

## Hoofdstuk V: The status of the human genome: is it ever licit to modify an individual's genome?

*Hoofdstuk V uit "Het embryo: iets of iemand?", onder redactie van mgr.prof.dr. E. Sgreccia e.a., Colomba, 1997 door P. Garrett, M.A.*

The human genome is a biological entity which comprises the three-billion-letter genetic code contained within the nucleus of the typical human cell. The biological raw material of the genes which contain this genomic information is the deoxyribonucleic acid (DNA) molecule. This molecule is best envisaged as a twisted ladder, with uprights composed of chains of sugar and phosphate groups, while the rungs consist of bases sticking inwards towards each other. These rungs of the DNA ladder form properly only when one pyrimidine base plugs into one purine base, which results in fixed proportions of one adenine to one thymine, and one cytosine to one guanine pertaining throughout the genome. These organic bases, along with their ribonucleic acid (RNA) cousin uracil, encode all the information which makes us into physical human beings.

During the 1960s, geneticists discovered that the chromosomes are not uniform but are made up of coding sequences which specify proteins, 'control' sequences (acting as switches for structural genes) and areas which contain base pair sequences with no obvious function. We now believe that the human genome contains 80-90,000 actual genes which code for proteins.

The high-profile Human Genome Project seeks to 'write out' the entire sequence of genetic letters: those which generate the proteins that constitute our physical bodies (exons) and those other sequences which do not (introns). When this task is completed, clinical geneticists will search out genetic 'spelling mistakes' as a prelude to genetic engineering treatments. Technologies will then be developed not only to repair dysfunctional parts of the genome, but also to enhance 'normal' ones. The technological barriers in this area are considerable, but so is the scientific motivation to overcome them. It will be important to refer back to this repair/enhancement distinction later when discussing the ethical status of the genome.

At this early stage the Human Genome Project is 'merely' trying to produce a standardized human genome which will not be the genome of a particular individual. Around the year 2010, human genome studies will progress to the analysis of multiple genomes, belonging to specific individuals, and the developing fields of genetic screening and genetic counselling will have to struggle to come to terms with the implications of this.

### 1. Status of the human genome

Looking at the ethical status of the human genome, one approach is to proceed by analogy with the debate over the ontological and moral status of the human embryo. Indeed, this was the approach taken by the Catholic philosopher Luke Gormally when he was asked to speak on the status of the human genome in Rome, in 1995. (1)

For Gormally, the individual human genome should be thought of as the fundamental information-bearing structure, within a complex organ of development and heredity, through which an organism exercises its natural powers of growth and reproduction. The functions of this genome have a determinate role in the formation of the human body, and an essential role in the transmission of an organized body of specific potentialities which are apt for actualisation in a living human being through God's creation of a rational soul.

Gormally argues, and I think rightly, that the ontological status of the human genome is rankable somewhere between that of the human embryo and that of a single human organ. Thus, while we do not owe a duty of care

to a particular human organ, we do owe such a duty to a human embryo. According to Gormally, it is possible to locate the moral status of the genome somewhere between these two extremes.

Clearly, such an analysis affords an important role to the human individual's genome and allows concepts and argument to be imported analogically from two well-developed areas of moral philosophy.

In order to make this qualitative comparison more precise, Gormally goes on to remind us of the 'causal role' which each individual genome plays in a person becoming the living bodily being he is. By equating acceptance of the life given through parents, to acceptance of a particular genome, Gormally leaves us in no doubt as to the ontological and moral importance of each individual's genome. In fact, Gormally's understanding of the genome's status leads him to formulate a significant final statement: "I have come to think that understanding what [the genome] is gives us some reason for thinking that modifications of the genome designed simply to alter non-pathological limitations are contrary to moral wisdom". (2)

This allows that genetic modification may be licit as long as it aims at the correction of a pathological limitation. This type of demarcation will roughly equate to the separation between curative and enhancement engineering and will necessitate a close definitional analysis of the term pathological. This refined analysis is to be welcomed, but will always leave a grey area between the pathological and the non-pathological. Gormally is right to remind us that those who destroy the distinction, or abandon the intellectual effort of distinguishing, 'destroy the possibility of thinking coherently about what is required for acceptance of the particular bodily life which each of us has been given.'

## **2. Excavation of categories drawn from theology and ethics**

An alternative approach might involve the excavation of categories drawn from the disciplines of theology and ethics. For example, Joseph D. Cassidy and Edmund D. Pellegrino, writing in the *International Journal of Bioethics* (3) have developed their perspective on human gene therapy under the following six headings: accountable stewardship; preservation and protection of the nature and destiny of humankind; respect for persons never merely the means of human experimentation; equality of 'value' of each person and, finally, charitable justice in distribution of resources. This treatment of the issue has obvious strengths and weaknesses. Its key strength lies in the disentangling of themes and ideas, while it suffers from what appears to be a lack a coherent and systematic theological under-pinning. This weakness is in large part due to the severely compressed format of the article, but it does lead to statements which cry out for further clarification. For example: "Biblical stewardship begins in Genesis 1-3 where we are shaped in *God's image* so that He shares with us, as His intelligent and free co-workers, the co-operative care and use of creation... God commands everyone (through Adam) to conserve and cultivate (Gen: 15) a creation already adapted to human needs yet still *perfectable* by our creative efforts. He assigns to us the right preparation thereof by the precepts and practice of the works of mercy (Matthew 25: 34-46). Consequently when Christians employ genetic engineering technology within *ethical constraints*, they fulfill the imperative of responsible stewardship". (4)

The italicised terms require considerable unpacking if this statement is to escape a question-begging cul-de-sac. In fairness, Cassidy and Pellegrino are acutely aware that all the resources of the Catholic tradition will need to be brought to bear on these complex ethical problems. They suggest that: "In this crisis of ethical orientation, the Catholic Church speaks on life's meaning from a global perspective as the representative of a great moral tradition, capable of shedding light on 'values', of suggesting models of reasoning on difficult medical and societal questions and finding articulated solutions to hard cases like the moral applications of engineering the human genome." (5)

In spite of the spatial constraints, Pellegrino and Cassidy provide a useful and delicate balancing act between 'the desire for learning as a desire for God', and the 'priority of ethics over technology'. We are steered towards occupation of the 'middle ground' between blind acceptance of every scientific 'advance', on the one hand, and total rejection of 'responsible and humane scientific progress and therapeutic treatments of genetic disease' on the other. Pellegrino and Cassidy's conclusion calls upon us to distinguish the practical virtues of our ability to manipulate the genome, from the moral dangers such artistry may entail, in order to affirm a technology at the service of man. Such an outcome is, for Pellegrino and Cassidy, achievable because those who apply the 'norms of right reason' to the field of genetic modification will abjure the subordination of the human person to mere technology.

### **3. A taxonomy of the problem**

The most fruitful approach to this difficult ethical problem of deciding upon the limits of genetic intervention, is to begin by producing a taxonomy of the problem. The more classificatory distinctions developed in the foundations of an analysis, the better the analytical superstructure is likely to be.

Most writers try to distinguish enhancement engineering from mere repair engineering, but specialists tend to distinguish a third category (6) or expand upon caveats. (7) Eijk argues convincingly for the additional category of prevention engineering to cover cases where genomes are modified to prevent future damage. In the bio-medical part of his thesis he discusses the insertion of genes into liver cells of rabbits, encoding the low density lipoprotein receptors on the surface of liver cells, so that they may serve to take up cholesterol from the blood into the liver cell. Later, in the ethical part of this work, he speculates: "Perhaps this procedure could become a therapy for humans who have a deficiency of these receptors, and consequently have a high concentration of cholesterol in their blood, rendering them prone to atherosclerosis, especially of the coronary arteries." (8)

The category of preventive genetic engineering has its place in an accurate taxonomy of the field. Future studies will be clearer if they employ this tripartite system instead of the traditional bipartite one.

Peterson's insight seems equally valid when he writes: "If one or a combination of the definitions of health and disease that have changing applications is more convincing, there may still be a clear conceptual distinction between cure of disease and enhancement of capacity at any given time, but its application would vary temporally. The line of division would move over time. What would be ruled enhancement of capacity at one time might well fall under cure of disease at a different time ... the applied result of the distinction would be conceptually consistent but not fixed in application." (9)

It is noteworthy that Eijk does not provide a full discussion of the problem of defining disease but is well aware of the importance of this aspect of the field of inquiry. Gormally claims to be employing a relatively narrow, Aristotelian conception of health according to which health is the 'wellfunctioning of the bodily organism as a whole'. Usefully, Peterson dedicates over 20 pages to the definitional problem itself (10) – a feat of intellectual honesty which imports analytical humility into the field of view.

Apart from the classifying of 'objectives' under the headings of cures, preventions and enhancements, we must also distinguish 'target tissues' according to whether they are somatic or germ-line. This distinction is now so commonly used that politicians and members of the general public employ it in their discussions of genetic engineering. Some writers have expressed doubts about the supposedly hermetic seal between the two types of tissue on the ground that delivery systems and vectors are so poorly understood and, more importantly, controlled, that a putative somatic treatment might inadvertently result in germ-line changes.

#### **4. Analysis of moral agency according to the means-end model**

Even an exhaustive taxonomy of 'target-tissues' and 'objectives' will not provide an analysis of the acting person or his/her acts. To make such a 'moral' assessment we must overlay our two dimensional taxonomy with a framework for the analysis of moral agency.

Indeed, Gormally touches upon one aspect of this dimension when he comments upon enhancement genetic engineering by suggesting that: " .... even if the suggested mode of carrying out the modification were not in breach of other moral principles and did not involve unwarranted risks, it would still be unacceptable as involving a wrong attitude to a particular living human being in the particularity of his or her bodily existence." (II)

The proposed engineering on the human genome will be adjudged licit only if both the methods and the intentions, of the researcher, parent or other agent, are morally acceptable. In the words of Pope John Paul II: "I approve and support your worthy researches. I reaffirm that they must all be subject to moral principles and values which respect and realise in its fullness the dignity of man." (12)

A year later, addressing the World Medical Organisation, the Pope distilled the principles which would have to be respected if genetic engineering was to be licit.

1. The dignity of the human person must be respected by safeguarding man's identity as *corpore et anima unus*.
2. The methods used must not affect the bodily and spiritual union of the parents in procreation.
3. Manipulations to create genetic under-classes must be avoided.
4. Fundamental motives must not aim at a reductionist and materialist conception of man.
5. The 'liberty and autonomy' of the human person must not be violated. These paraphrased guidelines are simply the seeds from which a more complete analysis of the liceity of genetic engineering may emerge. Eijk observes that these guidelines do not explicitly rule out all enhancement genetic engineering, but he goes on to remind us that the document *Donum Vitae* admits of no exceptions, and rejects every attempt at enhancement of human qualities by genetic engineering: "such enhancement manipulations are contrary to the personal dignity of the human being, his integrity and his identity. Thus they can by no means be justified by the eventual beneficial consequences for future mankind. Every person has to be respected for himself: in this the dignity and the right of every human being consists from his origin." (13)

All such stipulations amount to limitations on the range of genomic modifications which may be deemed licit. In any particular proposal it will be necessary to evaluate methods, intentions, attitudes and effects to arrive at a judgment. This case by case analysis is well suited to the rapidly altering science of genomic modification.

#### **5. The new Genesis: self-creation**

Another fruitful approach is pursued by Ronald Cole-Turner. (14) He surveys and summarises the writings of six prominent theologians on genetic engineering, subdividing them into two broad groupings: "Karl Rahner, Paul Ramsey and Robert Brungs, who are discussed first, are apprehensive about the direction in which this new

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technology might take us. Roger Shinn, J. Robert Nelson and Hans Schwarz, by contrast, mix caution with a greater openness to the important benefits that this technology promises.” (15)

That Karl Rahner finds his way into the litany of conservatives will come as a surprise to many readers. This judgment of Rahner is a reflection of Cole-Turner’s own perspective which is adequately summed up in the last sentence of his book: “Only in the most recent moment of creation have we appeared, and already our technology is giving us the power to add to this great work of creation.” (16)

The hermeneutic difficulties involved in the interpretation of texts are always considerable, and one aspect of this is brought out most clearly if we compare the views of Cole-Turner and Eijk on the subject of Rahner’s writings on theological genetics.

Cole-Turner begins by praising Rahner’s work as “in some ways the most thoughtful theological engagement with genetic engineering,” but he later adds the judgment that while the theme of self-determination might appear to lead in the direction of a highly positive stance towards genetic intervention, the theme of the ‘givenness’ of the individual human ‘existential’ leads in the opposite direction, for what is given is precisely the genetic make-up at birth. (17) And by way of support for this assessment Cole-Turner quotes from Rahner’s seminal article on genetic manipulation (18): Genetic manipulation, however, does two things: it fundamentally separates the marital union from the procreation of a new person as the permanent embodiment of the unity of married love; and it transfers procreation, isolated and torn from its human matrix, to an area outside man’s sphere of intimacy.” (19)

It is, of course, important not to be misled by the phrase ‘genetic manipulation’ which for Rahner, writing in 1966, was practically confined to artificial insemination by donor (AID), and while he is prescient of subsequent technological advances his remarks must be interpreted against this backdrop.

Eijk, analyzing the same Rahnerian material forms the judgment that: “The conclusion of this reasoning is that self-manipulation, considered to be an essential new manner of man’s essential freedom of man, must not be rejected as immoral.” (20)

According to Eijk, Rahner, like Häring, does not accurately indicate the limits of genetic manipulation, but simply mentions a few extreme forms of it which are clearly immoral – as when they destroy the ‘vital substrate for genuine human intercommunication.’

Interestingly, before going on to excoriate Rahner for his analysis, Eijk does unearth a useful heuristic from Rahner’s, previously mentioned *‘The Problem of Genetic Manipulation’* and according to this there are four elements for determining the moral quality of any proposal in genetic manipulation. (21)

These elements we may paraphrase as follows:

1. The subject: it is quite different whether this is done by a married couple or the state (who is the acting person or party?).
2. The moral quality of the act depends on the premeditated result on the whole human being (intentional outcome).
3. Moral quality depends on method of employment (means).
4. Each available step 1), 2), and 3) must be undertaken only if it is appropriate to the true nature of man (reference to underlying anthropology/theology).

To avoid the charge of begging the question, and in order to flesh out *the true nature of man*, one must either deliver a systematic anthropology or admit, as Rahner does, that the question about the liceity of genetic engineering is ultimately unanswerable. This is because, according to Rahner, any theologian wishing to proceed by way of ontological categories must admit that most of the characteristics of any man are merely contingent and not necessary to his substantial self. Rahner himself gives the examples of hair colour and quantity, but Eijk simply charges that: "Rahner, however, fails to provide more concrete criteria to distinguish whether genetic manipulation is at variance with man's nature or not." (22)

That Cole-Turner and Eijk see Rahner's works from such radically contrasting perspectives provides a valuable insight; namely, that an individual writer's gen-ethics depends completely upon his basic theological and anthropological beliefs. At one level this is trivially obvious, but at another level it warns us to be circumspect about the evaluations gen-ethicists make of each other's writings. Stated more bluntly – the hermeneutic problems associated with reading secondary sources are particularly acute in this area, and the cautious reader will want to carefully consult the original texts upon which judgments have been passed.

In fact, there must be as many answers to the question, how much genetic modification of a human genome is licit, as there are theologies and anthropologies in the minds of men. Rahner's achievement lies in predicting and formulating many of the questions which need to be asked, while Eijk's achievement, it seems to me, lies in providing us with a beautifully clear taxonomy of bio-medical possibilities coupled with an anatomy for the beginning of moral inquiry in this field.

## **6. Man as Imago Dei**

We may also profitably journey outside the broad confines of Catholic treatments of the matter in hand to appreciate approaches such as that taken by Karl Barth when discussing the Imago Dei in his monumental *Church Dogmatics* (23) An accessible introduction to how Barth's work impinges on the issue of genetic engineering is to be found in Geoffrey Brown's chapter within *Bioethics and the future of Medicine*. (24)

Brown establishes a geometric model for the exposition of Barth's views. Within this model there are three concentric circles: the innermost circle corresponds to the 'order of obedience'; the middle circle represents the order of creation; and the notion of a closed deposit of absolute truth from which unchanging ethical principles may be derived.

According to Brown: "The outer circle involves Barth in a discussion of The Imago Dei which is a divine prototype, a divine pattern of being in relationship according to which the human is made and after which human life should be fashioned. The human being is in God's image because the man-woman relationship is like the harmonious confrontation between the Persons of the Holy Trinity. Barth's doctrine of the Imago Dei is Christological which implies that real humanity in the image of God is Christologically known: Jesus is true human being, authentic human being, ideal human being." (25)

Within the middle circle (order of creation) Brown explains: "As there is an I-Thou intra-trinitarian relationship, a community of disposition and act in the divine essence, similarly there is in humanity as male and female an I-Thou relation, a 'face-to-face' relation. Thus, the pattern of his life is analogous to that of divine life: this is God's image and likeness in humanity therefore within the order of creation the Imago Dei consists in a band of freedom, mutual respect, and willing helpfulness." (26)

Barth's view may be encapsulated within three objections to the idea of using genetic engineering in a non-therapeutic manner. Barth views such attempts as an unwarranted overruling of the interpersonal requirements of the nature of the human as made in the image of God because it:



1. denies human freedom,
2. disregards the demands of respect for life and
3. violates the I- Thou relationship to which a person is called as made in the image of God. For Brown: "Human freedom before the determining command of God is the most conclusive of the three emphases of the argument in that it is the least negotiable and vulnerable of the three ... and a theologically true doctrine of the Imago Dei implies mutual affirmation of God-given freedom of self-determination before the command of God." (27)

And quoting again from Church Dogmatics: "[Life should be seen as a loan] – responsible to God and fellow humanity in patterns of freedom, care and love. Consequently, any genetic tampering that violates such freedom in vitro must be rejected. If our humanity is to be after the humanity of Christ which was for others." (28)

There is at least an echo within these Barthian proscriptions of the call by the present Pope that genetic engineering must "respect and realise in its fullness the dignity of man" (29) and that genetic engineering must not "expose man to the caprices of somebody else, depriving him of his autonomy." (30)

Of course violating the autonomy of an individual's God-given freedom deforms both object and subject (moral agent). This is treated with great clarity by Oliver O'Donovan in his book *Begotten or Made*. (31)

"Unless we approach new human beings, including those whose humanity is ambiguous and uncertain to us, with the expectancy and hope that we shall discern how God has called them out of nothing into personal being, then I do not see how we shall ever learn to love another human being at all." (32)

Any decision about the licitness of a particular genetic intervention should be taken with reference to O'Donovan's observation, but of course fleshing out the content of 'how God has called them out of nothing into personal being', and more importantly, for what ordained purpose he has done so, will require excavation of systematic theological approaches to anthropology, and may well rely upon Christological insights of the type developed by Barth.

## **7. The risk of under-valuing the disabled already born or unborn**

While recent committees of inquiry, at least in the Anglo-Saxon world, appear to have learned from, and been informed by, many of the analyses already mentioned, it is worth noting one particular tension which bedevils those addressing themselves to this area. Namely, that to argue that a genetic defect should be genetically treated, without making those already born with that defect – phenotypically expressed in them – feel that permission to under-value them is being implied, is a very difficult task.

Having argued that licit genetic treatments may in principle include germ-line therapy as well as somatic therapy, the Working Party reporting to the Catholic Bishops' Joint Committee on Bio-ethical Issues in the UK goes on to remind us that: "Those who are already parents of disabled children, whether born or unborn, should be supported by society in accepting and caring for their children. Those who decide, for good reasons, to accept the possibility of conceiving children with genetic disorders should be similarly supported, and should not be subjected to social disapproval." (33)

This type of statement is important for those worried by such comments as Gormally's that: "There are, then, limitations of our bodily constitution which I believe we should accept as the conditions of accepting the particular life each of us has been given. But there are other limitations which we may have good reason to

think should not be there: those that arise from failures of function (or structural formation) which should not exist in any living body. These are all the failures characteristic of ill-health, for health is to be understood as the well-functioning of the bodily organisation as a whole.” (34)

## 8. Accepting versus combating every genetic anomaly

How must we consider such conditions as dyslexia and Down’s Syndrome in relation to this observation? Would the parents of already born children affected with these ‘problems’ be unanimously in favour of genetic therapy? Is there not a danger that a scheme conceived as the ‘repair’ or cure of an individual may actually alter the individuality of the person in a radical and symplify unacceptable way?

To push this discussion further we may refer to an unpublished paper written by Michael S. Bates (35) Writing as both the dean of a theological seminary and as the father of a profoundly disabled 14 year-old girl, he brings a unique perspective to bear on the question in hand: “I have proposed (in line with a great host of prominent thinkers in the Church’s history) that God is both all powerful and all good. Therefore, as Creator and sustainer of all that is, He is ultimately responsible for the presence of such things as genetic anomalies. If He is sovereign, which we go forward assuming He must be, such anomalies must be part of His design and ultimately, somehow even for His glory.” (36)

To answer the question ‘Why genetic anomalies?’, Bates posits four possible reasons:

1. For the sake of God’s glory – a hard teaching but a necessary one according to which nothing we experience is meaningless: “We may not see the sweet side of it in this life (Job certainly did not!)... But we can rest absolutely certain that such things are not mistakes nor do they happen by chance.”
2. “God creates some people with genetic anomalies to show us our own brokenness and our need of His grace... such people help us to clarify our vision of ourselves. To realise our differences are only differences of degree, that we are all radically disabled, fosters a sense of humility, which in the 1990’s has a ‘dank and shameful smell to the worldly, the scent of failure, lowliness, and obscurity.” Might not the rush to clear away and cure genetic imperfections, even radical ones, be the child of hubris, a hatred of personal destiny, perhaps even diminishing our receptivity or openness which is consent to death? As Rahner remmnds us: *“One only reaches the absolute future by way of death’s zero hour, not because the former is death’s gift, not because it could be calculated te be impossible in any other way, but because, beyond all deduction, absolute love was pleased to triumph in its greatest defeat.”* (37)

Rahner may have been considering artificial insemination with donor sperm as the target for this remark or perhaps it is meant to confront the spectre of enhancement engineering. But we may not try to apply it to proposals for repair engineering, at least for dilectical purposes.

3. “God creates some people with genetic abnormalities not only for His own glory, and to show us our own brokenness, but also because such disabled people present us the gift of allowing us to serve them unconditionally with no expectation of receiving back.” (38) Must we not be committed to loving all humans as people born Imago Dei, which is first an ontological category, independent of





any ability we may or may not have by His grace? We must remember that the immaterial aspect of the Imago Dei is as radically disfigured in any one of us as it is in the most profoundly disabled individual.

4. "God creates some people with genetic anomalies to increase our desire for heaven... Things like genetic anomalies serve as sign posts, reminding us that this world is not our home."

If the early Hebrews were able to accept joyfully the plundering of their homes and property because they had 'a better possession and an abiding one' shouldn't we be able to store up our misfortunes with equal fortitude?

None of this resonates in the late 20th Century mind, but does it not have theological purchase? Is the individual identity of the unborn child with an extra copy of chromosome 21, repaired, enhanced or obliterated by a genetic engineering procedure to remove the extra chromosome from every cell?

Of course attempting to answer the question why do genetic abnormalities exist, entails a deep study of Theodicy – the problem of reconciling God's omnipotence and justice with the existence of, in this case, a nonmoral evil and its attendant suffering. Is Bates claiming that God may be seen as the cause of evil and in this way seeking to justify its presence in the world? How radically different would the arguments be employed and the conclusions reached in a system which views such evils as due to privatio boni or total absence of good?

Is it not in fact the case that much suffering degrades without ennobling, and more over fails to bring out the best in others? Might not our chance to serve others unconditionally come to represent an asymmetric self-indulgence which fails to see the person who always has something of himself or herself to give back to the carer?

Indeed, if genetic anomalies are accurately described as non-moral evils do we not have a duty to combat them with every means at our disposal – including genetic engineering. (39)

Jacques Ellul's term, 'the technological imperative' (40) aptly describes our modern disposition of allowing what science can do, to be what science may do. To this unthinking acceptance of the 'gifts' of science Michael Bates' arguments provide a measure of counter-balance.

It must be said that Michael Bates is not opposed to all forms of curative genetic engineering. I have simply used sections of his article to illustrate that a case, for the inviolable uniqueness of the profoundly genetically disabled, could be theologically made. If we set Ronald Cole-Turner's view that individual genetic enhancements could be adding to God's great work of creation against this view of each individual's inviolable uniqueness, we come to appreciate the breadth and depth of disagreement which exists in the modern genetics of genetic engineering. This serves the useful purpose of underlining the importance of writers developing their view out of coherent and systematic theologies and anthropologies.

Only by developing such coherent views will the protagonists avoid the intellectual charge that they are merely making assertions, to support preconceived personal commitments or prejudices, instead of advancing arguments. The quality of 21st century discussions of these key issues will be determined by just how far theologians and ethicists are able to see the essential importance of this. The field is already being 'fruitfully' surveyed with considerable creativity – a creativity that will be further enriched if researchers act 'ecumenically' (eclectically) in the future. The pace of scientific 'advance' demands supreme efforts from those addressing these issues and we must hope that some shared sense of mission will therefore emerge:

## The answer

The short answer to the question we set ourselves is almost certainly yes, but determining exactly to what extent requires continuing study and attention.

## Noten

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28. K. Barth, *Church Dogmatics*, *op. cit.*, III/2, p. 208.
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30. John Paul II, "Medecine, droits de l'homme et manipulations genetiques," *op. cit.*, p. 311. Cited in W.J. Eijk, *op. cit.*, p. 259.



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37. *Ibid.*, p. 220.
38. *Ibid.*, p. 9.
39. Some theologians such as John S. Feinberg have suggested that the problem of distinguishing the pathological from the non-pathological could be theologically phrased as the attempt to discover those genetic anomalies which are the consequence of sin in the world. This approach may turn up a dividing line somewhere in the vicinity of that predicted by the traditional separation of therapy and enhancement, but it will exchange the problem of defining health for the problem of defining the consequences of sin. We may suspect that writers such as Peterson will not be terribly impressed by this attempt to exchange one set of demarcation problems for another, but perhaps such parallel analyses would ultimately enrich each other.
40. J. Ellul, *The Technological Society*, transl. by J. Wilkinson, New York: Alfred Knopf Vintage Books, 1964.

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