand for concerns that it is inappropriate for humans to change the way other living organisms including human beings are constituted because it amounts to usurping the creative prerogative of God. The theology of creation is challenged to answer these new scientific developments, at least if there can be an answer. After all, the theologian Ted Peters argues that the primary role of the phrase 'playing God' is to serve as a warning and that it has very little cognitive value when looked at from the perspective of a theologian.

The expression 'playing God', according to Ted Peters, can take three distinct meanings that, from our point of view, again merge in the reflection on human ES-cell research. In the first instance, the expression pertains to the steadily growing base of human knowledge about the foundations of God's creation of the human being, namely with regard to embryonic stem cells. The laboratory has become the place where we gain insight into God's awesome secret. The Torah is no longer the lamp to light the (human) path (Ps. 119,105); rather, the microscope has become the beacon. One small 'peephole' allows us a nearly panoramic view of the so-called 'germ at the beginning of human life,' the stem cell. This cell, whose nucleus is protected by a cell wall, is now the new sacred place; whoever enters it walks in the Holy of Holies. This sacred place no longer contains two stone tablets, as did the Ark, but the two new laws of life, the DNA strings. As a result, when using the phrase 'playing God,' people point to the growing power of medicine over life and death. This power culminates in human ES-cell research. The stem cell — to which some accord the status of the inception of human life — is used (or abused) to save the life of a patient with serious ailments. Last, 'playing
God' is employed in a more or less literal manner where human beings themselves attempt to create — as God — new human tissue or even life, with the aid of (therapeutic) clone technology. In brief, the power of mastering (human) nature through (therapeutic) cloning raises the question whether the human being, as the image of God, is permitted to carry out this task or whether God alone may exercise this right?

To answer these questions, we ought to fall back on the structure of human moral experience. That structure is based on the distinction between (1) that which we are responsible for individually or collectively (nurture) and (2) that which has been given to us as a background against which we act and which cannot be altered by ourselves (nature). Ancient philosophy already distinguished the independent human capacities from their destinies, which are in divine hands. Christian moral theology also distinguishes between the world created by God — our natural condition as creatures — and the scope of human freedom. Medical researchers use scientific language to come to the same distinction: cells and genes given by Mother Nature versus what can be done to manipulate human nature. The relationship between 'createdness' — whether by God or by a natural process — and free will constitutes the backbone of moral reasoning and any alteration in this relationship is worrying.19

Therapeutic cloning or human embryonic stem cell research seems to disturb this moral balance. One fears the prospect of 'designing babies' because such technology would undermine the distinction between our 'createdness' and our personal choices. However, Audrey Chapman says it should be noted that, ironically, theologians involved in the ethical debate seem less inclined than some secular commentators to employ the phrase 'playing God' or to refer to the potential of cloning impinging on divine prerogatives and exceeding appropriate limitations of human activity.20

The pejorative note reverberating in the phrase 'playing God' leads us back to our mythical past. One of the most powerful myths that frames and filters the cultural reception of cloning technology is that of Prometheus's pride or hubris.21 The Greek Titan is not only characterized as the creator of all sciences but also as the divine power that created humanity. The point of the story is that Prometheus provided humanity with the heavenly fire — scientific knowledge — which separates humankind from animals, and promotes the human to master of the universe. From Zeus's point of view this is a transgression, which has to be followed by a fall. Zeus chained the Titan to a rock where an eagle could feast on his liver.22

Nowadays, diseases such as cancer and Parkinson's make people worry. On the other hand those diseases can only be overcome thanks to the increasing knowledge of the therapeutic value of embryonic stem cells. According to Ted Peters, such an ambiguity may lead to a deterministic interpretation of human destiny, which he calls 'Promethean Determinism'. This interpretation reduces humanity and human biology to their genetic substratum, which hardly allows human freedom and creativity to flourish.

4. A theological interpretation

4.1 A way out of determinism

It is equally compelling to investigate how a 'gene theology', insofar as it is formulated on the basis of a belief in a sort of predestination, reasons. Here the genome takes the place of a Janus-faced God who arbitrarily rules over and disposes of everything. On the one hand the human is literally bound by the invisible threads of DNA. Human life is reduced to the performance of a drama whose 'dénouement' has been determined in advance. The divine DNA directs the play and humans act it out. In this perspective of God's providence the separation and autonomy of humanity over against God is
eliminated. On the other hand, the illusion is created that once the genetic structure is untangled a total control of the further evolution of human dignity and scientific and technological development becomes possible.

This conflicts with a basic understanding in contemporary theology. In this connection it is instructive to return to the distinction between the sacred and the holy, as Roger Burggraeve develops this.23 “Rudolf Otto interpreted the Sacred or the Numinous in a dual sense: as that which both surpasses and penetrates reality. The divine adorns its face with a great and unapproachable mystery that, as the ground in which all participates, at once fascinates (fascinosum) and incites fear (tremendum).24 That aspect which elicits a feeling of anxiety displays itself in the divine as an overwhelming power before which the human must bow in worship. The fascinating aspect consists in the fact that because the divine permeates the whole of nature, humans can participate in this power by fully immersing themselves in nature. As a consequence, the distinction between the divine and the world — that typical characteristic of the Hebrew Bible — becomes extremely vague. This fusion between the sacred and nature directly expresses itself in a linguistic manner: one speaks of the sacred in a neutral genre (Sacrum and Numinosum). As an impersonal force, the numinous points unambiguously to the state of chaos before the biblical creation. In contrast, Judaism characterized the Creator as a personal God or the Holy. The creation, and above all humanity, was in this scheme radically separated from the creator. “The biblical creation honors a paradoxical relation between dependence and independence”.25 Although man as a created being receives his existence from God, he thereby acquires his autonomy, a `received autonomy’. In contrast with the other creatures, God has literally set man on his feet and allowed him to walk erect. This really means that God realizes his power precisely in giving up his right to exercise power over humanity. “God's holiness consists in the humility of his abnegation and his `self-limitation' (tsimtsum).”26 Through the voluntary inhibition of his omnipotence and omnipresence, God has given the human breathing room inasmuch as the human is a free, autonomous and responsible creature.
4.2 The human as created co-creator

As we interpret the phrase 'playing God' it is important to recall the tension between the biblical calling of humanity to realize its essence as the image of God, on the one hand, and the Promethean propensity to become God, on the other hand. This temptation is at the nucleus of original sin as described in Genesis 3. The tension between vocation and desire may be translated as a warning against human pride: 'playing God' (imago Dei) is not the same as 'being divine' (imitatio Dei). The expression 'playing God' therefore must not be explained in terms of the human as Creator but as 'created co-creator.' This term offers us a fitting concept for a theological approach to our theme.

The Protestant theologian Philip Hefner introduced the term 'created co-creator' in his article The Evolution of the Created Co-Creator, but the Catholic theologian Karl Rahner s.j. had in the early seventies anticipated a similar vision of humanity in relation to God and creation. We now propose unravelling the various components of this expression and evaluating them one by one.

The term co-creator implies that creation or nature is not a static order brought into existence through a single, one-off act of God. This has been made clear by our ever-growing knowledge in the field of genetics. Revolutionary genetic developments have put theological anthropology in an evolutionary perspective. The DNA molecule is shared by all living beings. Spontaneous genetic mutations keep evolution in check, on the one hand, but on the other hand they are responsible for faults in the mechanism of cell division that often lead to fatal illnesses such as cancer. From God's side the new insights from genetics mean that creation is an evolutionary process in which God remains continuously active. Moreover, God is ubiquitous and at every moment God influences creation at the level of its smallest building blocks (the hereditary material). In the end, the future of this evolution is always uncertain, just as God's Kingdom is found in the field of tension between the 'already' and the 'not yet.' Together these elements constitute the kernel of the doctrine of God's uninterrupted creation, or creatio continua. For humanity, knowledge of the origins of a (genetic) disease means that the human is no longer passively subordinate to God's creation but may take an active and creative part in it through, for example, the recourse to (therapeutic) cloning technology.

The prefix 'co' in 'co-creator' suggests that the human stands on an equal footing with God. Thanks to the development of ES-cell research, humans have indeed gained insight into the secrets of God's creation, and with the aid of cloning techniques they are able to employ this knowledge in the creation of human tissue (therapeutic cloning) or even a 'complete' human being (reproductive cloning). But this does not yet mean that the microbiologist will bring this knowledge to bear for the good of creation as God originally intended. Human creativity is ambiguous. On the one hand people may apply their technological ingenuity to the reduction of suffering in the creation. On the other hand, science and technology have equally brought about suffering. An unbounded veneration of the efficiency, measurability and usefulness of human life has been the cause of the exploitation of all creatures — including (incipient) human life — as objects, means or functions of humans themselves. The human is not divine: he only plays at being God; is 'only' an image of God. “When man loses sight of the ambiguity of his creativity, the risk is great that he confuses the technologically 'possible' with the 'desirable' or the 'valuable,' in short, with the 'good'".

God's work of creation is always distinct from that of humans. While the human being has the natural properties of matter at his disposal, God creates from nothing (creatio ex nihilo). All of
nature is dependent on the divine Creator that transcends it. If this distinction between divine and human creation is not respected “it betrays a veiled naturalism, a variant on the alleged 'thou shalt not play God' commandment.”\(^\text{32}\) It supposes that human life when naturally gifted (in whatever way) has a higher moral value than when scientists, supported by technology, intervene in human life. Insofar as the area of our research is concerned, this would mean that the stem cell is naturally a sort of 'biological niche' for the unique genetic constitution of (beginning) human life that may not be operated upon without violating human dignity. The fact that stem cells are researched and manipulated by people itself makes therapeutic cloning immoral. What Mother Nature has given us is inviolable.

Such an argument contains a naturalistic fallacy. It presumes to deduce what ought to be from what is. But Mother Nature is not divine. God has created nature as good, but the creation is not complete (cf. creatio continua): suffering, sickness and death are equally the consequences of our genetic constitution. Human cloning technology must aim at improving on the creation that we have inherited. Thus, the human hereditary material itself is not holy; only God is. Because life is created, it is good but it is not God.

In summary, we might state that it is necessary constantly to bring two elements together in order to achieve a clear theological understanding of the use of new cloning technologies for therapeutic purposes. On the one hand we have the very nature of the human, which God has created good but which is nevertheless not complete and thus subject to disease, suffering and death. Humanity, in the image of God, is therefore called to apply technology to work with God in the unending Kingdom (cf. the created co-creator). Separating these two components of the human being as created co-creator can lead to two different judgements of the merits of ES-cell research, both of which are one-sided.

First, if we understand the human being only as co-creator the human will be tempted to act as if (human) life has value only to the extent that it is useful for humanity itself. Human embryonic stem cells could then be taken to constitute mere raw material to be manipulated in function of human needs or desires. Although viewed scientifically, embryonic stem cells cannot be considered the equivalent of human life, microbiologists are for the moment restricted to 'borrowing' them from human embryos in vitro. Quite independently of the potential advantages of ES-cell research, scientists must always keep in mind that 'weak' (beginning) human life is also created in the image of God and therefore deserves respect.

Second, if we take the human being to be only a created being, alongside other creatures, and therefore one who is not permitted to intervene in matters of human life, it becomes difficult to justify not only cloning technology but also medicine in general, since all of medical science and not just ES-cell research aims at the reduction of human suffering.

Nonetheless, the notion of createdness and with it the aspects of mortality and fallibility, in combination with the doctrine of sin, provides humanity with the important insight that not everything that can be done may be done.

5. Conclusion

The key question isn't whether we play God but rather how we should play God. Knowing good and evil, humanity has to realize and incarnate its morally good disposition, following Jesus Christ, who is the true image of God. The Christian conception of God is inseparable from the stories of
Jesus of Nazareth, the Son of God, whom Christians believe to be the definitive expression of God's purpose for humanity. Although the four evangelists offer different portraits of Jesus' life they all agree on this point: Jesus of Nazareth spent a great deal of his life healing the sick. If the gospels present Jesus' healing miracles as an essential element of his divine identity, does this then mean that he defies the original will of the Creator? Or are the miraculous healings Jesus accomplished the very expression of God's intention for humans?

If Jesus would thus defy the will of God by healing the sick, would he be placed on the same level as Prometheus who rebelled against the tyranny of the evil chief divinity Zeus? Jesus himself fulminated against such a view, saying “I drive out demons" with the help of the spirit of God” (Mt 12,22-32). Jesus, moreover, three times withstood the invitation of Satan to abuse his divine powers and collaborate in the rebellion against God (Mt 8,1-10). Jesus' miraculous healings perfectly coincide with the task of the human as image of God (Ex 15,26b), while Eden remains the symbol of the original and final aim of God's work of salvation (Is 51,3). The healing miracles of the New Testament confirm the Old Testament's portrayal of a God who takes pleasure in the (human) nature of creation and at the same time continuously creates and redeems (human) nature, a process culminating in the life, death and resurrection of Christ. According to Christians, (human) nature — marked by sickness, suffering and death — is not reconcilable with God's original creative work. (Human) nature is originally good but at the same time is subjected to evil forces due to the human freedom to sin. Rudolf Bultmann sums up the ambiguous character of nature as follows: “The creation has a peculiarly ambiguous character: on the one hand, it is the earth placed by God at man's disposal for its use and benefit; on the other, it is the field of activity for evil, demonic powers.”

In sum we can say that emphasizing the 'co-creator' pole of humankind as Imago Dei, implies an invitation to accept the advantages of therapeutic cloning. Stressing the fact that the human is 'created' by God, moreover, being a sinful creature, rather leads to a condemnation of the cloning technology.

Because of the history of the human person, this criterion suggests that we should constantly reconsider what possibilities we have at our disposal at this point in history to serve the promotion of the human person. This requirement is part of a dynamic ethics which summons us to do that which is better as its actualization becomes possible. By virtue of the progress of science and technology, new possibilities are constantly being opened up for our activity, e.g., therapeutic cloning. It is the specific task of ethics to inquire as to how the growing possibilities can be realized to serve the dignity of humankind. The promotion of the human person becomes a moral obligation insofar as it becomes possible (le souhaitable humain possible). Ethics is indeed fundamentally a way of living and its own growth must keep in step with human life itself as it unfolds throughout history.

The ambiguity that arises out of a theological 'clarification' of the expression 'playing God' demands an even more thorough clarification of a theology of creation. In other words, there is a limit to a bioethical explanation: the phrasing as well as the challenge become basically theological. We dare to hope that fundamental theology takes up that challenge and tries to design a renewed hermeneutics of 'genesis'.

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Notes
1. Bart Hansen is a researcher (F.W.O. Vlaanderen), Center for Biomedical Ethics and Law, K.U.Leuven. Paul Schotsmans is professor and director of the Center for Biomedical Ethics and Law, K.U.Leuven.
2. G. DE WERT, 'Het schaap kan nu worden gekopieerd, de volgende stap is de gekloonde herder,' in NRC Handelsblad, 12 maart 1997, p. 7.
10. D. Dickson, 'Ethics Can Boost Science' in Nature 408(2000), p. 275. It has to be noticed that because of the therapeutic value of ES cell research, France and the Netherlands signed the convention but did not ratify it. They anticipate making an exception for art. 18.
13. Pontifical Academy for Life, Declaration on the Production and the Scientific and Therapeutic Use of Human Embryonic Stem Cells: “The progress and results obtained in the field of adult stem cells show not only their great plasticity but also their many possible uses, in all likelihood no different from those of embryonic stem cells, since plasticity depends in large part upon genetic information, which can be reprogrammed.”
52-57.
24. R. BURGGRAEVE, Zinvolle seksualiteit, p. 68, o.c.
25. Id., De Bijbel geeft te denken, p. 68, o.c.
26. Ibid., p. 68, o.c.


31. R. BURGGRAEVE, *De Bijbel geeft te denken*, p. 59, o.c.


33. K. DIERICKX, *Genetisch gezond? Ethische en sociale aspecten van genetische tests en screenings* (Antwerpen — Groningen, 1999), p. 148. “The miracle-healings of Jesus can be divided into two groups. The first group consists of exorcisms, and these belong to the most authentic nucleus of Jesus’ traditions. The second group of stories was shaped by the healings, more properly speaking, and deals with the curing of deaf, blind and lame people.”

